Merck KGaA
Darmstadt, Germany

science

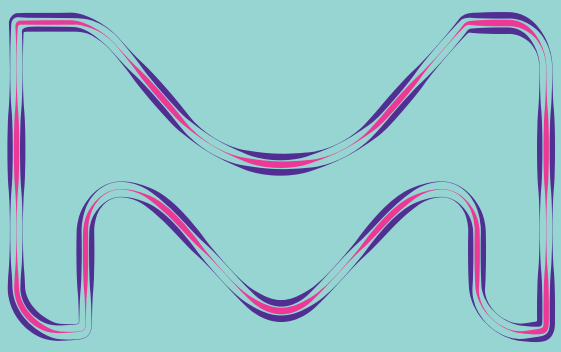
ANNUAL REPORT 2018

…is at the heart of every-thing we do.

Merck KGaA

Darmstadt, Germany

DISCLAIMER



Publication of Merck KGaA, Darmstadt, Germany. In the United States and Canada the subsidiaries of Merck KGaA, Darmstadt, Germany, operate as EMD Serono in Healthcare, MilliporeSigma in Life Science and EMD Performance Materials. To reflect such fact and to avoid any misconception of the reader of the publication certain logos, terms and names of businesses of the publication have been substituted or additional descriptions have been added. This version of the publication, therefore, slightly deviates from the otherwise identical version of the publication provided outside the United States and Canada.

€ 2.2 BILLION

invested in research and development in 2018.

Around **52,000**

hearts beat for science.

Employees in **66** countries share a passion for pushing boundaries and making new discoveries.

Since **1668**, our name has stood for the positive power of science.

Online

You can find out what else makes our research hearts beat faster at

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“We believe that scientific exploration and responsible entrepreneurship make techno-logical advantages possible that benefit us all.”

STEFAN OSCHMANN
Chairman of the Executive Board and CEO

Key Figures for 2018

GROUP

Key figures[1]

€ million	2018	2017	Change € million	Change in %
Net sales	14,836	14,517	319	2.2%
Operating result (EBIT)[2]	1,727	2,423	–696	–28.7%
Margin (% of net sales)[2]	11.6%	16.7%		
EBITDA[2]	3,528	4,164	–636	–15.3%
Margin (% of net sales)[2]	23.8%	28.7%		
EBITDA pre[2]	3,800	4,246	–446	–10.5%
Margin (% of net sales)[2]	25.6%	29.3%		
Profit after tax	3,396	2,615	781	29.9%
Earnings per share (€)	7.76	5.99	1.77	29.5%
Earnings per share pre (€)[2]	5.10	5.92	–0.82	–13.9%
Business free cash flow[2]	2,508	3,193	–685	–21.4%

[1] Fiscal 2017 has been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

[2] Not defined by International Financial Reporting Standard (IFRSs).

GROUP

Net sales
€ million

[1] Excluding the Consumer Health business divested in fiscal 2018. Key figure for fiscal 2017 adjusted.

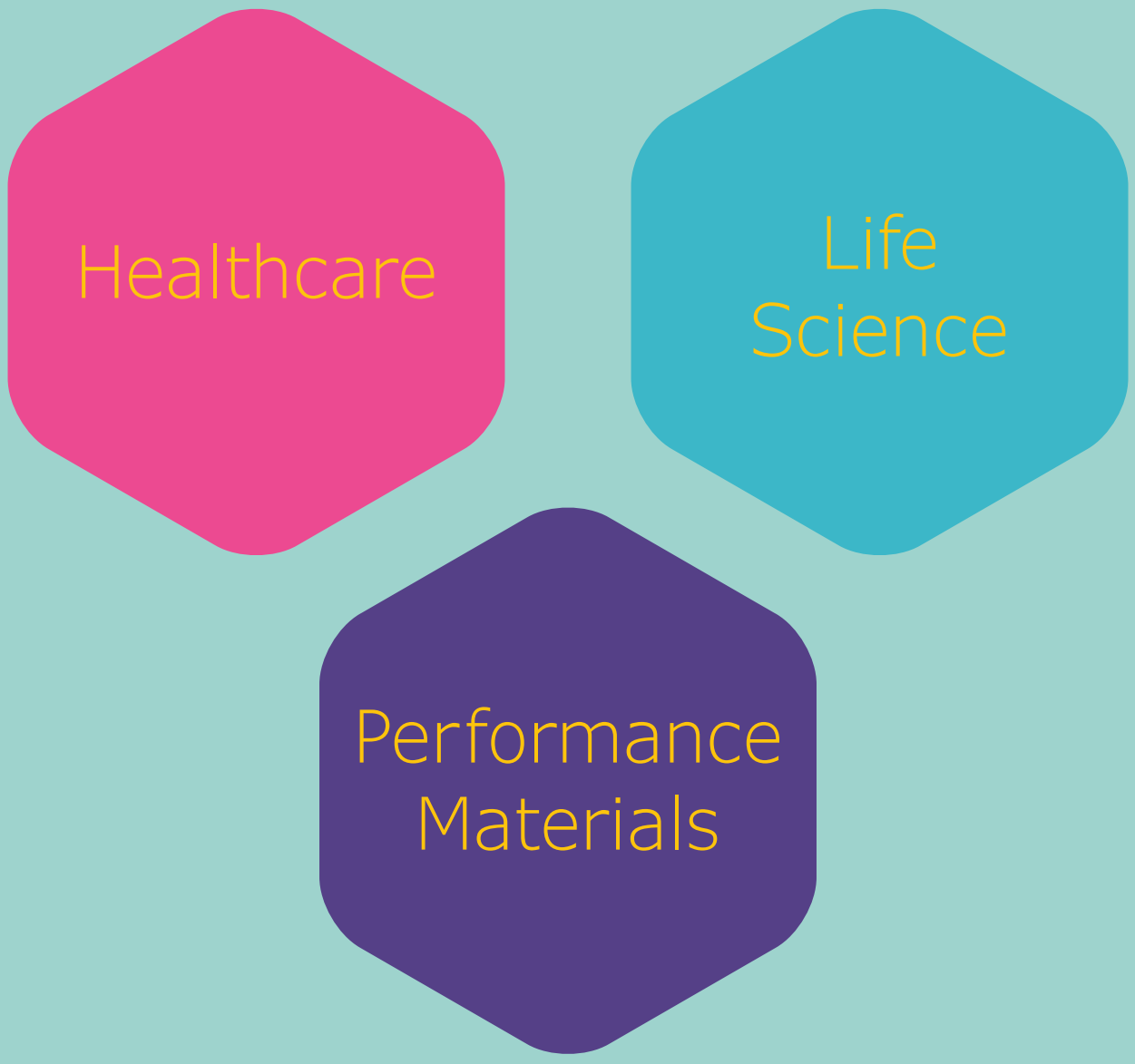
GROUP

EBITDA pre[2]
€ million

[2] Not defined by International Financial Reporting Standards (IFRSs).

Business Sectors

Merck KGaA
Darmstadt, Germany



Highlights of 2018

February 21

Life Science enhances presence in Asia
In 2018, we invested in a cell culture facility in South Korea, a manufacturing and distribution center in India, and a facility to accelerate Mobius® single-use manufacturing in China. With these new locations, an investment of €40 million, we are responding to growing demand from the biotech industry in Asia.

April 19

Merck KGaA, Darmstadt, Germany, sells Consumer Health
We reached an agreement to sell our Consumer Health business to Procter&Gamble for a cash purchase price of approximately €3.4 billion. Consumer Health transferred to P&G on December 1. This is a further step in our strategic orientation toward innovation-driven businesses.

May 3

350 years
This year offered a good reason to celebrate in Darmstadt together with 900 guests from politics, business and industry. During this anniversary year, we looked to the future as well as the past. For instance, we opened a new innovation center in Darmstadt that provides more space for smart projects outside of our existing business areas. Throughout 2018, we also held a number of other anniversary events around the world.

中国

June 20

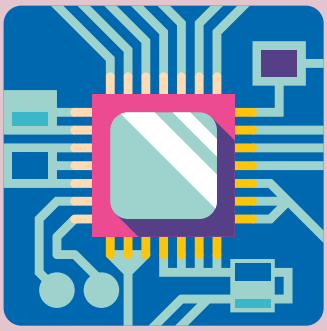
Partnership to accelerate our CRISPR initiative
We announced a partnership with Tongji University in Shanghai. As a member of our CRISPR Core Partnership Program, we will provide the university exclusive access to our genome-editing technology and comprehensive technical support.

June 20

Merck KGaA, Darmstadt, Germany, forms cooperation with Alibaba Health
To significantly improve the lives of 40 million patients in China by 2025 is an ambitious goal. We have teamed up with Internet healthcare company Alibaba Health to meet this challenge. The collaboration aims to provide Chinese patients with improved access to healthcare services via a health platform that will start out by tracking drugs for patients with diabetes, thyroid disorders and cardiovascular diseases.

June 20

New OLED technology center in Shanghai
We are complementing our OLED positions in Asia with a new OLED technology center in Shanghai – in addition to the existing ones in Korea and Taiwan. Working as a local partner with our customers, we intend to drive innovations forward for the display industry and bring them to market faster.



July 3

Transformation program for Performance Materials
To secure the future prospects of Performance Materials, we have launched the transformation program Bright Future with the aim of further expanding our position as a leading supplier of solutions for the electronics industry. After 2019, the average annual sales growth of Performance Materials is expected to be between 2% and 3% again, with Semiconductor Solutions as a significant driver of this growth.

July 17

Research heroes wanted
We are launching the "Future Insight Prize", with an award of up to €1 million annually for groundbreaking scientific work. Over the next 35 years, we'll be awarding it to promote innovations in the areas of health, nutrition and energy.

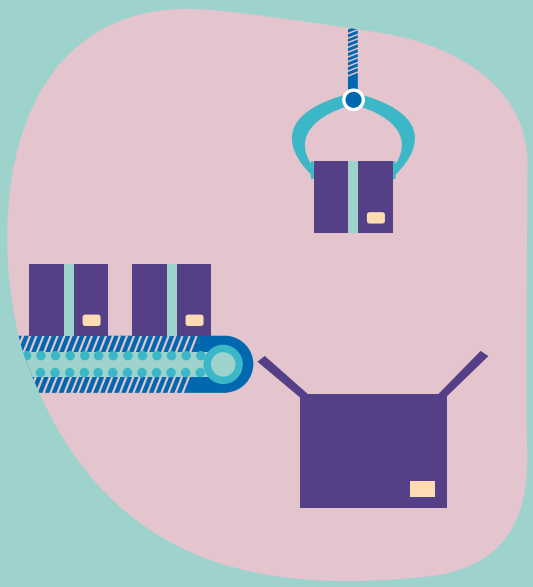
July 30

FDA agrees to review request for approval of cladribine tablets
The U.S. Food and Drug Administration (FDA) accepted for filing the New Drug Application for cladribine tablets as a potential treatment for patients with relapsing forms of multiple sclerosis. The FDA is examining whether cladribine tablets, a short-course oral treatment, can be used to treat patients in the United States. The proposed dosing is a maximum of 20 days of treatment over two years.

September 11

Bavencio® in combination with INLYTA® to combat kidney cancer
The phase III JAVELIN Renal 101 study evaluating Bavencio® and Pfizer's Inlyta® compared with Sutent® as initial therapy for patients with advanced renal cell carcinoma yielded positive top-line results. In February 2019 the FDA granted priority review to this therapy based on these interim results.

October 17



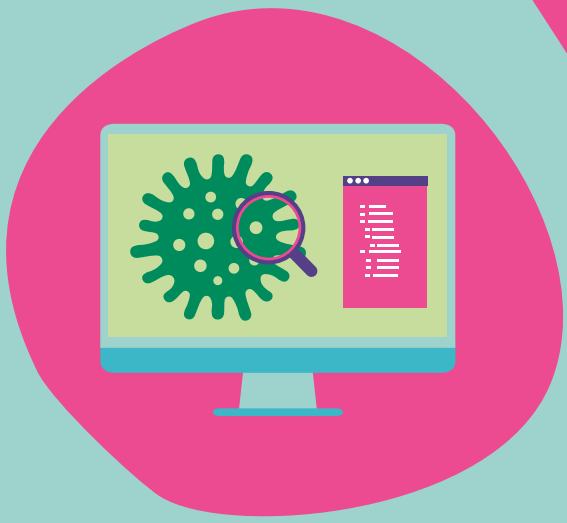
From Darmstadt to 90 countries
Since October 17, 2018, eight fully automated packaging lines and robotized logistics are up and running in the new packaging center, which covers a total area of 15,000 square meters. Here, medications from our current product portfolio are packaged and shipped to more than 90 countries. The new capacities help address rising patient demand for our primary products Glucophage®, Concor® and Euthyrox® in the therapeutic areas diabetes, cardiovascular diseases and thyroid disorders. Some €63 million were invested in the construction of the new packaging center between 2015 and 2018.

November 12

New innovation hub in Southern China
We announced the plans to establish a new competence center for innovation in Guangzhou in Southern China scheduled to open September 2019. It will be located in the heart of a large biotechnology park where startups will conduct research in all three of our business sectors. To coincide with this, we will also start our three-month China Accelerator Program in 2019.

November 19

Collaborate against cancer with Syntropy
We want to advance cancer research. To that end, we intend to form a joint venture under the name Syntropy with software company Palantir Technologies. Syntropy will enable research centers to have access to a collaborative technology platform to drive forward cancer research, speed up scientific progress and improve people's lives.

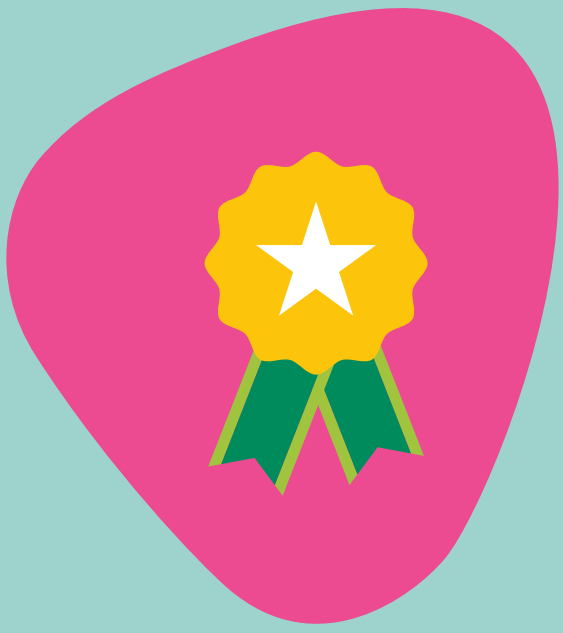


November 20

Fourth place in the Access to Medicine Index
This result means that we have maintained our ranking since the index was last published in 2016. We are proud of our efforts to improve access to medicine and thus the health of underserved populations.

November 28

Recognized compensation system
The European investors federation Better Finance recognized us as the company with the most shareholder-friendly board compensation system in the German DAX 30 stock index. We revised this system in the run-up to the 2018 Annual General Meeting. The establishment of objective compensation criteria resulted in improved comprehensibility – now even with a seal of quality.



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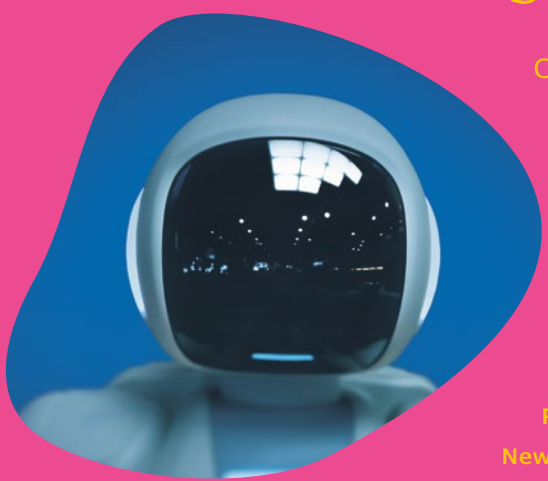

3. Beyond tomorrow

Can pandemics be predicted? How does smartphone glucose monitoring work? Where will our meat come from in the future? How can we better connect researchers with each other? Whoever wants to actively shape the future, needs to ask the right questions.

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Heart beats

Why science? What fascinates us about it? Each of us has an answer to that. We wanted to find out what they were – so we followed the passion.

Research drives us all

ANA LUISA CADORE
Sales Expert, Life Science,
São Paulo, Brazil

MARC FEIGLIN
Head of Alliance Management & Partnership,
Yavne, Israel

SHINJI OKITSU
Group Leader Immunology, Healthcare, **Billerica, United States**

FRANZISKA HÖLY
Deputy Foreman, Performance Materials,
Darmstadt, Germany

SUNNY CHOI
Talent and Development Manager,
Seoul, Korea

Get to know our team from around the world at
https://www.emdgroup.com/annualreport/2018/magazine/heartbeats.html

"It's my job to give people the courage to explore new things that did not exist before. If they succeed at that, it makes my heart beat faster."

SUNNY CHOI
Talent and Development Manager,
Seoul, Korea

"My mother suffered from cancer during the same time I was researching the cellular mechanism responsible for her illness. My research could conceivably help to better understand the disease. That was an enlightening moment for me."

SHINJI OKITSU
Group Leader Immunology, Healthcare,
Billerica, United States

"Even as a child, I dreamed of helping shape the world. My passion for science was more deeply engaged after I came to Israel and immersed myself in this ecosystem of entrepreneurship and technology."

MARC FEIGLIN
Head of Alliance Management & Partnership,
Yavne, Israel

"I am passionate about science, because sometimes it only takes a small finding for the big breakthrough that improves the lives of many people."

ANA LUISA CADORE
Sales Expert, Life Science,
São Paulo, Brazil

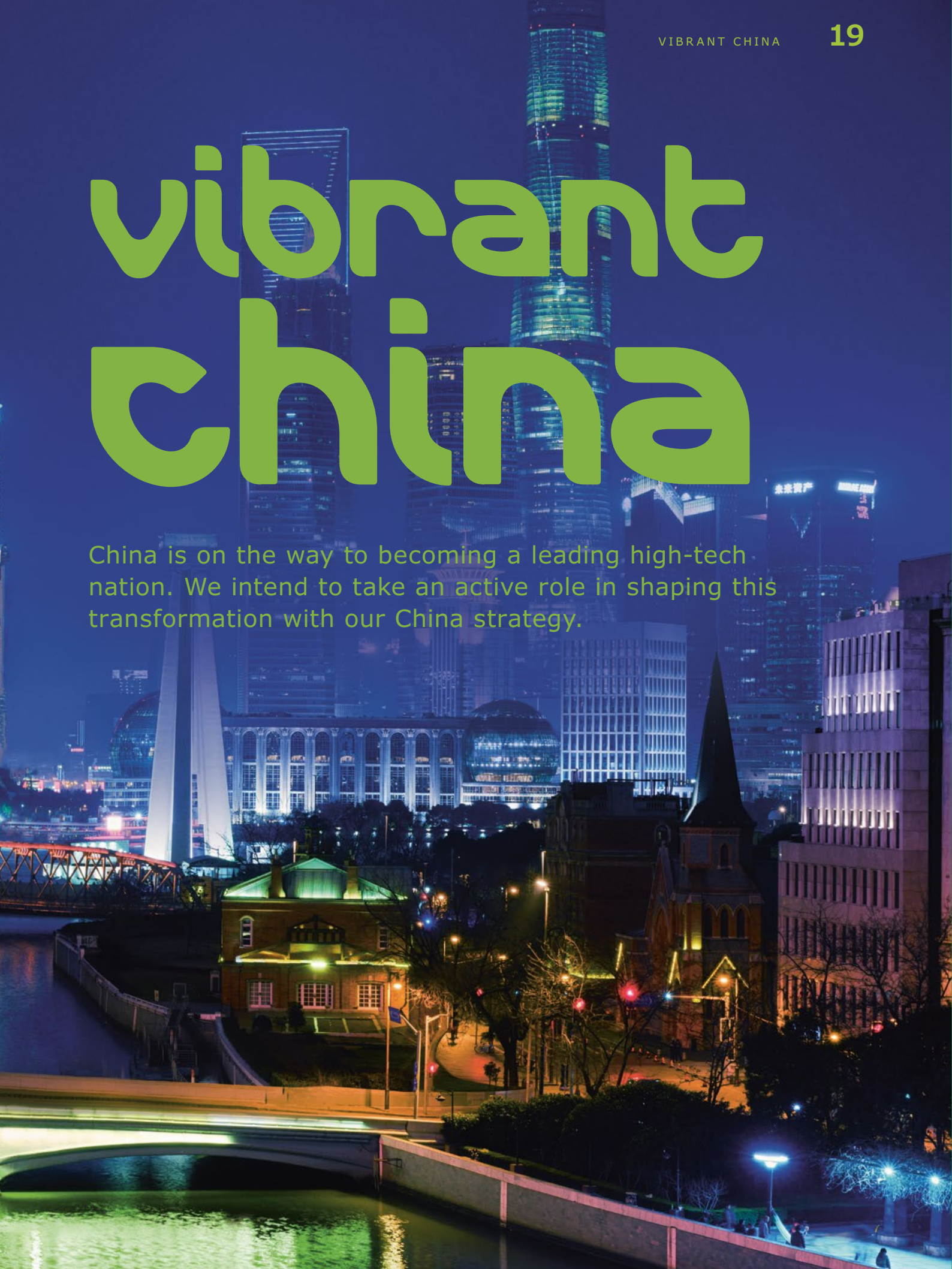
"I am simply fascinated by everything we can achieve with technology and science. Our knowledge can be found in so many products around the world. I am very proud of that."

FRANZISKA HÖLY
Deputy Foreman, Performance Materials,
Darmstadt, Germany

2

vibrant china

China is on the way to becoming a leading high-tech nation. We intend to take an active role in shaping this transformation with our China strategy.



Beijing

在中国展宏图

Big plans for China

China intends to become a leading high-tech nation. We are benefiting from this transformation and will soon implement an important aspect of our China strategy: increasing production and research in China for China. After a long history as one of the world's largest sales markets, the country will now take on a key role in the realization of our global strategy.

China has big plans for the future. In fewer than ten years, it aims to become a world market leader in industries such as mechanical engineering, green technology and biotechnology. Modern high-speed trains made in China are already traveling through the country and competing with established Western manufacturers at the global level. In 2020, more than five million electric vehicles are expected to be on China's streets. An investment program of more than €850 billion is available for the Belt and Road Initiative, with 900 projects planned in more than 64 countries to develop the Eurasian continent into a huge economic area.

By 2049 at the latest, what is now an emerging economy intends to be the world's leading and most innovative industrial nation. According to Allan Gabor, President of Merck KGaA, Darmstadt, Germany, in China and Head of Performance Materials in the country since February 2018, who has been managing the Performance Materials business in the country since February 2018, the company is orienting itself toward China's ambitious development: "We aspire to double our Group sales within China. By 2025 we want every single person in China to come into contact with our products or services in a positive way. Given our diverse portfolio across pharmaceuticals, life science and electronic materials, such a bold vision is attainable."

DYNAMIC EVOLUTION, MOTIVATED TEAM

We are pursuing these ambitious goals with a strong and dedicated team in China. Among the team members is Christopher Neff, who has been with our company for nine years and was appointed Head of the China Office of Merck KGaA, Darmstadt, Germany, in 2018. As early as 2012, Neff spent a few

months in China as part of his university degree. "It's great to be back here now. The country is incredibly fascinating, the culture diverse and the economic development exciting and dynamic. My colleagues here are all very highly motivated and it is a great environment to work in."

A GROWTH MARKET WITH IMMENSE POTENTIAL

The optimism with which our employees work on the diverse projects in China is also a product of our current success: In 2018, we generated sales of €1.9 billion in the country, an increase of more than 18% over the previous year. China is thus the largest growth driver for our company, with the highest sales after the United States. And in the business units Display Solutions (Performance Materials) as well as General Medicine & Endocrinology (Healthcare), China is already the number one global market for our company.

That's why part of the 2018 festivities to celebrate our 350th anniversary took place in Shanghai. During the celebration, Stefan Oschmann, Chairman of the Executive Board and CEO, spoke to 400 guests from politics, business and industry: "We look ahead to the future with curiosity – and it is precisely this future of science and technology that will be shaped to a large extent right here in China."

Similar ideas were voiced by Allan Gabor: "When we look at China now, we see so much more than just a huge sales market; the country is becoming a key factor in shaping global trends and influencing our global strategy."

"By 2025 we want every single person in China to come into contact with our products or services in a positive way."

ALLAN GABOR
President of Merck KGaA, Darmstadt, Germany, in China and Head of Performance Materials in China

DEMAND FOR TECHNOLOGIES AND EXPERTISE

China needs technologies and know-how for its transformation. Immense investments are earmarked for this, and we hope to benefit from these investments in our businesses.

The realization of this aim requires a host of measures, in Allan Gabor's opinion. Among them are smart collaborations with key stakeholders in the country as well as re-thinking some of the company's structures to be able to optimize local future growth. Other measures include increasing local production efforts and fostering talent development in China more efficiently. Finally, networking more closely with the country's innovation ecosystem and rigorously digitalizing products, services and processes.

One of the most important steps along the way is to ensure that partnerships and networks become more effective. Gabor adds that this endeavor is particularly challenging because of "the special complexity of stakeholder management in China," saying: "We're looking at other, predominantly local companies and also initiating diverse collaborations with a variety of public-sector players."

NEW INNOVATION CENTERS

We are also greatly intensifying our R&D in China. Research centers and laboratories have existed in Shanghai, Suzhou and Beijing for some time, and a new OLED technology center was opened in Shanghai in 2018. In Guangzhou, an agreement was

signed with the local authorities to build an Innovation Hub. Located at the heart of Guangzhou International Biotech Island, this hub will serve as a place of knowledge exchange for experts, partners and customers in all three business sectors, enabling them to develop and enhance innovative technologies for strategic markets in the Pearl River Delta and beyond.

Stefan Oschmann announced the launch of innovation hubs in China during his visit to the country in February 2018. To achieve this goal, a team of representatives from science and industry is being set up in Shanghai to form our China Innovation team. The team members have extensive knowledge in the areas of healthcare, chemistry and digital technologies and are led by Sophie Sun, Head of our China Innovation Hub. Together, they will explore the opportunities in the Chinese innovation ecosystem. “A very lively innovation ecosystem is developing in China, allowing the country to become an industry leader for technological innovation,” says Sun. “The Chinese government promotes innovation and industry developments through a number of programs and initiatives that are also highly relevant to our areas of business and expertise. We therefore want to collaborate closely with start ups, academic institutions, industry players and local governments so that we can jointly develop new technologies and solutions for China and for the world.”

We support further innovations with our Accelerator program, which is already established at the company’s headquarters in Darmstadt, Germany and was recently launched in China as well. Selected start ups can work for three months on collaboration projects with our experts at the Innovation Hub in China. In addition, they have the opportunity to continue their projects at the Innovation Center in Darmstadt to explore the European market. They are thus able to make an important contribution on China’s path to becoming a global innovation leader. This development enables China to potentially contribute more innovative solutions supported by us.

At least

40

million patients per year should be treated with medications from our company by the year 2025.

3,500

employees on site

85

years of presence in China

Investments in the Nantong production site since 2017:

€ 250

million

SWIFTER DECISION-MAKING, A MORE PRAGMATIC APPROACH

To achieve our ambitious goals in this extremely dynamic business environment, we must also make some changes. “We have to be more agile and flexible so that we can adapt to the incredibly high speed of change in China through fast decision-making and processes. We must also be even more open to taking risks, trying new things and being more pragmatic in the best sense of the word,” explains Allan Gabor.

At the end of this transformation, we will produce and offer our services in China for China – and thus grow along with the country as part of the local ecosystem, boosted by a national focus on innovation.

The health platform for everyone

Our Healthcare business sector has great ambitions in China – take, for instance, our partnership with the Internet giant Alibaba.

People in China who want to keep an eye on their health need only scan the barcodes on their medication with a mobile phone. Users then receive the digital package information leaflet along with instructions on how to take the medication as well as details on the disease and the drug itself. All of this information is provided by Alibaba Health’s drug tracking platform to help ensure safe drug use. Medication reminders and the contact between doctors and patients help enhance therapeutic compliance among patients.

The service is delivered by us and Alibaba Health, a subsidiary of the Chinese Internet giant Alibaba, and it represents one of the first results of a cooperation that the two companies began in 2018. Rogier Janssens, Managing Director of our Biopharma business in China, describes the partnership as “a great step forward in China’s digital ecosystem.” Every year, more than 600 million consumers are active on Alibaba’s retail marketplaces in China. Its subsidiary Alibaba Health develops digital hospitals and connects them with bricks-and-mortar clinics, and the two companies want to expand this digital infrastructure with a joint health platform. This opens up very interesting opportunities for offering services and solutions that add value beyond the medications themselves and thus create a solid foundation for reaching the ambitious goals of the Biopharma business.

“By 2025, we want at least 40 million patients to be treated with our medications every year, and sales in Biopharma will triple compared with today,” says Janssens. Other than tracking and tracing drugs, the joint health platform with Alibaba will be used above all for online health services in areas such as diabetes, thyroid disorders, colorectal cancer and cardiovascular diseases. “Demand in China is immense,” says Janssens. Every second case of a common illness such as diabetes or cardiovascular disease is believed to be undiagnosed. “That means that millions of sick people in China are currently not being treated. We can help these people with our digital solutions,” says Janssens. The right diagnosis is a precondition for effective therapy. Millions of patients can gain access to much needed medications through these new digital tools.

We are moving forward vigorously with the implementation of our plans. For instance, we and Tencent, a leading provider of Internet-based services, agreed in January 2019 on a cooperation. “As part of this cooperation, we will work with Ten-cent to investigate the innovative combination of patient-centered healthcare and digital platforms,” says Rogier Janssens, describing the goals of the agreement. These co-operations with Alibaba Health and Tencent complement each other, adding huge value to our current and future products in China through using more efficient and effective digital methods.

Owing to China’s large population, the need for digital treatment solutions there is enormous.

TWO SECTORS, TWO SITES IN NANTONG

Since 2017, the medications for which our company and Alibaba offer these additional services on their joint platform in China are packaged in Nantong, a city on the Yangtze River not far from Shanghai. More than €250 million have been invested in two modern production facilities there. After Darmstadt, Nantong is our second largest pharmaceutical production location in the world. Here, we produce the diabetes medication Glucophage XR®, the thyroid medications Euthyrox® and Thyrozol®, and Concor® for the treatment of cardiovascular disease. In the future, the Life Science business sector will also produce inorganic salts and biochemical cultures for environmental audits in Nantong and deliver them to pharmaceutical manufacturers and laboratories from there.

New partner

A chat with Steve Vermant, Managing Director of our Life Science business sector and Head of Research Solutions in China, about the partnership with Tongji University under the CRISPR Core Partnership Program and the potential for CRISPR/Cas9 in China.

Steve Vermant, Managing Director of the Life Science business sector and Head of Research Solutions in China

What role do technologies such as CRISPR/Cas9 play in academic research in China?

Steve Vermant: Biotechnology is one of the Chinese government's main areas of investment at the moment. The focus on research at universities has been rising rapidly, with us also seeing increasing demand for our supplies and materials. In the world of highly complex biotech research, our CRISPR Core Workflow and other new technologies are very attractive to both universities and our renowned industry partners, and we help them use these technologies efficiently for their research.

Do we also provide expertise?

Of course. After all, our aim is to solve the biggest challenges in the life sciences – and we want to accomplish that together with our customers. For this purpose, we provide our scientific and technical expertise as well as our extensive portfolio of more than 300,000 products. Genome editing tools, for example, have become much more readily available thanks to our technology. This also includes CRISPR Cas/9, for which we hold fundamental patents.

Which concrete products do we offer for CRISPR Cas/9?

A molecular biology reagent kit that makes it possible to edit gene sequences quickly and simply with the help of gene scissors. Thanks to CRISPR, a procedure that used to take months can now be completed in just one week. That's a real breakthrough in biomedical research. Simpler access and faster processing mean that far more researchers can work on fundamental questions, such as the influence of individual genes on various illnesses.

What role does the collaboration with Tongji University play in all of this?

We provide Tongji University with technologies and train the employees there. Besides Tongji University, more than 80 other academic institutions worldwide are part of our international CRISPR Core Program. They get access to our CRISPR products and technical expertise and can attend the program's board meetings in North America and Europe, where they can talk about the latest intellectual resources with scientists from leading industry and research organizations. In this way, we help our Chinese customers and partners set foot in the world of top-level research.

How did the partnership with Tongji University come about?

We have been collaborating with the university for many years. Tongji is currently one of the leading universities in China, especially in the areas of stem cell research and genetic modification.

How do we benefit from this partnership?

We are able to establish our brands in China and cement our leading position for CRISPR in the Chinese research community. Right after the announcement of our partnership with Tongji, we received inquiries from other universities in the country. We have a clear plan and an extensive portfolio of solutions ranging from equipment and reagents to laboratory devices and services. As a partner to the life science research community, we want to accelerate innovation.

Well-founded bioethical positions

The Bioethics Advisory Panel of Merck KGaA, Darmstadt, Germany, (MBAP) is staffed with international biomedical experts. It develops guidelines for research in which our business sectors are involved, including the investigation or use of genome editing. The panel looks at important ethical issues related to processes of discovery, development, manufacturing, sales, and distribution of genome editing technology, such as clustered regularly interspaced short palindromic repeat (CRISPR).

Our Bioethics Advisory Panel (MBAP) has defined a clear operational position under consideration of scientific and social questions to provide a framework for the use of promising therapeutic approaches in research and application. For instance, we reject any CRISPR/Cas-mediated heritable human genome editing in embryos and any manipulation of germ cell lines.

China's plan for the future

Focus on biotechnology in China's Five-Year Plan

In 2011 China's Ministry for Science and Technology (MOST) published a Five-Year Plan for the development of modern biotechnological science and the corresponding technology. The aim was to establish an innovative biotechnology sector in China.

In its 13th Five-Year Plan, which was published in **2015**, the Ministry confirmed that innovations in biotechnology and the corresponding industry play a significant role in the economic and social development of the entire country. It is therefore important that the number of high-tech companies and growth technologies in this sector continues to grow.

Technology mega-trends such as AI are driving an increase in demand for increasingly smaller but more powerful microchips.

Semiconductors as a new driver of growth

With local production and development sites, the Performance Materials business sector is moving even closer to its partners and customers in China. In the future, it will concentrate on the continued growth of its semiconductor solutions business.

The semiconductor industry is another focal point of China's development strategy. In the medium to long term, China aims to operate on an equal footing with leading countries such as the United States or South Korea. According to the "Economist", China's goal is to nearly quintuple the sales volume from local chip manufacturers in the coming years – from USD 65 billion in 2016 to more than USD 305 billion in 2030. By the same year, it also wants most of the domestic demand to be met with products made in China. So far, this is only true for a third of the country's total demand. China intends to invest about USD 150 billion in its domestic industry – a plan that also offers us the opportunity to further enhance our position as the leading solution provider for the electronics industry.

The Performance Materials business sector sees enormous growth potential for semiconductor materials in China. "The Semiconductor Solutions sector is active in specialized markets. Our innovative materials contribute to the development of new processes. Demand for innovative materials among Chinese chip manufacturers will probably continue to rise in the future," says Winnie Hui, Head of Business Planning and acting representative of the Semiconductor Solutions business unit in China. Born in Hong Kong, Hui grew up in New Zealand and has now returned to her home country, where she works in a team at our company that is restructuring the semiconductor business in China.

"The demand from chip manufacturers in China for innovative materials will probably continue to rise."

WINNIE HUI
Head of Business Planning, Specialty Accounts Business Field, Semiconductor Solutions

Our high-tech materials are essential for the manufacture of powerful microchips.

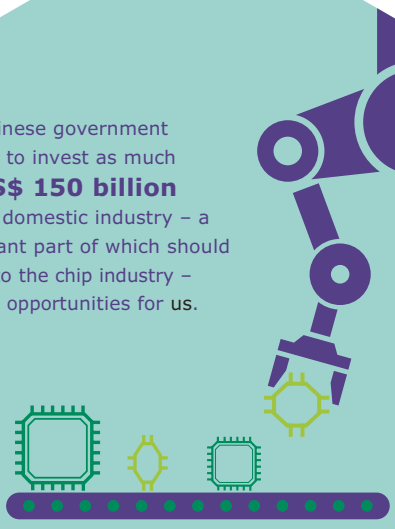
CONTINUOUS TECHNOLOGICAL ADVANCES HELP SHAPE THE INDUSTRY

Technology megatrends such as big data, the Internet of Things and artificial intelligence call for increasingly smaller but more powerful microchips. These technology megatrends are also driving the growth of the materials market. If China evolves into a leading microchip manufacturer and increases its domestic IC production, demand for high-tech materials will continue to rise. Our company is regarded as the global technology leader for many of these high-tech products. Its portfolio includes, among other things, high-precision materials and solutions based on colloidal silicon dioxide as well as process and deposition materials. We have developed materials in which polymers arrange themselves along the conductive structure to address the miniaturization process. This directed self-assembly (DSA) technology, as it's called, is used in the computer chips of tomorrow.

Winnie Hui sees the development of local production as a key prerequisite for maintaining successful business relationships with national and international customers in China in the future as well. This is only logical, since we focus on long-term partnerships in our business and will continue to supply specialized materials and customized solutions that require a great deal of technical expertise.

According to Winnie Hui, partners who set up local production operations are our most important customers, yet regulatory institutions are also key, since they have – and exert – a lot of regional influence in shaping requirements from central government. She also expects to see mergers between local companies: "If we want to stay successful in this competitive environment, we have to be agile and maintain our high pace."

The Chinese government intends to invest as much **as US$ 150 billion** into its domestic industry – a significant part of which should flow into the chip industry – offering opportunities for us.



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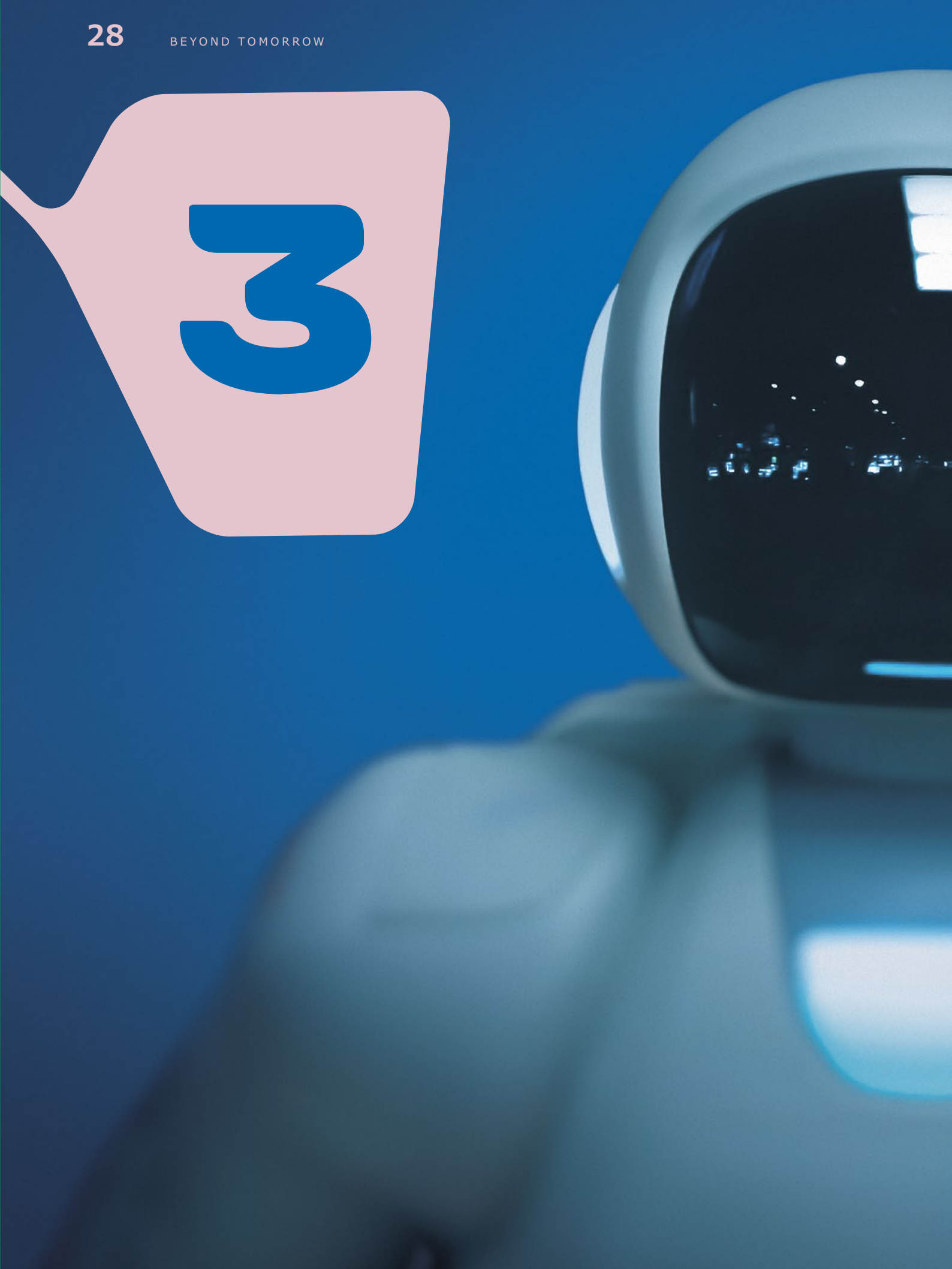
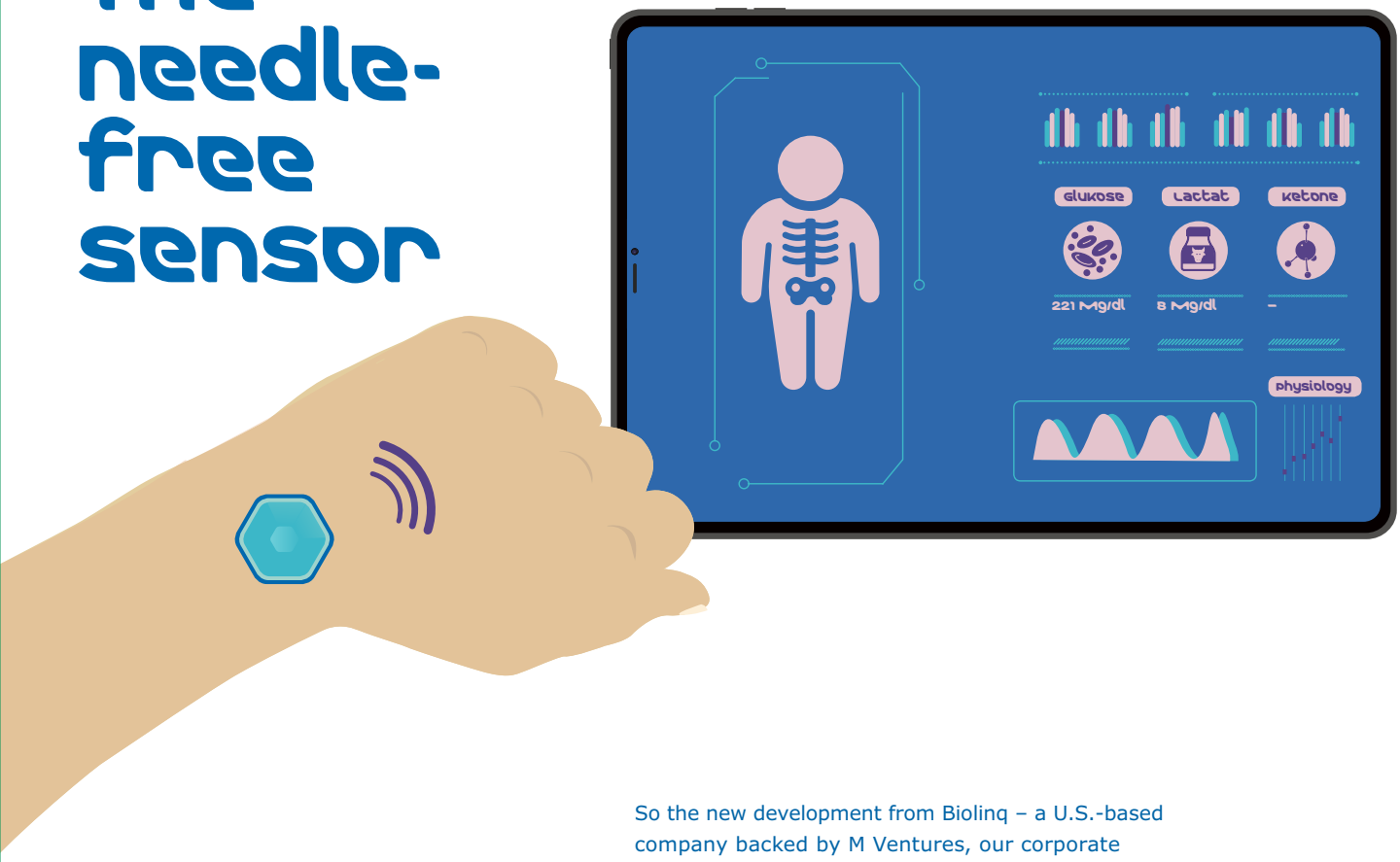


Beyond tomorrow

Can pandemics be predicted? How does smartphone glucose monitoring work? Where will our meat come from in the future? How can we better connect researchers with each other? If you want to actively shape the future, you need to ask the right questions.

The needle-free sensor



Biolinq, a portfolio company of our corporate venture capital arm M Ventures, is on the edge of a breakthrough that could not only significantly improve the lives of people suffering from diabetes, but medical diagnostics as a whole.

Would you prick yourself with a needle 100 times to maintain your own health? And what about 1,000 times? Or tens of thousands of times? That's a lifetime's number of needle pricks for many of the 380 million people suffering from diabetes. Yet the concentration of blood sugar, or glucose, must be monitored regularly in order to minimize the long-term complications of diabetes, such as increased atherosclerosis and nerve disorders. And so far, monitoring requires a drop of blood – every single time. So most patients prick themselves several times a day, their entire lives. Over time, this is not only extremely bothersome; it also has a negative effect on their quality of life.

So the new development from Biolinq – a U.S.-based company backed by M Ventures, our corporate venture capital arm – could improve the lives of many people. Nectar, the name of this revolutionary product, looks like a patch the size of a euro 50-cent coin. It contains tiny sensors that, when applied to the skin, analyze what is known as the interstitial fluid directly beneath the top layer of the skin. This fluid is not within skin cells or other cells, but in the space between cells. The sensors currently measure glucose, but in the future could measure a number of things, such as lactate and ketone levels. Studies have shown that measuring glucose in the interstitial fluid leads to even more precise results than interstitial fluid from the subcutaneous tissue, where traditional Continuous Glucose Monitors (CGMs) operate.

Moreover, Nectar is not only affordable, it is also easy to use. It is completely pain-free, can remain on the skin for more than seven days, and sends the data wirelessly to a smartphone. The app that goes along with it is also easy to use. "Biolinq is on the verge of improving and simplifying the lives of millions of people living with diabetes with just a small patch," explains Edward Kliphuis, Biolinq Board Member and Investment Director of M Ventures.

"Bioling is on the verge of improving and simplifying the lives of millions of people living with diabetes with just a small patch."

EDWARD KLIPHUIS
Investment Director of M Ventures and Bioling Board Member

Another major advantage of Nectar over the traditional method of analyzing blood sugar levels with a drop of blood is that it measures continuously. There are other alternatives (traditional CGMs) that enable continuous measuring, such as sensors implanted under the skin, but in contrast to Nectar, those methods always involve a foreign body under the skin, and that can cause problems. Nectar is currently being validated and optimized in clinical trials with patients and is expected to be approved and launched commercially in the coming years. Kliphuis says the results so far are impressive.

Diabetes is, however, not the only field of application for Bioling's tiny sophisticated sensors. Because the sensors can potentially also detect ketone and lactate levels in the future, they can also be used to analyze the influence of nutrition and physical activity on health. As a result, Bioling can also contribute to weight loss and the promotion of a healthy lifestyle. And that is just the beginning. Each Nectar patch contains dozens of sensors that allow for each patch to analyze several biomarkers.

M Venture's investment in Bioling is more than just a strategic move to help us gain a foothold in the growing field of what is known as biosensoring; in the medium term, a paradigm shift in medicine initiated by Bioling could well be on the horizon – a shift toward needle-free blood monitoring.

Liquid biopsy

Sometimes, a needle prick can also make everything easier.

As noted, daily needle pricks can be a burden for a diabetic. But there are other patients for whom a blood sample can bring genuine relief – in particular when so much information can be derived from the blood drawn that complex diagnostic procedures and therapeutic failures can be avoided. For example, within the concept of personalized medicine, many types of cancers are now treated with highly specialized therapeutics. But that requires precise knowledge of the characteristics of the tumor cells and their genetic basis. In some types of cancer, the tumor is positioned in such a way that a needle biopsy is risky. One way to get around this is a liquid biopsy, in which traces of mutated genetic material of cancer cells are detected in the blood.

That is precisely the focus of the research collaboration we began in 2016 with Biocartis, a Belgian molecular diagnostics company. This collaboration is already seeing results: In November 2017, Biocartis and we were proud to announce the CE-IVD marking for their first two fluid biopsy tests, the Idylla™ ctKRAS Mutation Assay and the Idylla™ ctNRAS-BRAF Mutation Assay. Together, they detect 44 mutations of colorectal cancer tumor cells that are relevant for choosing the appropriate treatment. "With these tests, we can help patients with colorectal cancer around the world," explains Erwin Sablon, Head of Research and Development at Biocartis.

"With these tests, we can help patients with colorectal cancer around the world."

ERWIN SABLON
Head of Research and Development at Biocartis

The tests are based on Biocartis' Idylla™ platform, a fully automated molecular diagnostics system. It integrates all the sample preparation steps and provides doctors with sameday results of the desired test. This enables quicker access to the right treatment for patients – and as such they can benefit from further progress in personalized medicine.

A platform for the fight against cancer

As announced by Merck KGaA, Darmstadt, Germany, and the U.S. company Palantir Technologies, their Syntropy joint venture seeks to network research data around the world and enable scientists to collaborate more effectively.

How does cancer develop? How can it be prevented? And which treatment is particularly effective in which patients and for which kind of cancer? Despite significant scientific gains in recent years, there are still few answers to these critical questions. Advances in medical research have generated a tremendous amount of knowledge about diseases, their development and the treatments for them, but the full potential of this knowledge has not yet been tapped.

Research institutions around the world produce huge amounts of biomedical data, but much of it is trapped in silos within and between institutions. For example, data may be stored in central cancer center registries, collected in research projects, or produced as a result of clinical trials. This critical data is often inaccessible to the scientists and clinicians who need it to advance their own work as well. Enabling the global scientific community to integrate, analyze and collaborate on this data could help us develop a more accurate picture of the human body and its diseases. Finding similarities, parallels or differences in various genes and disease variants could unlock valuable discoveries.

DATA ACROSS THE GLOBE IS PACKAGED DIFFERENTLY

A wealth of knowledge thus lies untapped in this data, and it can't be examined and analyzed or collectively leveraged in part because the data isn't uniform. This is a result of common research practices: One scientist enters findings in an Excel table, while another researcher collects data using a specialized software program. Sometimes it's not even possible to integrate data within a single large institution. For instance, one department in a cancer registry may have developed a computer program to record all the parameters of its work, while another department stores everything on the Internet in a central database. In addition, scientific journals currently contain the most transparent publication of scientific discoveries and the methods used to obtain them, but they reveal mainly only the findings; the data itself is usually not accessible.

Syntropy aims to address this challenge in two steps. First, Syntropy will help standardize data within organizations, breaking down internal silos and uniting disparate datasets in one place. Second, Syntropy users will have the option of engaging in secure, transparent data exchanges, enabling opportunities for collaboration. Syntropy users will be able to collaborate worldwide in a structured form – and could be the source of a great knowledge and developmental boost in modern medicine.

> "We are committed to tailoring Syntropy to meet the precise needs of cancer researchers and clinical doctors."
>
> **STEFAN OSCHMANN**
> Chairman of the Executive Board

SYNTROPY IS EXPECTED TO TAKE RESEARCH TO A NEW LEVEL

The foundation of Syntropy is its platform, based on Palantir Foundry, which integrates different types of data from across organizations and makes it uniform. Syntropy's purpose is not to market the data – ownership remains with the users, generally researchers and scientists. Instead, Syntropy's business model consists of selling software while fostering an environment for collaboration through the creation of a data ecosystem to further scientific discovery. The idea is that the platform expands on its own once the scientific community realizes how effective the tool is for its work. "With Syntropy, we intend to unlock the value of untapped data

and to enable the world's leading experts to collaborate in the fight against cancer and other diseases," says Stefan Oschmann, Chairman of the Executive Board. Syntropy could become not just a data eco-system, but also a new "place to be" for researchers: a place to meet and support one another – prompted by the exchange of data. Increased networking among the scientific community would take the quality of research and collaboration between researchers to a new level.

EXTERNAL AND IN-HOUSE DATA WILL BE AGGREGATED

The fact that Syntropy may simplify this exchange of information creates immense opportunities – if only because of the sheer amount of data that exists. Genetic material is a good example: At the turn of the millennium, hundreds of scientists worked together for years on the Human Genome Project to sequence the first human genome. Today, machines can completely sequence a human genome for less than $1,000 in three days. The information obtained this way is increasingly being used to guide decisions about treatment. For instance, a tumor disease has between 1,000 and 10,000 gene changes. If the critical points are known, medications can be chosen that are particularly effective. This breakthrough would not be possible without collaborative efforts within the scientific community, and while we can't predict what the future outcomes created from Syntropy will be, we are optimistic about the possibilities.

Syntropy will drive the creation of new knowledge and accelerate scientific discovery.

"Syntropy aims to help researchers collaborate securely to realize the value of scientific data, driving discoveries that will deliver better treatments to patients faster."

ALEXANDER KARP
Palantir Technologies co-founder and CEO

Real Meat without the side effects

Meat consumption around the world continues to rise, with negative consequences for animals, the earth's climate, and the environment. Should meat be banned? That's unrealistic. A better solution is to develop meat for which no animals have to be slaughtered. Mosa Meat is working on that. It won't be long before the Dutch company introduces the first cultured hamburger to the market. Delicious, affordable – and "clean".

Burger with patty made by Mosa Meat

When Mark Post eats a juicy prototype hamburger from his own manufacture, it's not just because it tastes good: he also sinks his teeth in for scientific reasons. For nearly 13 years, Post, who is Professor of Pharmacology at the University of Maastricht, has been conducting research on meat for which no animal has to die. This was the idea behind the company Mosa Meat, which Post founded in 2015 and in which our corporate venture capital fund M Ventures has an equity stake. And the idea is now on the verge of a breakthrough: In 2021, Post is aiming for the market launch of his ground beef made from cultured meat. Although there are still challenges to overcome, Mark Post is optimistic: "We intend to fulfill our mission of making meat more sustainable, healthy, and animal-friendly."

But how can you produce real meat without slaughtering animals? There are two key steps: First, researchers take animal muscle cells which have the function of creating new muscle tissue when the muscle is injured, and cultivate them in a bioreactor, allowing them to proliferate until there are trillions of cells. Second, when researchers stop feeding the cells, they naturally merge to form myofibers. Under specific conditions, these primary myofibers increasingly put on bulk and lengthen, until these strands of muscle tissue naturally – without genetic tricks – form the shape of what we intend to produce: meat. This process is not automated yet, so the price of the cultured ground beef is still expensive. Furthermore, fetal bovine serum is traditionally used to feed the cells, and the process to extract it is not in line with standards of the developers at Mosa Meat. For this reason, Mosa Meat is researching sustainable solutions that would eliminate animal products from the production process. In light of this, the M Ventures investment could also lead to a strategic partnership: We have immense expertise in cultivating cells and developing bioreactors, and could help Mosa Meat master these challenges.

Alexander Hoffmann is a member of the New Businesses Team at M Ventures and a member of the Mosa Meat Board of Directors since we invested in the company. He believes strongly in the great significance of Post's innovation: "It is clear that our global hunger for meat is leading to increasingly greater problems," he says. In addition to the issue of animal welfare, the demand for meat requires grazing land for large-scale livestock farming, wastes water, drives climate change, and worsens global injustice. "The solution is not to ban the consumption of meat, but to promote alternatives," Hoffmann explains. He believes Mosa Meat burgers offer exactly that: a promising way to overcome the meat dilemma.

IF → **THEN**

If, in the near future, we do not ensure that a greater share of the world's meat is produced without large-scale livestock farming…

…then the overheated production of meat will have a major negative impact on climate change and the food security of the soon-to-be ten billion people on this planet. This in turn will make meat a rare, expensive, and thus exclusive product for those who can still afford it.

If, in ten years' time, the aim is for 100 million people all around the world to eat Mosa Meat's ground beef…

…then we have to ensure that our ground beef doesn't cost any more than products that are still produced with meat from slaughtered animals. It is also important to us that our production processes use resources sparingly and respect the environment. What we also need is sales staff who know how our ground beef is made and understand the philosophy behind the process.

MARK POST

Mark Post (61) is the founder of Mosa Meat. He and his team have big plans. In the following four short scenarios, he looks at a future with "clean" hamburger meat.

If, as a developer of "clean" meat, you could make one wish…

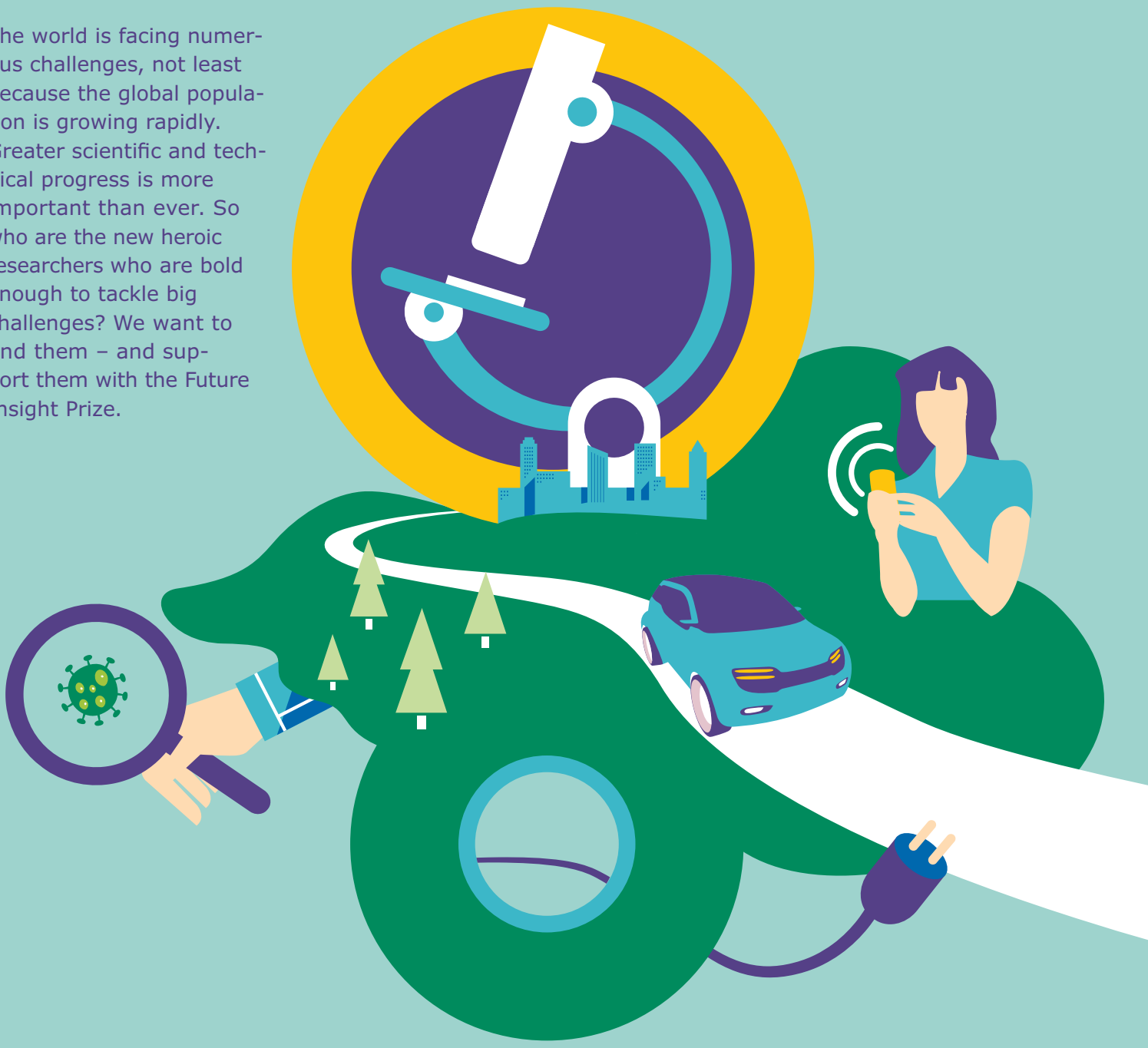
…then I'd wish that everyone who is interested in our hamburgers already had the opportunity to sink their teeth into one. We could then demonstrate even more convincingly that our concept works.

If, one day, there is a clear global demand for "clean" meat that does not require killing animals…

…then we will be able to see a positive impact very quickly. We anticipate that "clean" meat production will require 90% less grazing land and water. Energy consumption for meat will fall by 60% and greenhouse gas emissions will also decrease significantly, as there will be fewer herds of cattle emitting methane, which is very harmful to the global climate.

New heroes wanted

The world is facing numerous challenges, not least because the global population is growing rapidly. Greater scientific and technical progress is more important than ever. So who are the new heroic researchers who are bold enough to tackle big challenges? We want to find them – and support them with the Future Insight Prize.



GROWTH HAS ITS PRICE

In the not too distant future, almost ten billion people will share the earth – most likely as soon as the middle of the century. Two-thirds of the population will move to the cities, many of which are already reaching their limits. At the same time, as the climate continues to warm, the effects of climate change may become even worse in some regions of the world. Where will the food and energy for all the people come from? How will healthcare be provided? How can we make better use of limited resources such as land and water?

Solutions for these mammoth challenges require collaboration between many stakeholders from politics, business and industry. But above all, we need clever minds in research who can drive forward progress in science and technology and want to change the future for the better. Precisely this bold and inventive spirit is what we want to support. That's why we launched the "Future Insight Prize" with an award of up to one million euros annually. We'll be awarding it for the next 35 years to promote groundbreaking scientific innovations in the categories of health, nutrition and energy.

AN OPPORTUNITY FOR VISIONARY IDEAS

We're starting with a focus on progress in the health category. The prize will be awarded to scientists whose work enables the subsequent development of a pandemic protection system. This "dream product", which is not yet possible with current technology, is intended to provide faster protection against newly emerging pathogens. The aim of such a "pandemic protector" is to analyze these pathogens in the shortest possible time and identify an active substance for the treatment or prevention of disease to prevent the outbreak of a new global epidemic.

We will announce the winner of this prize in the summer of 2019. Until then, a scouting team will monitor scientific activity worldwide with the aim of selecting potential candidates for the award. Experts in relevant fields are likewise free to propose candidates of their own. The jury comprises distinguished scientists and managers both from our company and from renowned academic reseach institutions and other technology groups. The exciting question is: Whose project will receive this big boost? One thing is already certain: It will help a great idea continue to grow.

http://futureinsightprize.emdgroup.com

Future Insight Prize

We plan to support courageous projects over the next years in the following areas:

2019
Pandemic Protector – Protection against newly emerging pathogens and identification of an active substance for the treatment or prevention of disease (category: health)

2020
Multi-drug resistance breaker – Solving the problem of antibacterial resistance to multiple antibacterials (category: health)

2021
Food generator – Technology to help feed the world's growing population (category: nutrition)

2022
CO_2-to-fuel converter – Generating fuel through photocatalytic conversion of atmospheric CO_2 (category: energy)

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TO OUR SHAREHOLDERS

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TO OUR SHAREHOLDERS

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Our Shares

Dear shareholders, dear friends,

We had a special year in 2018: The company commemorated an amazing anniversary – 350 years. We were able to look back on a long history of contributing to the progress of science again and again. Above all, however, we have been directing our focus on what lies ahead. After all, the most important history remains the one we are writing today.

In business terms, 2018 proved challenging, but we held up well over the year. We also made decisions that will guide our future path and allow us to generate profitable growth again in 2019.

- In our Healthcare business sector, we presented a number of results from clinical studies involving our drug candidates. Not all of the studies achieved the results we had hoped for; this is normal when developing innovative medicines. We gained many important insights that will help us streamline the development of our Biopharma pipeline. One further key milestone was the FDA's acceptance of our application for market approval of cladribine tablets as a potential treatment for relapsing-remitting multiple sclerosis. Finally, we also further refined our focus on innovation-driven businesses through the sale of the over-the-counter products business (Consumer Health).

- Growth in our Life Science business sector continued to perform above the market. We have further expanded our position as the most profitable technology and solutions supplier in the life science industry. We recorded particularly strong sales growth in our Process Solutions area, where we offer leading-edge processing technologies for biotech and pharmaceutical companies as well as products critical to the advancement of cell and gene therapy. Moreover, our e-commerce platform made a significant contribution to business growth.

- In the Performance Materials business sector, we have developed a new strategy and restructured our organization. With the help of our multi-year "Bright Future" transformation program, we will implement our new strategy and create the basis for future profitable growth beyond 2019. Our goals in taking this step are to sharpen our focus on our customers' needs as well as to centrally decide on the assessment of projects and the related use of resources as part of an integrated approach to research and development.

Stefan Oschmann

Chairman of the Executive Board and CEO

Our Group sales in 2018 showed a slight increase of 2.2% to € 14.8 billion[1], supported primarily by the Life Science and Healthcare business sectors. EBITDA pre, the key performance indicator to measure our operations, dropped by –10.5% to € 3.8 billion[1]. There are several reasons for this decline: Last year, we invested in research and development as well as the market launches of the new products in our pharmaceutical business. Our Liquid Crystals business recorded further price declines. For the most part, however, the decline in earnings was due to negative foreign exchange effects that are primarily attributable to movements in the currencies of various growth markets. Over the past year we reduced our debt load by € 3.4 billion and thus reached our target for 2018, which was to achieve a net financial debt to EBITDA pre ratio of less than two.

Our shares essentially closed out the year 2018 at the level they recorded at the start of the year. The shares performed well when compared with the sector, particularly in the fourth quarter, and closed out the year above the relevant benchmark index for the pharmaceutical industry[2] and well above the relevant chemical industry index[3] and the German benchmark DAX index. For 2018, we will propose to the Annual General Meeting a dividend of € 1.25 per share.

As you can see, we achieved a solid result in 2018. This result is largely thanks to our employees. Numbering some 52,000 worldwide, they worked hard and achieved much in 2018. On behalf of the entire Executive Board, I would like to express my heartfelt thanks for their extraordinary dedication.

Once again, there is much to do for us this year. The markets and industries in which we operate continue to develop at a rapid pace.

- Precision medicine will profoundly change the entire healthcare sector. New technologies and high-performance data analyses will enable us to gain an ever greater understanding of serious and complex diseases. Looking ahead, we will be able to tailor medicines even more exactly to the needs of each patient.

- Falling equipment costs, improved access to knowledge and new financing options will raise scientific research and development to a completely new level. It will, for example, become easier for smaller biotech companies to bring new technologies and therapies to market maturity with greater speed.

- At the same time, more and more items in our everyday lives will be interconnected. The Internet of Things is becoming a reality, and unimagined possibilities are emerging in almost all areas of our lives.

[1] Excluding the Consumer Health business divested in 2018.
[2] MSCI European Pharma Index.
[3] Dow Jones European Chemical Index.

This is good news for us because we are helping to shape all these developments. Science is at the heart of everything we do. It forms the basis for the technologies we get off the ground. Every day, our more than 7,000 researchers work to push the boundaries of the possible.

In Healthcare, we continue to pursue our long-term goal of becoming a global specialty innovator. To this end, we focus on oncology, immuno-oncology and immunology. Our pharma pipeline harbors great potential, which we want to harness further in 2019 and beyond, also in collaboration with strong partners.

Life Science plays a leading role in attractive markets, and we want it to stay that way. This is the reason we are strengthening fast-growing business areas such as bioprocessing technology for the manufacturing of medicines. It is also the reason we are pushing promising new technologies such as our BioContinuum Platform. It will help us to significantly simplify the complex process of producing biological medicines over the coming years as well as accelerate it.

In Performance Materials, we aim to expand our position as a leading solutions supplier for the electronics industry. The electronics sector is considerably benefiting from the megatrends of digitalization, mobility and urbanization. It services a broad range of different customers, making it less susceptible to the ups and downs of individual markets. In particular, our business with semiconductor materials will continue to advance Performance Materials over the long term.

At our company, we are also working on technologies of the future beyond our three business sectors.

The announced Syntropy joint venture we plan to create with Palantir Technologies represents a particularly exciting project. Syntropy aims to markedly accelerate cancer research. To achieve this, the large volume of biomedical data being collected by scientists and physicians worldwide every day plays a key role. This data may prove very valuable to science. Far too often, however, it’s not accessible to the scientists who need it. We aim to change this through Syntropy. We want to enable researchers to structure and analyze data from various sources through the use of pattern recognition. In addition, it is planned that scientists can securely exchange data in a traceable manner while retaining control of their own data at all times.

Syntropy is a project with considerable potential, an attribute it shares with other issues of the future – for example, new interfaces between the human body and the digital world and new technological approaches for liquid biopsy or for the biotechnological production of meat. Please see the magazine section of this Annual Report for more information on these issues.

To advance our research, we are present in all of the world's technology regions, which, of course, today also means China. Alongside Germany, the United States, and Israel, China has become a top location for science and technology, and we are investing heavily in the country. Last November, we announced the establishment of our new Innovation Hub in the southern Chinese city of Guangzhou, one of the country's major technology hubs. We are also stepping up our production in China: we operate one of our biggest pharmaceutical production plants in the eastern Chinese city of Nantong.

Contributing to advancements in science and technology is a great opportunity – but it also comes with considerable responsibility. We strongly believe what matters is not just what a company does, but also how it achieves its goals. Our long history has taught us that sustainable business success always derives from responsible conduct. I am very pleased we achieved a very good fourth place in the 2018 "Access to Medicine" index for the second time in a row. Every two years, experts from the Access to Medicine Foundation compare the activities of the 20 leading pharmaceutical companies in this area. Our fourth-place ranking is a gratifying recognition of our commitment to improving access to healthcare for people in developing countries, and it is a strong incentive for us to continue our efforts.

For us, scientific research and responsible entrepreneurship go hand in hand. Only when combined do they enable technological advancement that benefits all of us – our customers, our employees, society and, of course, you, our shareholders.

Over the coming years, we at Merck KGaA, Darmstadt, Germany, want to develop breakthrough technologies that will make a substantial difference in the lives of millions of people. This is what drives us, now and in the future.

Sincerely,

Dr. Stefan Oschmann
Chairman of the Executive Board and CEO

The Executive Board

Udit Batra
Member of the Executive Board
CEO Life Science

Stefan Oschmann
Chairman of the
Executive Board and CEO

Kai Beckmann
Member of the Executive Board
CEO Performance Materials

Marcus Kuhnert
Member of the Executive Board
Chief Financial Officer

Belén Garijo
Member of the Executive Board
CEO Healthcare

Our Shares

At a glance

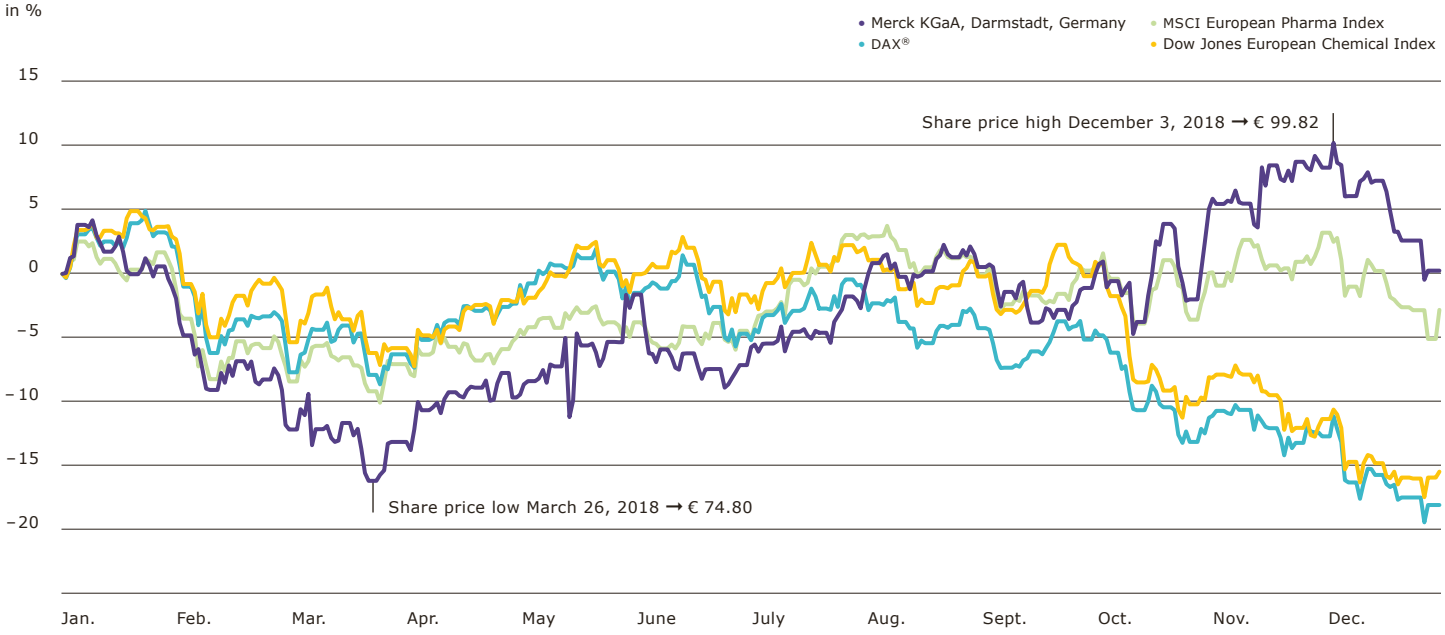
The performance of our shares was, on the whole, characterized by volatility in 2018: Following a downswing in the first quarter amid a market setting that came under visible pressure, the share price staged a recovery by the year-end. Our share price remained almost unchanged over the previous year at +0.26%, finishing the year at € 89.98. The shares substantially outperformed the relevant reference indices, which all recorded a downswing during the same period. When compared with the DAX® reference index, which fell by around 18% during the period as a whole, our shares performed just under 19 percentage points better. Their outperformance vis-à-vis the relevant chemical industry index, which fell by almost 16% in 2018, was around 16 percentage points. The pharmaceutical industry index declined by around 3% in 2018, thus underperforming our shares by 3 percentage points in the same period.

In 2018, the Executive Board and the Investor Relations team gave in-depth briefings to more than 660 investors at investor conferences as well as during roadshows and conference calls.

The average daily trading volume of our shares increased by 23% from approximately 474,000 in 2017 to over 584,000 in 2018. The North America region continued to dominate: its proportion of the free float increased to around 36% (2017: 29%). By investor type, growth and value investors dominated, as in the previous year. In 2018, growing interest could be seen among value investors, who now hold approximately 28% of the free float. At the end of 2018, the top five investors held around 28% of the free float (2017: 19%).

OUR SHARES

Share price development from January 1, 2018 to December 31, 2018



Source: Bloomberg (closing rates).

OUR SHARES

Key share price data[1]

		2018	2017
Dividend[2]	€	1.25	1.25
Share price high	€	99.82	114.40
Share price low	€	74.80	87.90
Year-end share price	€	89.98	89.75
Daily average number of shares traded[3]	number	583,653	473,740
Market capitalization[4] (at year-end)	€ million	39,121	39,021
Market value of authorized shares[5] (at year-end)	€ million	11,629	11,599

[1] Share-price relevant figures relate to the closing price in XETRA® trading on the Frankfurt Stock Exchange.
[2] 2018 dividend subject to approval by the AGM.
[3] Based on the floor trading systems of all German exchanges and the regulated market on XETRA®.
[4] Based on the theoretical number of shares (434.8 million).
[5] Based on the number of shares in free float (129.2 million).
Source: Bloomberg, Thomson Reuters.

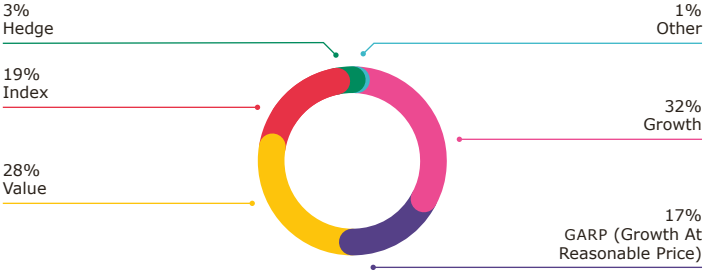
OUR SHARES

Identified investors by region as of December 2018
in %

Source: Nasdaq Shareholder Identification. Total number of shares outstanding: 129.2 million.

OUR SHARES

Identified investors by type as of December 2018
in %



Source: Nasdaq Shareholder Identification.

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COMBINED MANAGEMENT REPORT*

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*The management report for Merck KGaA, Darmstadt, Germany, has been combined with the Group management report and published in our 2018 Annual Report as well as in the annual financial statements of Merck KGaA, Darmstadt, Germany. The annual financial statements and the combined management report of the Group and Merck KGaA, Darmstadt, Germany, for 2018 are filed with the electronic German Federal Gazette (elektronischer Bundesanzeiger) and are available on the website of the German company register.

This combined management report contains certain financial indicators such as operating result (EBIT), EBITDA, EBITDA pre, business free cash flow (BFCF), free cash flow, net financial debt and earnings per share pre, which are not defined by International Financial Reporting Standards (IFRSs). These financial indicators should not be taken into account in order to assess the performance of the Group in isolation or used as an alternative to the financial indicators presented in the consolidated financial statements and determined in accordance with IFRSs.

The figures presented in this combined management report have been rounded. This may lead to individual values not adding up to the totals presented.

The separate, combined non-financial (Group) report of Merck KGaA, Darmstadt, Germany, which we issue pursuant to sections 289b–289e and 315b–315c HGB, is available as online version on our website as of April 15, 2019 at https://www.emdgroup.com/en/cr-report/2018/. It is integrated into the 2018 Corporate Responsibility Report in accordance with DRS 20 subsection 252 (b). We have prepared an overview of the information contained in the combined non-financial (Group) declaration at https://www.emdgroup.com/nfr18.

Fundamental Information about the Group

The Group

We are a vibrant science and technology company. Science is at the heart of everything we do. It drives the discoveries we make and the technologies we create. Our work makes a positive difference in millions of people's lives every day.

In Healthcare, we discover unique ways to treat the most challenging diseases such as multiple sclerosis and cancer. Our Life Science experts empower scientists by developing tools and solutions that help deliver breakthroughs more quickly. And in Performance Materials, we develop science that sits inside technologies and changes the way we access and display information.

Everything we do is fueled by a belief in science and technology as a force for good. A belief that has driven our work since 1668 and will continue to inspire us to find more joyful and sustainable ways to live. We are curious minds dedicated to human progress.

We operate globally under our corporate brand. The only exceptions are Canada and the United States. In these countries, we operate as EMD Serono in the biopharmaceutical business, as MilliporeSigma in the life science business and as EMD Performance Materials in the high-tech materials business.

In November, we announced the intent to form a joint venture under the brand name Syntropy, a joint venture with technology and software company Palantir Technologies. Syntropy is expected to empower scientists and research centers with a collaborative technology platform to advance cancer research, help drive scientific discovery and improve human lives.

Apart from our three business sectors, our financial reporting presents the five regions Europe, North America, Asia-Pacific (APAC), Latin America as well as Middle East and Africa (MEA). As of December 31, 2018, we had 51,749 employees worldwide[1], which compares with 52,941 on December 31, 2017.[2]

Healthcare

Our Healthcare business sector comprises the two businesses Biopharma and Allergopharma. On December 1, our Consumer Health business tranferred to Procter & Gamble (P&G). Since 2015, Belén Garijo has been CEO of the Healthcare business sector and member of the Executive Board. In 2018, Healthcare generated 42% of Group sales and 37% of EBITDA pre (excluding Corporate and Other), making it the largest of our three business sectors. The regions Europe and North America generated 58% of Healthcare's net sales in 2018. In recent years, we have steadily expanded our presence in growth markets. In 2018, Asia-Pacific and Latin America accounted for 35% of sales.

BIOPHARMA

Our Biopharma business discovers, develops, manufactures and markets innovative pharmaceutical and biological prescription drugs to treat cancer, multiple sclerosis (MS), infertility, growth disorders as well as certain cardiovascular and metabolic diseases. Biopharma is the larger of our Healthcare businesses and operates in four franchises: Oncology, Neurology & Immunology, Fertility and General Medicine & Endocrinology. Our R&D pipeline positions us with a clear focus on becoming a global specialty innovator in oncology, immuno-oncology and immunology including MS.

2018 marked the 20th anniversary of the European Commission's approval of our top-selling product Rebif® (interferon beta-1a), a disease-modifying drug used to treat relapsing forms of MS, acting in a way similar to that of interferon beta protein produced by the human body. Rebif®, which was approved in Europe in 1998 and in the United States in 2002, is registered in more than 90 countries worldwide. Rebif® has been proven to delay the progression of disability, reduce the frequency of relapses and reduce magnetic resonance imaging (MRI) lesion activity and area.

2018 also saw further launch progress of Mavenclad® (cladribine tablets), with approvals encompassing more than 40 countries. In addition, in July, the FDA accepted the resubmission of the New Drug Application (NDA) for cladribine tablets. The acceptance indicates that the FDA found the company's resubmission sufficiently complete to permit a substantive review. We view Mavenclad® as a complementary new oral treatment option in our MS product portfolio. Our MS treatment Rebif® is and remains a well-established therapy.

In March, we announced positive Phase IIb data for the first Bruton's tyrosine kinase (BTK) inhibitor to show clinical proof-of-concept in relapsing MS, namely evobrutinib, a highly specific, oral BTK inhibitor, and we further demonstrated our commitment to improving the lives of people with MS and other chronic progressive diseases via scientific advances and new data on our marketed and pipeline therapies (further details can be found under "Research & Development").

[1] The Consumer Health business was transferred to Procter & Gamble (P&G) on December 1, 2018, and was already classified as a discontinued operation according to IFRS 5 in April 2018. With the completion of the sale, around 3,300 employees joined P&G.
[2] The Group also has employees at sites which are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

Erbitux® (cetuximab) remains the second-best-selling drug in terms of revenue in the portfolio of our Biopharma business and is our flagship product in oncology. Treating more than 900,000 patients since authorization, the product is a standard of care for patients with epidermal growth factor receptor (EGFR)-expressing, RAS wild-type metastatic colorectal cancer (mCRC), as well as both recurrent and/or metastatic and locally advanced squamous cell carcinoma of the head and neck (SCCHN). We continue to invest in Erbitux® and are committed to making it available to those patients it will benefit most.

Together with Pfizer Inc., we are developing much-needed new treatment options for patients with hard-to-treat cancers. We have made key progress in this area, with regulatory approvals in 46 countries for our anti-PD-L1 antibody avelumab under the brand name Bavencio®. In 2018, approvals were granted in several countries including Australia and Brazil for Merkel cell carcinoma (MCC), Israel for both MCC and urothelial carcinoma (UC) and Canada for UC. Bavencio® was initially granted two approvals in 2017 by the U.S. Food and Drug Administration (FDA) for the treatment of adults and pediatric patients 12 years and older with metastatic MCC and previously treated patients with locally advanced or metastatic UC. These indications were approved under accelerated approval based on tumor response rate and duration of response. Continued approval for these indications may be contingent upon verification and description of clinical benefit in confirmatory trials. The prognosis for both patient groups is very poor, so for patients around the world this may represent a welcome new treatment option.

The Bavencio® approvals were based on data from our comprehensive clinical development program JAVELIN, which currently comprises at least 30 clinical programs, including several Phase III trials and over 9,000 patients evaluated across more than 15 different tumor types. In addition to MCC and UC, these cancers include gastric/gastro-esophageal junction, head and neck, non-small cell lung, ovarian and renal cell carcinoma.

We are continuing to explore all potential options and have entered into a number of strategic collaborations to evaluate avelumab in combination with a range of complementary oncology medicines (further details can be found under “Research & Development”). Key data from the JAVELIN program were presented at major medical congresses in 2018, including the European Society for Medical Oncology Congress (ESMO), where we shared promising new results from the Phase III JAVELIN Renal 101 study evaluating avelumab in combination with axitinib compared with sunitinib as initial therapy for patients with advanced renal cell carcinoma.

Earlier pipeline highlights included the presentation of new data for M7824 (TGF-β-trap/anti-PD-L1) in a range of tumors, adding to existing evidence for the potential of this bifunctional immunotherapy and supporting our plans to continue its exploration in advanced solid tumors and ongoing cohort expansions. Additionally, in August we initiated a trial to investigate M7824 compared with pembrolizumab as a first-line treatment in patients with PD-L1-expressing advanced non-small cell lung cancer (NSCLC). In December, the FDA granted orphan drug designation to M7824, its first regulatory designation, for the treatment of biliary tract cancer (further details can be found under “Research & Development”). Data shared for oral MET inhibitor tepotinib included positive results in NSCLC and advanced hepatocellular carcinoma (HCC). We are currently assessing the potential of investigating tepotinib in combination with novel therapies for the treatment of advanced HCC after the two HCC Phase II trials met their primary endpoints, with clinical activity and safety demonstrated both as first-line and second-line treatment. Both M7824 and tepotinib were discovered in-house at our company.

Being the global market leader in fertility drugs and treatments, with a unique and broad portfolio from therapeutics to technologies, our Fertility franchise is an important growth driver for our Biopharma business. Infertility represents an increasing challenge globally due to demographic changes and growing lifestyle trends like delayed childbearing. In this highly specialized market, the focus lies on quality, standardization and outcomes. With our portfolio we are confident of being well-equipped to face the challenges in this field, aiming to be the preferred fertility treatment partner of our customers and offering innovative solutions across therapeutics, lab technologies, connectivity and services.

The Pergoveris® Pen is the first product with a combination of recombinant follicle-stimulating hormone (FSH) and recombinant luteinizing hormone (LH) in a ready-to-use liquid version, eliminating the need for mixing. It thus provides an improved and convenient treatment option for women with severe deficiency of both FSH and LH, a group of patients that is difficult to treat. Launches will continue. The number of countries in which Pergoveris® Pen has launched reached 13 in 2018 and we will continue to provide patients with access to this innovative therapeutic.

In addition, we launched two new technologies at the annual meeting of the European Society of Human Reproduction and Embryology (ESHRE) in Barcelona. Our connectivity platform QBOX IVF streamlines the data transfer between lab instruments and electronic medical records, improving data management across the clinic. Geri® Assess 2.0 extends our innovative software portfolio, enabling automatic detection of key events in embryo and blastocyst development.

During the ESHRE meeting we also introduced our new online platform, www.fertility.com. It is the gateway to two online portals: one for healthcare professionals, offering the latest scientific information in the advancing field of fertility, and one supporting women, men and couples who are looking for information about fertility and/or undergoing fertility treatment.

Every day, more than 66 million patients around the world use our trusted general medicine and endocrinology (GM&E) medications. Today, Concor®, Euthyrox®, Glucophage® and Saizen® are highly valued brands and market leaders in many key markets around the world. As a result, in terms of sales GM&E is the largest business franchise of the Healthcare business sector, with strong growth in all major therapeutic areas of focus, contributing significantly to the overall profitability of Biopharma and Merck KGaA, Darmstadt, Germany. Although no longer patent-protected, the brand equity built over decades makes our flagship products cornerstones for the treatment of chronic cardiovascular, metabolic and endocrine diseases.

Concor®, containing bisoprolol, is the leading beta-blocker for chronic cardiovascular diseases such as hypertension, coronary artery disease and chronic heart failure. Euthyrox®, with the active ingredient levothyroxine, is the worldwide market leader with a market share above 40% for the treatment of hypothyroidism, a disease with high prevalence but still low diagnosis rates in most emerging markets. Glucophage®, containing the active ingredient metformin, is the drug of choice for first-line treatment of type 2 diabetes. During 2018, several health authorities worldwide continued to authorize Glucophage® for prediabetes when intensive lifestyle changes have failed. This indication for Glucophage® is now approved in 40 countries. Due to an increasing prevalence of diabetes we see great potential for this product.

We also help to raise awareness and education in the areas we operate in, such as thyroid diseases and diabetes. This is well demonstrated by our active role in International Thyroid Awareness Week and partnership with the International Diabetes Federation (IDF), which serves as a basis for implementation of education and communication activities emphasizing the importance of type 2 diabetes prevention.

Earlier in the year we announced our collaboration with U.S.-based Medisafe to help our cardiometabolic patients better manage medication intake and adhere to prescribed treatment regimens. In the countries of scope, our patients will have access to a customized version of Medisafe's mobile platform that could combine reminders, motivation and support systems, targeted content, coupons and interventions in their local language.

Saizen® (somatropin) is our main endocrinology product and is indicated for the treatment of growth hormone deficiency in children and adults. Saizen® is delivered with the Easypod® electromechanical injection device, the only growth hormone injection device of its kind. Easypod® is able to wirelessly transfer data such as injection times, dates and doses to the web-based software system Easypod® connect, making it easier for healthcare practitioners and patients to ensure adherence and reach their treatment goals.

CONSUMER HEALTH

Our Consumer Health business tranferred to P&G on December 1. The cash purchase price was approximately € 3.4 billion. The transaction comprises the Consumer Health business in 44 countries with more than 900 products and two production facilities in Spittal (Austria) and Goa (India). Around 3,300 employees have transferred to P&G. The successful completion of the transaction marks a further step in our company's strategic focus on innovation-driven businesses.

ALLERGOPHARMA

Our allergy business Allergopharma is one of the leading companies in the field of allergy immunotherapy (AIT) in Europe. For high-precision, effective allergy therapy, we offer comprehensive diagnosis solutions as a basis for individual treatment concepts. Our AIT products concentrate on causal treatment of type 1 allergies such as allergic rhinitis (for example, hay fever) and allergic asthma to meet patients' needs. For AIT, strong evidence of efficacy and an acceptable safety profile have been well-documented in allergy-induced allergic rhino-conjunctivitis in numerous clinical trials. Furthermore, there is a potential positive effect on the long-term course of the allergic disease. AIT is designed to induce tolerance in the immune system of the allergy patient to the allergy-triggering allergen, thus potentially inducing an immune modification.

We offer high dosage, hypoallergenic, standardized preparations for allergen-specific immunotherapy for pollen and house dust mite allergies as well as a wide range of diagnostic allergy tests. Based on long-standing expertise, scientific excellence and entrepreneurial responsibility, we do our utmost to provide physicians with first-class therapy options and help people with allergies lead more fulfilled lives. Products of Allergopharma are available in 18 countries worldwide.

Life Science

In Life Science, we are a leading, global supplier of tools, high-grade chemicals, and equipment for academic labs, biotech and biopharmaceutical manufacturers, as well as the industrial sector. We make scientific discovery easier and faster with technologies like CRISPR for gene-editing; and we provide drug manufacturers with process development expertise that make medicines safer and more effective for patients. We offer both testing kits and services to ensure that our food is safe to eat and water is clean to drink.

In Life Science, our purpose is to solve the toughest problems in life science by collaborating with the global scientific community. Since acquiring the chemical and technology company Sigma-Aldrich in 2015, we have put a strategy in place that we continue to execute today: complete the integration of Sigma-Aldrich; strengthen our core businesses by delivering a broad and relevant portfolio to our customers and establishing new pillars of growth in scientific areas like cell and gene therapy and continuous bioprocessing. As ranked by sales, our Life Science business sector has achieved a top-three ranking in the global life science industry.

Udit Batra was named CEO of the Life Science business sector in 2014 and was appointed to the Executive Board in 2016. In 2018, Life Science generated 42% of Group sales as well as 44% of EBITDA pre (excluding Corporate and Other).

Our portfolio comprises more than 300,000 products ranging from lab water systems to genome-editing tools, antibodies and cell lines, as well as end-to-end bioprocessing systems to support the manufacturing needs of both emerging biotech and large pharma companies. For example, our Life Science business sector has built the expertise to further develop our BioReliance® End-to-End Solutions, a service offering for process development and manufacturing for emerging biotechs. Another example is BrightLab™, our digital ecosystem for complete lab management.

Our e-commerce platform, sigmaaldrich.com, continues to grow and connect customers in nearly every country with the products needed to advance their research, development and production efforts. In 2018, we implemented initiatives to optimize how our customers search and find our products, engage with our content and make purchasing decisions. With our teams' technical expertise and dedication to customer service, we continued to experience growth in both user sessions and revenue. This was recognized with three external awards.

In the first quarter of 2018, we made the first of several investment announcements. In February, we invested €40 million in Asia, which included an integrated cell culture facility in Songdo, Incheon, Korea; a new manufacturing and distribution center near Mumbai, India; and a single-use manufacturing facility in Wuxi, China. The Songdo center includes cell culture media facilities (imMEDIAte Advantage® Custom Media) and a logistics infrastructure to help meet the rapid growth in the biopharmaceutical industry in Songdo (Incheon, Korea). The new center in Mumbai, which is expected to be completed in 2019, is being built to ensure that our customers have ready access to the products needed to develop new therapies and biosimilars to accelerate access to health.

In June, we announced expansion plans to our operations in Gillingham, United Kingdom. The distribution center, which will grow by 5,250 square meters, will supply the pharmaceutical industry, biotechnology companies, research institutes and academic centers with biochemical and chemical reagents, laboratory supplies and testing services. The € 9 million investment will boost distribution capabilities for the business. Anticipated to open in early 2019, the updated facility will serve as the primary distribution center for the United Kingdom.

In September, we established our first Mobius® single-use manufacturing facility in China to support the development of the biopharma industry in the region. This facility, which is expected to be operational by the first quarter of 2019, will provide flexible and customized single-use solutions to support local customers in accelerating drug development and manufacturing.

In the second half of 2018, we opened a € 13 million (SG $ 20 million), 3,800-square-meter laboratory in Singapore, the only lab of its kind in Singapore and outside of the United States and the United Kingdom. The lab will focus on biologics testing, which is a major step in the drug development process.

In October, we also opened a new, 1,000-square-meter M Lab™ Collaboration Center in São Paulo, Brazil, to serve the Latin America region. The lab, which is one of nine such centers around the world, includes a non-good manufacturing practice (non-GMP) pilot and bench scale labs for customers. This allows customers to engage in process development support, troubleshooting, demonstrations and hands-on training to explore new ways to increase productivity, improve processes and mitigate risks.

In addition to new facilities, in 2018 we also announced a new platform for our biopharmaceutical customers who manufacture monoclonal antibodies. In the third quarter, we launched our BioContinuum™ Platform, which addresses intensified bioprocessing and continuous manufacturing. Continuous bioprocessing integrates the typical batch-based, separate manufacturing steps into a connected process, enabling a continuous flow from the addition of raw materials through product harvest, purification and testing. Pilot studies suggest that conversion to such a manufacturing method may reduce manufacturing costs by up to 50%.

A key goal for our Life Science business units is to help our customers that manufacture drugs, from small to large innovator companies, bring life-enhancing medicines and therapies to market – and

to patients – faster. To facilitate reaching this target, we opened our first BioReliance® End-to-End Biodevelopment Center in North America in June 2018. This center supplies drug manufacturers with complete solutions for the development of cell lines, upstream processes and downstream processes as well as production not subject to good manufacturing practices, or non-GMP production. The facility is designed to help customers with their biopharmaceutical manufacturing processes and accelerate clinical development from DNA to market.

Today, 60% of drugs in the pipeline are being developed by biotech start-ups focused on innovative therapies, including those intended to treat niche diseases with small patient populations. These companies are the focus of our global health commitment to support them in bringing their drugs to market through our grant programs. Grants provide these companies with free products and services of our company to help accelerate market entry of new therapies. Through our Advance Biotech Grant Program, every six months, three recipients around the globe are awarded a total of € 200,000 in services and products to address their process development challenges.

In February, we announced a two-year research collaborative with Washington University in St. Louis, Missouri, United States, that includes the use of our CRISPR genome-editing technology. The goal of the research is to determine the differences between gut bacterial communities in healthy and malnourished children, and to identify what features of healthy intestinal bacteria are critical for supporting healthy growth.

Further to these grants, in the second quarter of 2018, we announced three new partnerships with leading academic institutions. The first is a partnership with Oxford University's Jenner Institute, in the United Kingdom, which seeks to develop more robust and scalable vaccine manufacturing processes. A second collaboration, in addition to the aforementioned grant, is with Washington University in St. Louis, Missouri, United States, to optimize nutritional supplements to restore a healthy gut microbial community (microbiome). The third is a partnership with Tongji University in Shanghai, China, for our CRISPR Core Partnership Program to provide the university with exclusive access to our genome-editing technology and comprehensive technical support.

Related to our advancements in CRISPR, in December we announced a strategic alliance in the CRISPR/Cas9 rodent model market with France-based biotechnology company genOway. Through an exclusive worldwide license of our foundational CRISPR integration patents , genOway will develop new models and solutions allowing non-profit and for-profit scientists to use CRISPR/Cas9 technology. Under the agreement, genOway will also develop a network of sublicensees in both the model creation and distribution businesses and preclinical services for all potential applications worldwide, with a strong focus on the United States, Asia and Europe.

In addition to awarding grants to academic institutions, our businesses also extend to the wider community through SPARK, our global volunteer program. In 2018, through this initiative, nearly 1,700 employees volunteered nearly 9,000 hours to engage 66,500 students around the world in science learning. For the second year, our Curiosity Cube™, mobile science lab toured North America, traveling 30,000 kilometers and engaging approximately 36,000 students at schools and city centers in 24 communities.

In 2018, we served as the exclusive sponsor of TeleScience, a new online platform for Seeding Labs, an organization that provides scientists in developing countries with lab equipment, training and opportunities to collaborate with experts in their field. To date, our partnership with Seeding Labs has enabled the organization to equip 65 universities in 34 developing countries with 77 shipments (containing nearly 200 tons) of equipment, providing access to the global scientific community and helping to accelerate scientific research.

In October, we announced an agreement to sell our Amnis® Flow Cytometry and Guava® Technologies businesses to Luminex Corporation for € 63 million. The transaction transferred our flow cytometry platforms Amnis and Guava as well as the associated reagents under those brands. This included a portfolio of leading technologies serving the research space.

We will continue to actively manage our comprehensive portfolio by tapping into innovation and placing it in the best hands to continuously drive value for customers.

Performance Materials

Our Performance Materials business sector comprises our specialty chemicals business and supplies solutions for displays, computer chips and surfaces of all kinds. Effective April 1, 2018, Performance Materials comprises three business units: Display Solutions, Semiconductor Solutions and Surface Solutions. If we compare Performance Materials with a smartphone, Display Solutions represents the user interface, Semiconductor Solutions the intelligence and Surface Solutions the aesthetics.

On July 3, the Performance Materials business sector presented a strategy update explaining how, after 2019, it aims to achieve average annual sales growth of around 2% to 3% with an expected sustainable EBITDA pre margin of around 30%. We expect to be able to more than offset the decline in our liquid crystals business for displays with growth in the other businesses after 2019.

One pillar of the "Bright Future" transformation program is the realignment of Research and Development (R&D) as presented at the Capital Markets Day on October 16. In the wake of this realignment, the business sector is seeking to align its resources more

purposefully to the requirements of end customers. On top of this, decisions on the evaluation of projects and the allocation of resources are to be made centrally, and the business sector aims to push ahead with integrated and interdisciplinary R&D.

We are currently undergoing a transformation in the Performance Materials business sector with a view to adjusting to new market realities and customer requirements. We are building the foundations for the future. It is our strategic goal to return to sustainable profitable growth, to ensure an attractive margin and to remain competitive as Performance Materials. In order to achieve this, we have to optimize our cost base and to adopt our R&D ratio, which is far beyond industry benchmark. Our goal is a ratio of R&D investments compared to Sales of around 8%. This is at the upper end of what comparable companies invest in Research and Development. We are adjusting our cost structure in the Display Solutions and Integrated Supply Chain business units as well as in Research & Development, in particular.

Performance Materials accounted for 16% of Group sales in 2018 and its share of EBITDA pre (excluding Corporate and Other) was 19%. The EBITDA pre margin amounted to 32.7% of net sales.

Our Display Solutions business unit comprises the liquid crystals, OLED (organic light-emitting diodes), photoresists and liquid crystal windows businesses. Even though competition has intensified, we defended our position as the global market and technology leader in the display materials business in 2018. Modern, energy-efficient technologies such as UB-FFS (ultra-brightness fringe-field-switching) have further established themselves on the market. We have secured projects in the area of large-surface displays and for high-resolution mobile devices for our product offerings of the newly launched XtraBright™ brand.

The first commercial lighthouse projects in the architecture segment are running with our liquid crystal window modules. In October, we launched our new product brand, eyrise™. Its launch follows the opening of our production plant for liquid crystal window modules in Veldhoven, the Netherlands, at the end of 2017. Our business with photoresists for displays continues to consolidate thanks to proven technical success in high-performance product lines, in particular. This growth is supported by a strong position in new display production lines on the growing Chinese market. As a result of continuous improvements as well as substantial increases in the current lifetime and efficiency of the OLED materials in our portfolios, these materials have been selected for a large number of new devices being launched on the market.

Semiconductor Solutions, the second-largest business unit in Performance Materials, supplies products for integrated circuits, microelectronic systems, for antireflection coatings and for the miniaturization of transistor structures. Deposition materials and conductive pastes for semiconductor packaging round off the portfolio. We are continuously looking for new materials for metallization processes with low resistance and various dielectric characteristics for faster or better processors, servers and data storage density. Our business with dielectric materials for spin-on procedures is growing steadily. Furthermore, we are reporting rising demand for krypton fluoride (KrF) thick film resists, an important material in the production of 3D NAND staircase structures.

Materials for Directed Self Assembly (DSA) provide cost-effective patterning solutions which enable further chip scaling. DSA combines bottom-up with conventional top-down patterning. DSA uses a variety of different materials, in particular so-called block copolymers (BCP) that consist of two continuous, linked strands of different polymers. These BCPs have the ability to arrange themselves in even shapes along the conductive structure under certain conditions. They form the basis for the extremely fine transistors and printed circuit paths for the computer chips of the future. Our technological competence in combination with a strengthened supply chain have contributed to this growth.

In the Surface Solutions business unit our goal is to help customers with our materials and solutions to make innovative surfaces of all kinds more beautiful, more resistant or even more intelligent. Our pearlescent pigments enable striking automotive coatings, fascinating cosmetics, extraordinary packaging, innovative product design and even unique food creations. With our functional solutions we serve a large number of innovative applications, from dirt-repellent and easy-care surfaces to laser markings of plastic parts and cables.

On October 26, the Surface Solutions business unit announced that it would align itself even more closely with the needs of its markets. The future business areas of Surface Solutions will be automotive coatings, cosmetic solutions and industrial solutions.

Strategy

General principles

At our company, we believe in the opportunities of science, the transformational power of technology and the endless possibilities to change the lives of patients, researchers and customers. Our purpose is "We are curious minds dedicated to human progress". Science is at the heart of everything we do. It drives the discoveries we make and the technologies we create, it inspires our ideas and drives our entrepreneurial spirit.

We believe that scientific exploration and responsible entrepreneurship are key to technological advances that benefit us all. Our everyday decisions are guided by our company values. We want to live courage, achievement, responsibility, respect, integrity and transparency in every step we take, in every decision we make.

Together, we have defined the road ahead until 2022. This strategy is based on our Group Foundation, external trends that will impact our industry and a concrete map on how to reach our future ambition.

Group Strategy

THE TRANSFORMATIONAL JOURNEY SINCE 2007

Throughout the past years, our company has grown significantly through a series of strategic moves that have enabled us to develop into the vibrant science and technology company we are today. We have systematically and continuously strengthened and focused our portfolio of innovative science and technology throughout our business sectors. In Healthcare we divested our Generics business (2007) to focus on highly specialized products and acquired Serono (2007) to expand our pipeline and strengthen our business. This focused approach has continued until today with the divestments of the Biosimilars business (2017) and Consumer Health business (2018), so that we can increase our efforts on our Oncology, Immuno-oncology and Immunology franchises. Within Life Science, we have significantly transformed to become a diversified industry leader through the acquisition of Millipore (2010) and Sigma-Aldrich (2015). We continue to leverage the Sigma-Aldrich e-commerce platform to expand our reach and leadership in the industry as well as investing in strategic initiatives such as Gene Editing & Novel Modalities and End-to-End Bioprocessing. During this time, Performance Materials has continued to deliver profitable growth and a significant cash contribution, and we evolved this business further into attractive science and technology areas such as semiconductor materials through the acquisition of AZ Electronic Materials (2014), which also helped us further diversify our product portfolio that was strongly driven by liquid crystals.

Strategically, what we have achieved is the transformation of a classic chemicals and pharmaceuticals supplier into the vibrant science and technology company with leading positions in Healthcare, Life Science and Performance Materials. To further achieve our strategic goals from 2011 – 2017, we completed a transformation and growth program known as "Fit for 2018", primarily targeting organizational effectiveness and process optimization, and in the later years new initiatives such as the commencement of our Innovation Center in Darmstadt, new product innovations and our new brand.

THE ROADMAP

Our Group Strategy considers certain foundational elements such as, first and foremost, a risk diversification strategy that ensures that we are not over-exposed to any single customer, industry or region. We want to be a forward-thinking company generating long- term sustainable value. We focus our efforts and activities on innovative areas to add maximum value to the future of science and technology. We continue to operate under our current ownership structure with the Merck family, as a majority owner, and external shareholders. We aim to maintain an attractive financial profile. M&A (mergers & acquisitions) is an important part of our long-term value creation strategy with a focus on innovation-driven technology. In 2018, we further prioritized our activities in line with our strategic ambition to become the vibrant science and technology company. This includes the initiation of a new strategic approach in Performance Materials focused on the expanding electronics market, optimizing R&D through the efficient reallocation and adjustment of resources, and increasing our customer focus. In Healthcare, in addition to the aforementioned divestment of Consumer Health, we have continued our strategy of becoming a Global Specialty Innovator through continued development and externalization of selected pipeline projects. This way, we aim to ensure that promising products can be brought to the market quickly for the benefit of patients everywhere. Life Science is on track with the integration of Sigma-Aldrich and has continued along the path of science and technology leadership through its sustained investment and focus on its strategic initiatives of Gene Editing & Novel Modalities, which includes gene editing tools, viral and gene therapies, cellular therapies and RNA therapies, End-to-End Solutions for Bioprocessing and Connected Labs.

From now until 2022, we categorize our strategy as a period of growth and expansion, with all business sectors contributing to our growth ambition. In order to achieve our strategic ambition by 2022, we want to work on ensuring strong and innovative, specialty-focused pillars with strong positions in our priority growth areas, such as Oncology, Immuno-oncology and Immunology, Bioprocessing, and Semiconductor Solutions.

In more detail, it is our goal to continue to accelerate organic growth, expand our market footprint and sustain our leadership positions within our science and technology specialty areas. We have clearly defined goals, such as generating annual sales of at least € 2 billion by 2022 with products from our Healthcare R&D pipeline – products that we launched recently or expect to bring to market soon. In addition, we aim to double our Group sales in China. Healthcare shall contribute significantly to our growth ambition with the main drivers being new product launches and stable base business delivery. We expect Life Science to continuously target above-market growth with Process Solutions contributing significantly to this.

We expect the Performance Materials business sector to generate an EBITDA pre margin of around 30% after 2019. The business sector initiated the "Bright Future" transformation program. Besides the ambition to get back to organic top-line growth, the program focuses on resource allocation, process excellence and active portfolio management.

We aim to keep an attractive financial profile, regain our financial flexibility through stringent deleveraging and sustain our strong investment-grade rating. It is of utmost importance to us that we meet our obligations at all times through our diversified and profitable businesses as the basis for sustained cash flow generation. We are aiming to achieve sustained organic profitable growth, while targeted acquisition remains a growth option. We pursue a sustainable dividend policy. Provided that the economic environment develops in a stable manner, the current dividend represents the minimum level for future dividend proposals. In addition, our Group Strategy is always aimed at delivering our ambition of becoming the vibrant science and technology company, and be an innovation leader within our fields of activity. We will therefore strive to achieve our strategy by continuing to focus on our three core priorities: "Performance", "People" and "Technology".

Performance

Our priority area "Performance" includes all activities that create sustainable, profitable growth. We have defined a strategic roadmap until 2022 to meet our ambition. Our primary aim is to deliver accelerated profitable growth through sustained core business delivery and selective portfolio strengthening.

In Healthcare, a successful 2018 included our innovative product launches of Bavencio® and Mavenclad®, which together reached around € 160 million in sales in 2018. Our Healthcare core business has grown consistently for many quarters and we continue to diligently develop and manage our pipeline of innovative medicines. The 2018 news flow clearly shows that our pipeline contains highly attractive and innovative assets in key indications, in various stages of the clinical development process.

Going forward, in Healthcare, we will drive our positioning as a global specialty innovator by fully leveraging our pipeline potential. Here we aim to focus and prioritize development of key pipeline projects, deliver multiple study readouts in major tumor types and ensure a regular inflow of promising early-stage projects to ensure the long-term pipeline potential. We expect that our pipeline will continue to progress quickly. It therefore requires regular prioritization and de-risking decisions, with strategic partnerships and external financing being key. At the same time, it is our goal to continue to profitably deliver on our core business while further expanding our global reach.

In Life Science, we have achieved our € 280-million synergies target for 2018 and a net sales organic CAGR of around 6% since 2015, which is around 200 basis points (bps) above the market average – despite the integration of Sigma-Aldrich. Furthermore, we started various innovation projects to support our industry-leading growth and profitability in the future.

We are a highly differentiated leader, positioned for sustained and profitable growth, in Life Science. Working towards 2022, our strategy is to sustain above-market growth in our core businesses, with a focus on our leadership in Bioprocessing and delivering on our strategic initiatives such as End-to-End Bioprocessing and Gene Editing & Novel Modalities. The business sector will concentrate on advancing the already favorable portfolio mix with exposure to growth market segments, full operating leverage driving margin progression, ensuring that our strategic initiatives enable sustained above-market growth and making capacity investments that support industry growth dynamics.

Despite a decline in sales and profits at Performance Materials in 2018, we remain a market leader in this sector. In parallel we embarked on a transformation program to deliver on our strategy of becoming a leading electronics solutions provider and established a new R&D framework.

The focus of Performance Materials is on bringing the business back to a 2 – 3% organic sales growth trajectory from 2020 onwards, implementing our 5-year "Bright Future" transformation program and ensuring efficient resource allocation to foster the EBITDA pre margin of around 30%. We aim to further strengthen Performance Material's position as a leading electronics solutions provider, ensure a stronger focus on existing end market needs and implement a rigorous innovation and project prioritization process.

China is a major innovation hotspot and one of our strategically most important growth markets. Cornerstones of our strategy are further localization via our Healthcare and Life Science production sites in Nantong and the OLED application center in Shanghai, the engagement of key stakeholders in the local environment and tapping into the Chinese innovation ecosystem via our future innovation hubs in Shanghai and Guangzhou. The establishment of both these hubs is already well underway, with scheduled openings in the second half of 2019. Together they will create a strong platform for us and our partners to drive innovation, while also significantly contributing to the range of our activities and general footprint in China.

People

Our People Strategy aims at building the capability of the organization to shape the future and to address how we as a science and technology company can create a working environment that meets our employees' individual needs and allows curiosity to unfold. Our growth strategy calls for people with diverse experience and backgrounds who work together on the basis of shared values to create innovation and respond flexibly to changing demands.

Moreover, it is crucial to be perceived as an attractive employer in the market in order to continue to capture the interest of potential employees. The fact that we rank among the world's best employers was also confirmed by the distinction as "Global Top Employer 2018" by the Dutch Top Employers Institute. In addition, we were ranked fifth among employers worldwide in the field of biotechnology and pharmaceutics by Science magazine, a leading peer-reviewed international scientific publication.

Our leaders play a decisive role in our new "People Strategy". We aim to place next to our employees leaders who will develop them for future requirements, not just current needs, and foster the diversity and unique strengths within the organization. At the same time, we want the leadership style of our managers to enable strategic innovation. On top of this, we promote curious talents who can solve complex problems and are passionate about the work they do. We will also strengthen results-driven teams and networks by valuing team collaboration and providing flexible frames for teams and individuals to drive.

In this process, it is our goal to take data-driven decisions, both when hiring new members of staff and in the personnel development of employees (people analytics). Another element of this strategy is the promotion of diversity, with a special focus on women and talent in Asia, and the use of the unique strengths and understanding of key customers and markets that these employees bring. We have to value different perspectives and encourage constructive conflicts.

We place great importance on the continuous advanced training and further development of our managers. This is essential for them to address the diverse needs of their team members and the changing requirements of the businesses and of digitalization. Our leaders are responsible for pushing our strategy ahead by building up the right competences, thereby fostering innovation. As part of this, they take calculated risks, set clear and inspiring direction to their employees and provide the requisite structures and resources.

In the context of the "People Strategy" we also want to look at new forms of cooperation and experiment with methods that result in better decision-making. For example, pilot initiatives focus on expanding our "Science Network" further. Through this project we are promoting the establishment of a science community within the company to accelerate the exchange of innovative ideas and improve the collaboration between all employees in the Research and Development sector. In the Healthcare sector, we have begun to deepen the awareness of unbiased decision-making. We want to support leaders to help them reflect on their decision-making processes and take unbiased decisions.

Technology

Our priority area "Technology" is twofold. It is inherent in our business sectors through our innovations, product pipelines and digitalization strategies. In addition, the ways in which we address cross-sector innovations is reflected in our approach to potentially disruptive technologies. It covers the closely interlinked areas of innovation and digitalization. Developing and marketing innovative products and services are at the forefront of our Group strategy and all the business strategies. Our objective is to foster innovations both within the businesses and between them as well as beyond existing businesses into areas in which we are not yet active. In particular, we want to capture the opportunities that digitalization offers in order to create value for patients, customers and business associates. To us, digitalization means the digital integration of our entire value chain, the digitalization of our products, services and communication interfaces to customers as well as the development of new digital business models. This is supported by state-of the-art methods to collect and analyze vast amounts of data. Another example is Syntropy, our intended joint venture with Palantir Technologies to advance cancer research. Syntropy is expected to empower scientists and research centers with a collaborative technology platform to advance cancer research, help drive scientific discovery and improve human lives. Research institutions around the world are generating a rapidly growing amount of biomedical data, but much of it is trapped in silos within and between institutions. Today, this critical data is often inaccessible to the scientists and clinicians who need it to advance their work. Syntropy aims to unlock the value of this untapped data, enabling the world's leading experts to collaborate in the fight against cancer and many other diseases.

Furthermore, we opened our Innovation Center in Darmstadt as a Group-wide infrastructural commitment to our science- and technology-driven growth. The Innovation Center aims to develop entirely new businesses beyond the current spectrum as well as bring together people, scientific expertise, technologies and skills from different areas under one roof. Our cross- and beyond-sector innovation offers incremental and disruptive ideas and aims to keep us ahead of the game. We are focusing on our activities within three core innovation fields of interest: Liquid Biopsy, Clean Meat and Biosensing and Interfaces. With liquid biopsies, a variety of diseases can be diagnosed through the detection of biomarkers in body fluids. This could be a key technology for early disease detection and for expanding the delivery of precision medicine to more patients. The innovation field Clean Meat comprises technological innovations to meet the world's growing demand for protein- and nutrient-dense foods made by ethical, eco-friendly methods. The innovation field of Biosensing and Interfaces focuses on the integration of electronics with the human body to create a digital human/biological interface. This could enable faster and more accurate (remote) health monitoring and treatment.

Additionally we focus on disruptive innovation beyond our currently established business sectors. To achieve innovation success, we transform ideas into businesses through different pathways. They include M Ventures, our strategic corporate venture capital fund, with a total volume of € 300 million. M Ventures invests in promising start-ups and businesses within our core business areas and in innovations outside these areas by providing financial and/or strategic value. Furthermore, our Digital Office works to generate new digital business opportunities within our areas of expertise. It also supports the existing businesses in selecting digital projects where maximum value for our company can be generated. The Innovation Ecosystem is responsible for scouting, ideating and delivering new internal projects across and beyond our current scope.

The transformation of our company towards a science and technology company is evident at our Darmstadt site, which we are growing into a center of excellence for science and technology. Our largest site in the world already stands for excellent research and development as well as production that creates value. Darmstadt is the only site at which all three of our business sectors have a presence. In addition to being global Group headquarters, Darmstadt is home to our Executive Board and Group functions. At our new Innovation Center in Darmstadt, internal and external experts collaborate on identifying trends of significance to our business and markets as well as generating technology-driven growth going forward. All in all, this site offers a very good foundation for implementing our Group strategy successfully.

Business strategies

HEALTHCARE

Our Healthcare business sector comprises the Biopharma and Allergopharma businesses. Our businesses specialize in key franchises and specific diseases. Global megatrends such as a growing world population and an increase in average life expectancy continue to drive the demand for our healthcare products. To meet these demands and respond appropriately to the dynamics of our healthcare markets, we have significantly transformed our Healthcare business sector in recent years.

Following on from the successes over the past two years, we continue to drive pipeline projects with the aim of bringing groundbreaking medicines to patients, maximizing our existing portfolio and continuing our expansion in growth markets. The ambition of the Healthcare business sector is to become a global specialty innovator, operating in franchises with significant unmet medical need and

bringing high value to patients and consumers. Therefore, we continue to invest in research and development to discover new treatment options and improve existing ones. Together with our stakeholders and partners, we want to ensure that people can access the medicines they need to stay healthy and live longer.

The first pillar of our strategy is to reinforce our global footprint, e.g. bringing the innovation of our pipeline to patients and grow our presence in the United States and in China. The emerging markets and China are expected to be the largest growth driver for our established products in the future. Managing the balance between delivery of innovative medicines while expanding reach and ensuring profitable growth of the existing business will be one of the strategic challenges.

The second pillar of our strategy is the focus on specialty medicine franchises. Here, we expect oncology, immuno-oncology and immunology markets to remain highly attractive in terms of size, growth prospects, and profitability. Within each specialty franchise, our approach is to develop deep internal expertise and insight from internal research to commercialization, augmented by external talent sourcing, strategic partnering and asset acquisitions. Fertility and Endocrinology offer significant opportunities to bring value to patients, with high profitability and growth potential; maximizing the commercial potential of these areas will remain important.

The third pillar of our aspiration is innovation: to develop high-quality, first-to-market and best-in-class therapies, and to build a portfolio in each of our franchises. We have streamlined our pipeline and expanded our innovation capabilities with strong investigational drug candidates. In order to maximize the output of our R&D investments and increase our chances of success in discovering and developing new therapies, we focus our expertise on specific franchises and are exploiting synergies in disease mechanisms and biological pathways. We are investing in digital technologies as well as personalized and translational medicine in order to drive continued pipeline success.

In this context, strategic collaborations are an integral part of delivering on our commitment to transforming the lives of patients living with serious unmet medical needs. We recognize the value of collaboration in the research and development of breakthrough therapies, as well as in strengthening our current portfolio. Here, we focus on balancing the right blend of internal capabilities and external partnerships, building strong collaborations with other leaders in the industry.

On December 1, 2018, we announced the completion of the sale of our Consumer Health business to Procter & Gamble. The divestment of Consumer Health was aligned with our strategy of focusing on our pipeline of innovative medicines.

LIFE SCIENCE

Since closing the acquisition of Sigma-Aldrich, in November 2015, Life Science's organic sales growth has exceeded that of the industry and has remained the highest among integrated peers.

The Life Science business sector is executing an ambitious strategy to capture near-term opportunities and to invest for future growth. Our integration is on track, and we have consistently outperformed the market during the largest integration in our history and that of the industry.

Our aspiration remains to reinforce our leadership position as a tools and equipment supplier that is solving the toughest problems in life science. This has allowed us to achieve quality growth with a well-leveraged balance sheet.

To sustain our leadership for the future, Life Science has established a strategy based on three key pillars:

1. Ensure operational excellence by focusing on creating value, building a strong organization and implementing consistent processes
2. Strengthen the core organization by rejuvenating chemistry and reagents, expanding our leadership in bioprocessing, continuing to access new growth areas and strengthening our e-commerce platform to maintain our leadership position
3. Establish new growth pillars through our four strategic initiatives: Gene Editing & Novel Modalities, BioReliance® End-to-End Solutions, BioContinuum® Platform and BrightLab™.

We began the year 2018 with a recently signed commercial supply agreement to manufacture viral vectors for bluebird bio, Inc., of Cambridge (Massachusetts, United States), a clinical-stage company that develops potentially transformative gene and cell therapies for severe genetic diseases and T-cell-based immunotherapies for cancer. As part of the multi-year agreement, we will manufacture lentiviral vectors for bluebird bio's drug products developed to treat a variety of rare genetic diseases.

Throughout 2018, we streamlined our business through integrating strategic initiatives, such as single-use technologies for Bioprocessing, into the base business. We expanded our foundational intellectual property for our CRISPR technology with patents in key markets in Asia Pacific, the Middle East and Europe. We also expanded our business sector through the opening of new facilities throughout Asia and South America.

Looking ahead, we expect our strategy to continue to deliver net sales growth ahead of the market and maintain our market leading EBITDA pre margin. Our priorities for 2019 are to continue to support new growth pillars with our Gene Editing & Novel Modalities offerings, as well as differentiated gene editing tools, drug safety systems and models, and clinical viral manufacturing. In addition, we will further develop our BioReliance® End-to-End Solutions, a service offering for process development and manufacturing for emerging biotechs as well as our BioContinuum™ Platform, to address intensified bioprocessing and continuous manufacturing. We will also focus on expanding the use of BrightLab™, our digital ecosystem for complete lab management.

PERFORMANCE MATERIALS

Performance Materials targets attractive end markets that are driven by megatrends: digitalization, urbanization, mobility and affluency will drive advanced electronic systems with semiconductors at their heart. As a result, electronics demand is expected to grow for the foreseeable future. Roughly 80% of our sales are currently linked to the electronics market, which of course includes our Semiconductor Solutions and Display Solutions business units, but also parts of Surface Solutions.

The remaining 20% of our sales relate to the automotive and cosmetics market served by Surface Solutions. We expect demand in these segments to likewise benefit from global trends such as increasing affluency in developing countries.

Within the electronics market, we are active in the field of semiconductor and display solutions, targeting a material market of about € 85 billion. We are already one of the largest players in this field, while operating in selected and highly attractive market segments. In coming years, we expect that the market for liquid crystal materials for TVs – still our largest business and one of the most attractive – will continue to decline. For us, after 2019, this development is expected to be more than offset by growth in OLED materials and photoresists as well as in semiconductor materials and our solutions for surfaces. As a result, we want to achieve an attractive average sales growth of 2 – 3% after 2019 and to generate EBITDA pre margins of around 30%, substantially above the specialty chemicals industry average.

We have a solid foundation: a strong global customer network, a proven track record of delivering high-tech solutions, an efficient production infrastructure and the highest quality standards throughout the industry. Our innovative solutions allow us to establish intimate and long-term customer relationships, and understand the changing requirements of end customers in markets as diverse as consumer electronics, automotive and cosmetics.

The market segments we operate in represent a well-balanced mix of new and fast-growing areas (such as deposition materials in Semiconductor Solutions or OLED materials in Display Solutions), but also more mature segments where we have established ourselves as the clear market leader (liquid crystals for Display Solutions, for example, or pearlescent pigments used for coatings).

Our priorities are:

- Focus on the attractive electronics market to achieve long-term organic growth perspective of 2 – 3% per year (CAGR)
- Allocate our resources more efficiently to maintain an above-industry EBITDA pre margin of around 30%
- Actively manage our portfolio and expand our partnership network
- Foster our customer-centric orientation with an integrated R&D approach to better serve market and customer needs

Strategic finance and dividend policy

We are pursuing a conservative financial policy characterized by the following aspects:

FINANCIAL FLEXIBILITY AND A CONSERVATIVE FUNDING STRATEGY

We ensure that we can fulfill our obligations at all times. In this context, we pursue a conservative, proactive financing strategy in which we deploy a variety of financial instruments. We have diversified and profitable business activities as the basis for our strong and sustainable cash flow generation capacity. In addition, we have several sources of financing, including a € 2 billion syndicated loan facility that was renewed in 2018 and is in place until 2023 to cover any unexpected cash needs. The facility is a pure back-up credit facility and has not been drawn on so far. In addition, we have a commercial paper program with a volume of € 2 billion at our disposal. Within the scope of this program, we can issue short-term commercial paper with a maturity of up to one year. Furthermore, in 2018 we used bilateral bank loan agreements with first-class banks in order to optimize the funding structure and cost.

The bond market additionally represents a key source of financing. The most recent bond issues took place in 2014 and 2015 in connection with the acquisition of Sigma-Aldrich. They have terms that run to 2025, with the first redemption options for hybrid bonds in 2021 and 2024. The use of various instruments provides a broad financing basis and addresses different investor groups.

MAINTAINING SUSTAINABLE AND RELIABLE BUSINESS RELATIONS WITH A CORE GROUP OF BANKS

We mainly work with a well-diversified, financially stable and reliable group of banks. Due to our long-term-oriented business approach, bank relationships typically last for many years and are characterized by professionalism and trust. The banking group consists of banks with strong capabilities and expertise in various products and geographic regions. We regard these banks as strategic partners. Accordingly, we involve them in important financing transactions.

STRONG INVESTMENT-GRADE RATING

The rating of our creditworthiness by external rating agencies is an important indicator of the company's financial stability. A strong investment-grade rating is an important cornerstone of our financial policy, as it safeguards access to capital markets at attractive financial conditions. Our company currently has a Baa1 rating from Moody's, an A rating from Standard & Poor's (S&P), and an A– rating from Scope, each with a stable outlook.

DIVIDEND POLICY

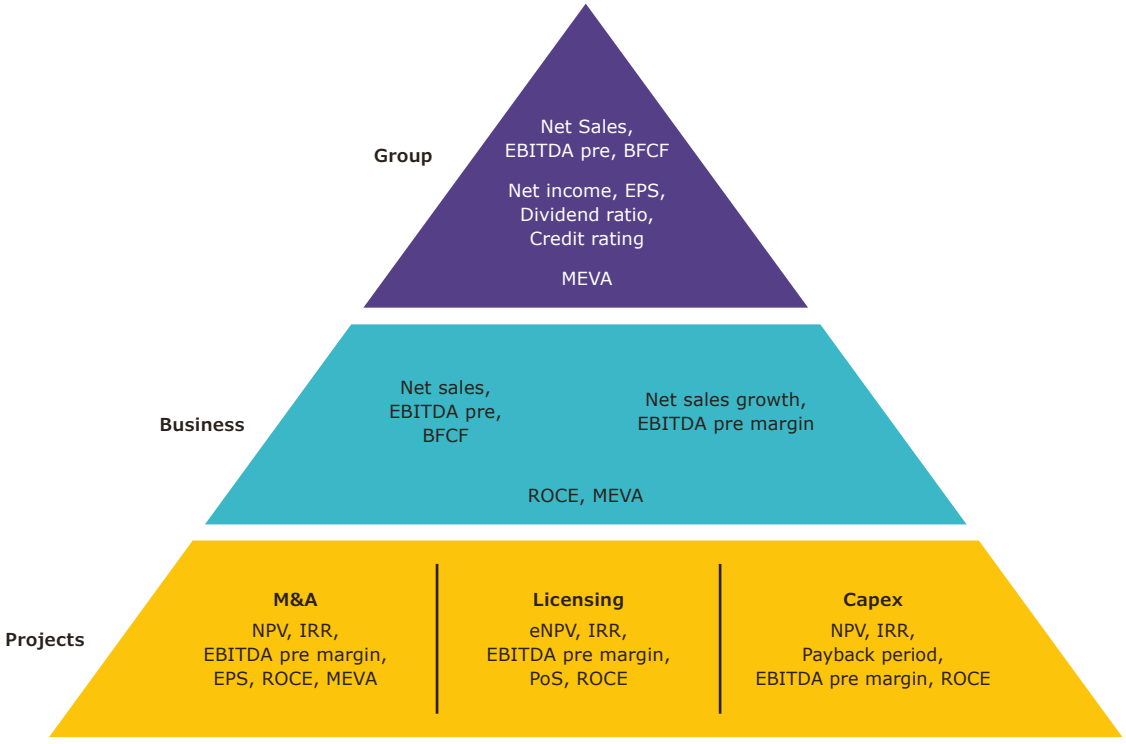
We are pursuing a sustainable dividend policy. Provided that the economic environment develops in a stable manner, the current dividend represents the minimum level for future dividend proposals.

The dividend policy is oriented towards the business development and earnings increase of the coming years. However, dividend growth could deviate, for example, within the scope of restructuring or in the event of significant global economic developments. We aim for a target corridor of 20% to 25% of earnings per share pre.

Internal Management System

As a global company with a diverse portfolio of products and services, we use a comprehensive framework of indicators to manage performance. The most important KPI (key performance indicator) to measure performance is EBITDA pre[1].

The Value Creation and Financial KPI Pyramid, which summarizes the important financial performance measures of the Group, reflects the comprehensive framework of financial KPIs to steer the businesses and prioritize the allocation of cash resources. It consists of three managerial dimensions, namely Group, Business and Projects, each of which require the use of different indicators.



Abbreviations

EBITDA pre[1] = Earnings before interest, income tax, depreciation and amortization as well as adjustments
EPS = Earnings per share
MEVA[1] = Value added of Merck KGaA, Darmstadt, Germany
BFCF[1] = Business free cash flow
ROCE[1] = Return on capital employed
NPV[1] = Net present value
IRR[1] = Internal rate of return
eNPV[1] = expected Net present value
PoS[1] = Probability of success
M&A = Mergers & Acquisitions

[1] Not defined by International Financial Reporting Standards (IFRSs).

Key performance indicators of the Group and its businesses

The three key performance indicators of net sales, EBITDA pre and business free cash flow are the most important factors for assessing operational performance. Therefore, we refer to these KPIs in the Report on Economic Position, the Report on Risks and Opportunities, and in the Report on Expected Developments. As the most important indicators of financial business performance, the KPIs are key elements of our performance management system.

NET SALES

Net sales are defined as the revenues from the sale of goods, services rendered to external customers, commission income and profit-sharing from collaborations, net of value added tax and after sales deductions such as rebates or discounts. Net sales are the main indicator of our business growth and therefore an important parameter of external as well as internal performance measurement. In addition, acquisition- and currency-adjusted sales are used for internal performance management. Organic sales growth shows the percentage change in net sales versus a comparative period, adjusted for exchange rate and portfolio effects. Exchange rate effects may arise as a result of foreign exchange fluctuation between the functional non-euro currency of a consolidated company and the reporting currency (euro). By contrast, portfolio effects reflect sales changes due to acquisitions and divestments of consolidated companies or businesses.

GROUP

Net sales[1]

			Change	
€ million	**2018**	2017	€ million	in %
Net sales	**14,836**	**14,517**	**319**	**2.2%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

EBITDA PRE

EBITDA pre is the main performance indicator measuring ongoing operational profitability and is used internally and externally. To provide an alternative understanding of the underlying operational performance, it excludes from the operating result depreciation and amortization, impairment losses and reversals of impairment losses as well as adjustments. These adjustments are restricted to the following categories: integration expenses, IT expenses for selected projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses, and other adjustments. The classification of specific income and expenses as adjustments follows clear rules and underlies strict governance at Group level. Within the scope of internal performance management, EBITDA pre allows for the necessary changes or restructuring without penalizing the performance of the operating business.

GROUP

Reconciliation EBIT to EBITDA pre[1,2]

			Change	
€ million	**2018**	2017	€ million	in %
Operating result (EBIT)[2]	**1,727**	**2,423**	**–696**	**–28.7%**
Depreciation and amortization	1,743	1,742	1	–
Impairment losses/reversals of impairment losses	58	–1	58	>100.0%
EBITDA[2]	**3,528**	**4,164**	**–636**	**–15.3%**
Restructuring expenses	46	61	–15	–24.6%
Integration expenses/IT expenses	142	188	–46	–24.4%
Gains (–)/losses (+) on the divestment of businesses	25	–310	335	>100.0%
Acquisition-related adjustments	2	63	–61	–97.2%
Other adjustments	58	81	–23	–28.1%
EBITDA pre[2]	**3,800**	**4,246**	**–446**	**–10.5%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

BUSINESS FREE CASH FLOW (BFCF)

Business free cash flow comprises the major cash-relevant items that the operating businesses can influence and are under their full control. It comprises EBITDA pre less investments in property, plant and equipment, software, advance payments for intangible assets, changes in inventories, trade accounts receivable as well as receivables from royalties and licenses. To manage working capital on a regional and local level, the businesses use the two indicators days sales outstanding and days in inventory.

GROUP

Business free cash flow[1,2]

			Change	
€ million	**2018**	2017	€ million	in %
EBITDA pre[2]	**3,800**	**4,246**	**–446**	**–10.5%**
Investments in property, plant and equipment as well as software and advance payments for intangible assets	–932	–1,012	80	–7.9%
Changes in inventories	–214	–18	–197	>100.0%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–145	–22	–123	>100.0%
Elimination first-time consolidation of BioControl Systems	–	–2	2	–
Business free cash flow[2]	**2,508**	**3,193**	**–685**	**–21.4%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

Investments and value management

Sustainable value creation is essential to secure the long-term success of the company. To optimize the allocation of financial resources, we use a defined set of parameters as criteria for the prioritization of investment opportunities and portfolio decisions.

NET PRESENT VALUE

The main criterion for the prioritization of investment opportunities is net present value. It is based on the discounted cash flow method and is calculated as the sum of the discounted free cash flows over the projection period of a project. The weighted average cost of capital (WACC), representing the weighted average of the cost of equity and cost of debt, is used as the discount rate. Depending on the type and location of a project, different mark-ups are applied to the WACC.

INTERNAL RATE OF RETURN (IRR)

The internal rate of return is a further important criterion for the assessment of acquisition projects and investments in property, plant and equipment as well as intangible assets. It is the discount rate that makes the present value of all future free cash flows equal to the initial investment or the purchase price of an acquisition. A project adds value if the internal rate of return is higher than the weighted cost of capital including mark-ups.

RETURN ON CAPITAL EMPLOYED (ROCE)

In addition to NPV and IRR, when looking at individual accounting periods, ROCE is an important metric for the assessment of investment projects. It is calculated as the adjusted operating result (EBIT) pre divided by the sum of property, plant and equipment, intangible assets, trade accounts receivable and trade accounts payable, as well as inventories.

PAYBACK PERIOD

An additional parameter to prioritize investments in property, plant and equipment as well as intangible assets is the payback period, which indicates the time in years after which an investment will generate positive net cash flow.

VALUE ADDED OF MERCK KGAA, DARMSTADT, GERMANY (MEVA)

MEVA gives information about the financial value created in a period. Value is created when the return on capital employed (ROCE) of the company or the business is higher than the weighted average cost of capital (WACC). MEVA metrics provide us with a powerful tool to weigh investment and spending decisions against capital requirements and investors' expectations.

Capital market-related parameters

NET INCOME, EARNINGS PER SHARE (EPS) AND EARNINGS PER SHARE PRE (EPS PRE)[1]

Earnings per share are calculated by dividing profit after tax attributable to the shareholders of Merck KGaA, Darmstadt, Germany, (net income) by the weighted average number of theoretical shares outstanding. The use of a theoretical number of shares takes into account the fact that the general partner's capital is not represented by shares. To provide an alternative view, we also report earnings per share pre, in other words after the elimination of the effects of integration expenses, IT expenses for selected projects, restructuring expenses, gains/losses on the divestment of businesses, acquisition expenses and other adjustments. Moreover, amortization of acquired intangible assets as well as impairment losses on property, plant and equipment and intangible assets are eliminated. The adjustment excludes impairment losses on intangible assets for acquired research and development (R&D) projects below a threshold value of € 50 million. Income tax is calculated on the basis of the company's underlying tax rate. The following table presents the reconciliation of net income to net income pre for the calculation of EPS pre.

RECONCILIATION OF NET INCOME TO NET INCOME PRE[1, 2]

			Change	
€ million	**2018**	2017	€ million	in %
Net income	**3,374**	**2,605**	**769**	**29.5%**
Non-controlling interests	22	10	12	>100.0%
Profit after tax from discontinued operation	−2,303	−57	−2,246	>100.0%
Income tax	368	−428	796	>100.0%
Amortization of acquired intangible assets	1,175	1,198	−23	−1.9%
Adjustments[2]	327	64	264	>100.0%
Income taxes on the basis of the underlying tax rate[2]	−741	−814	73	−9.0%
Non-controlling interests to be adjusted	−3	−3	–	0.4%
Net income pre[2]	**2,219**	**2,574**	**−355**	**−13.8%**
Earnings per share pre[2] (in €)	**5.10**	**5.92**	**−0.82**	**−13.9%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

CREDIT RATING

The rating of our creditworthiness by external agencies is an important indicator with respect to our ability to raise debt capital at attractive market conditions. The capital market makes use of the assessments published by independent rating agencies in order to assist debt providers in estimating the risks associated with a financial instrument. We are currently assessed by Moody's, Standard & Poor's and Scope. The most important factor for the credit rating is the ability to repay debt, which is determined in particular by the ratio of operating cash flow to net financial debt.

DIVIDEND RATIO

With the aim of ensuring an attractive return for our shareholders, we are pursuing a reliable dividend policy with a target payout ratio based on EPS pre (see definition above).

Other relevant/non-financial performance measures

Apart from the indicators of the financial performance of the businesses, non-financial measures also play an important role in furthering the success of the company. From a Group perspective, specifically innovations in the businesses as well as the attraction and retention of highly qualified employees are of central importance.

INNOVATION

Innovations are the foundation of our business and will also be the prerequisite for future success in changing markets. We are continuously working to develop new products and service innovations for patients and customers. Indicators for the degree of innovation are defined individually depending on the specifics of the respective businesses.

TALENT RETENTION

Employing a highly qualified and motivated workforce is the basis for achieving our ambitious business goals. Therefore, we put a strong focus on establishing the processes and the environment needed to attract and retain the right talent with the right capabilities at the right time. To measure the success of the related measures, we have implemented talent retention as an important non-financial indicator.

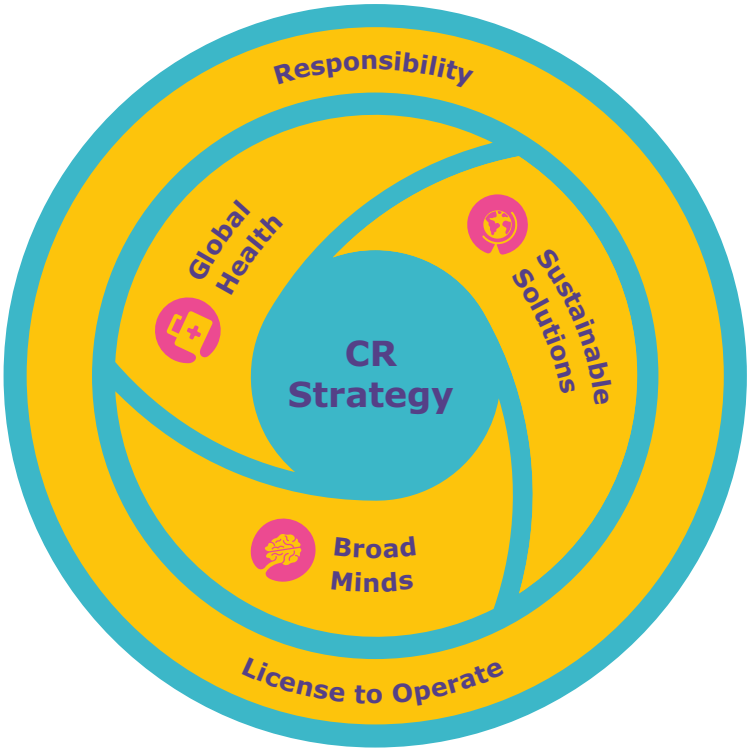
Corporate Responsibility

We take responsibility every day – and have been doing so for 350 years. This commitment is codified in our corporate strategy and values. Responsible conduct with respect to employees, products, the environment and society is a fundamental prerequisite for our business success.

Strategy and Management

Our corporate responsibility (CR) activities are steered by our CR Committee, which consists of representatives from our business sectors and relevant Group functions. The Chairman of the Executive Board and CEO is responsible for the committee, which is chaired by the head of the Group Corporate Responsibility unit.

Humankind is being confronted with global societal challenges such as climate change, resource scarcity and insufficient access to healthcare in low- and middle-income countries. Responsible governance can help solve these global issues. We believe that in pursuing this approach, we can also strengthen our financial performance. In 2018, we strategically repositioned ourselves: We focus even more on creating sustainable value for both our company and society. To achieve this, we are taking a shared value approach. We have adapted our three strategic spheres of activity to bring them more in line with our business. These spheres are organized under the headings of "Global Health", "Sustainable Solutions" and "Broad Minds". We focus our resources on those areas where we can have the greatest impact. The effects our actions have on society – such as the development of new products – should be considered strategically in their own right. Needless to say, we respect the interests of our employees, customers, investors and the community, and work to minimize ethical, economic and social risks, thereby sustainably contributing to our long-term corporate success.

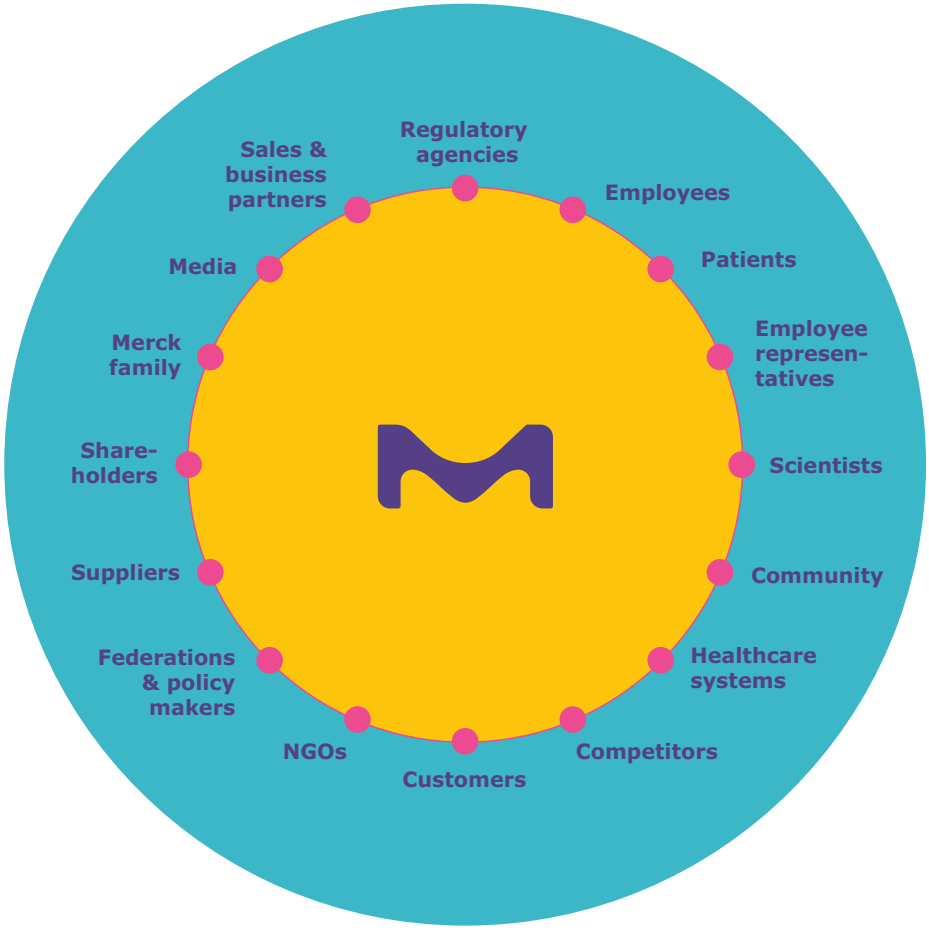


Global Health: In low- and middle-income countries, many people lack access to high-quality health solutions. We join forces with partners to provide local solutions and develop treatments for neglected tropical diseases in Africa. For instance, we are using praziquantel tablets to fight schistosomiasis. Through our Global Health Institute, we are developing diagnostics, therapies and preventive solutions to address infectious diseases such as malaria and therapeutic challenges such as antimicrobial resistance.

Sustainable Solutions: We are constantly working to improve the sustainability footprint of our products – even during their use phase – which also helps our customers achieve their own sustainability goals. To this end, we have established systematic approaches for product development such as Design for Sustainability, a program within our Life Science business sector that allows us to assess the sustainability of our products during development. Product developers use various tools, such as product lifecycle analyses.

Broad Minds: As a science and technology company, we endeavor to excite people about science, inspire curiosity and help creativity to soar. Our goal is to strengthen our reputation in the field of science, especially in those areas where we have particular expertise. We not only support educational programs for schools, but also back pioneering research at institutes of higher learning. Reflecting the way that music and literature inspire people, we promote a range of cultural initiatives worldwide. Creativity and curiosity are the bedrock of science, culture and art, and also underpin our holistic approach.

Our corporate responsibility efforts are aligned with the United Nations (UN) Sustainable Development Goals (SDGs), and we are working to help achieve this ambitious agenda by 2030. In addition to promoting the SDGs, we also support relevant responsible governance initiatives. Through our membership in the UN Global Compact we are committed to upholding the Compact's principles on human rights, labor standards, environmental protection and anti-corruption. We ensure that we live our own corporate responsibility



principles by following the guidelines of the Responsible Care Global Charter, which is an initiative of the International Council of Chemical Associations (ICCA). Responsible Care aims to help the chemical industry enhance its environmental, health and safety performance. We are also a member of the Chemie[3] initiative in Germany, a collaboration between the German Chemical Industry Association (VCI), the German Employers' Federation of the Chemical Industry (BAVC) and the German Mining, Chemical and Energy Industrial Union (IG BCE). This globally unique alliance seeks to make sustainability a core part of the chemical industry's guiding principles and to drive the sector's position within the German economy as a key contributor to sustainable development.

To us, corporate responsibility means listening and taking action, and so we place great importance on dialogue with our various stakeholders. These stakeholders include employees, business associates, the Merck family, investors, regulatory agencies and industry associations. This continuous exchange creates transparency and clearly demonstrates how we live our values. In recognition of our dedication to responsible and sustainable business practices, we were again listed on the FTSE4Good index in 2018. Inclusion in this leading international sustainability index is only possible if a company meets stringent social, environmental and ethical behavior criteria.

Our good standing in other major sustainability indices was also maintained in 2018, with our inclusion in the STOXX Global ESG Leaders index, the Euronext Vigeo Eurozone 120 index and the Ethibel Sustainability Index (ESI) Excellence Europe. In early 2019, EcoVadis, an independent rating agency, granted us Gold status for our sustainability performance. EcoVadis assesses around 45,000 suppliers from 150 countries across the four categories of Environment, Social, Ethics and Sustainable Procurement.

Strategic sphere of activity: Global Health

Our aim is to create a healthier future for all: for individuals, communities and countries. We want to use innovation in science and technology to improve the health of underserved populations in low- and middle-income countries. To achieve this, we are leveraging our expertise from all business sectors and collaborating closely with a wide range of partners. We also participate in industry-wide initiatives and work closely with other businesses to develop new approaches.

In 2018, we refined our strategy for addressing the global needs that impact access to healthcare. Our strategy is designed to overcome barriers to access for underserved populations and communities in developing countries in a business-integrated and sustainable manner, thereby creating "shared value". For us, creating shared value means developing business models that increase the value and competitiveness of our company and at the same time solve unmet health needs and bring value to underserved populations. We want to be instrumental in the elimination of schistosomiasis and fight malaria and other infectious diseases while helping to build local capacity across the value chain and positioning our company as a leading and reliable partner.

The 2018 Access to Medicine Index continues to rank us in fourth place. Every two years, this index assesses the world's leading pharmaceutical companies on activities and initiatives they have implemented to promote access to medicine in developing countries. We received particular recognition for leading practices such as establishing our Global Health Institute to accelerate research and development (R&D) targeting schistosomiasis, malaria and bacterial infections, strengthening commitment to open innovation and establishing the Capacity Advancement Program to improve access to better diabetes, cancer, hypertension and fertility therapies in underserved regions.

Strengthen the availability of healthcare solutions

We research, develop and refine healthcare solutions that address unmet needs, tailoring them to local environments. With our Global Health Institute, we have defined a comprehensive portfolio of R&D projects to develop integrated health solutions. This includes treatments, diagnostics, preventive measures against infections and approaches to strengthen health systems, targeting schistosomiasis, malaria and bacterial infections. The Institute operates as a social business enterprise delivering innovations for the most vulnerable – with a special focus on women and children in the developing world.

This portfolio also includes the development of a new pediatric formulation of praziquantel to treat the worm disease schistosomiasis in children under the age of six, through the Pediatric Praziquantel Consortium, which is a public-private partnership. Marketing Authorization Application is planned for 2020, and we expect the product to be ready to launch in the first endemic countries in Africa in 2021.

For malaria, we are completing the Phase I/Ib clinical activities of our anti-malarial compound, which has the clear potential to treat and prevent malaria. In the drug discovery area, our strategic collaboration with the University of Cape Town in South Africa has led a new research and development platform. In 2018, this collaboration (including Medicines for Malaria Venture) was extended to continue screening activities with the aim of identifying new therapeutic solutions while building up research capacity in and for Africa. This program continues to leverage our proprietary chemical library of almost 100,000 compounds to identify new lead programs for the treatment of malaria. The program is co-funded by the German Federal Ministry of Education and Research.

We have developed a kit for malaria diagnosis based on our Muse® cell analyzer. It aims to accurately diagnose malaria and measure the type of malaria parasite as well as the infection level. The malaria kit was launched for research use in 2018. At the end of 2018, we divested the technology platform developed by our Life Science business sector to the U.S. laboratory supplier Luminex, which is now marketing the diagnostic kit.

Additionally, we are working towards demonstrating the efficacy of our product IR3535® for malaria prevention in Africa. The insect

repellent is already used for complementary prevention from vector-borne diseases, such as dengue fever or ZIKA. Products containing this active ingredient stand out due to their particularly good tolerance in young children and pregnant women. In 2018, we entered a collaboration to support the National Malaria Control Program in Ghana. Here we develop malaria prevention solutions based on IR3535®.

Address affordability challenges

Through intellectual property initiatives and equitable pricing strategies we are able to provide assistance to those people who are unable to pay for the health solutions they need. Publicly available databases enable us to be transparent about our patents and patent applications. To strengthen our commitment to the London Declaration to fight neglected tropical diseases, we formed a partnership with the Drugs for Neglected Diseases initiative (DNDi), under which we are involved in the Drug Discovery Booster project for neglected tropical diseases. The objective is to find potential cures for leishmaniasis and Chagas disease.

As one of more than 100 members of WIPO Re:Search, an open innovation platform sponsored by the World Intellectual Property Organization (WIPO), we share intellectual property and knowledge with the aim of accelerating early discovery for infectious diseases. Through WIPO we are collaborating with the University of Buea (Cameroon) and University of California San Diego (United States) to find potential cures for onchocerciasis, leishmaniasis, Chagas disease and African trypanosomiasis (sleeping sickness).

We continue to work with the World Health Organization (WHO) to combat the worm disease schistosomiasis in Africa. In 2018, we donated approximately 200 million praziquantel tablets for distribution in 34 African countries, and this year our donation program was expanded to include Burkina Faso, Niger and Sierra Leone. We keep production capacities at a level sufficient for manufacturing 250 million tablets a year. Since 2007 we have supplied almost 900 million tablets free of charge, which is equivalent to the treatment of around 360 million schoolchildren. As a founding member of the Global Schistosomiasis Alliance, we are helping to eliminate schistosomiasis worldwide.

Raising awareness

Health professionals, communities and patients are empowered through access to the appropriate tools, knowledge and skills to help them make informed decisions about prevention, diagnostics, treatment and care. Our regular campaigns help to increase awareness of certain diseases globally, with a focus on those diseases where we have extensive expertise, such as cancer, thyroid disorders, diabetes and multiple sclerosis. In addition, we have championed World Malaria Day with awareness campaigns and through engagement around the We for Malaria program. In 2018, we hosted events in Ghana that created the opportunity for collaborations in research and business activities to tackle preventive methods against malaria. Via our charitable organization, we bring together some of our activities in underserved regions of the world. Our Access Dialogues series promote discussion with numerous public and private stakeholders on access-to-healthcare challenges. Dialogues in 2018 covered the topics of innovation and intellectual property as well as supply chain and delivery.

A schistosomiasis health education project in Ethiopia was launched jointly with the NALA Foundation at the end of 2017, with the aim of promoting the long-term behavioral change that is needed to eliminate schistosomiasis. The project targets a rural area in Ethiopia, focusing on approximately 260,000 students in 290 schools through activities such as distribution of customized educational material. In 2018, we reached 74 schools with nearly 70,000 students. The goal is to extend this model to other regions in Africa.

The Global Pharma Health Fund (GPHF), a non-profit organization funded by our company, works to combat falsified medicines in developing and emerging countries. To date, the GPHF has supplied 843 Minilabs at cost to detect falsified medicines in around 100 countries. In 2018, the GPHF developed testing methods for five additional active ingredients so that the Minilab can now test 90 active ingredients, ranging from antimalarials, antimycobacterials and antivirals to antipyretics and antibiotics.

Promoting accessibility and improving supply chains

We promote initiatives to strengthen supply chains and to develop localized health solutions in order to deliver and reach out efficiently at the point of care. We are a founding member of the Accessibility Platform, an informal, private-sector initiative that is working on a comprehensive approach to meeting supply chain and distribution challenges in developing countries. The platform promotes information exchanges between the various stakeholders and creates joint options for action.

NTDeliver is our digital information tool, which facilitates transparency in supply chains for medicine donations. Deliveries from companies running donation programs are clearly displayed – from purchase orders made by the WHO through to delivery to the first warehouse in the destination country. This improves coordination and provides a more transparent overview of the in-country inventory. Following a pilot in 2017, we carried out two implementation rounds in 2018, including using NTDeliver last mile tracking as a standard reporting tool in the school-based schistosomiasis program in Kenya. The system is collecting and consolidating field information and has helped us to reach out to more than 12,000 teachers throughout Kenya.

In 2018, we started the CURAFA™ project as part of our vision to improve primary healthcare for everyone everywhere. So-called CURAFA™ points of care for integrated primary healthcare services are run by local pharmacists and nurses, who provide pharmaceutical and clinical services, medicine, digital health solutions, and insurance and financing schemes. The project was implemented in collaboration with the non-governmental organization Amref Health Africa. We rolled out five primary healthcare points in Kenya during 2018.

Strategic sphere of activity: Sustainable Solutions

Through our products, we are helping overcome global challenges such as climate impact and resource scarcity. In doing so, we are also supporting our customers in reducing the impacts of their own activities and achieving their own sustainability goals.

Life Science: reducing environmental impacts throughout the product life cycle

It is important to us that we improve the environmental impact of our products. This applies to the entire life cycle – from production and use through to the disposal of our products. With our Design for Sustainability (DfS) program, we have developed a comprehensive approach for more sustainable life science products. This keeps sustainability criteria in the foreground during product development or re-engineering, and documents them in a scorecard. When developing a new product, our aim is to improve on as many of these criteria scores as possible. The objective is to lower environmental impacts of devices and instruments, also during use by customers. Beginning with the concept stage, product teams identify potential environmental impacts and opportunities to make improvements. By the end of 2018, 27% of these product development projects met three or more sustainability criteria.

In addition, our researchers are developing innovative solutions in line with the "12 Principles of Green Chemistry" developed by chemists Paul T. Anastas and John C. Warner. The objective is to permit research that is as environmentally compatible as possible, and to minimize adverse effects on human health. More than 750 greener alternatives to conventional products are available so far. With DOZN®, we have developed a web-based quantitative Green Chemistry analysis tool. To date, we have used this matrix to assess and improve more than 40 products. It is our goal to make this system available to our customers in 2019, so that they can measure the environmental impact of their research and make more environmentally conscious decisions.

We are expanding our portfolio to include greener alternatives, such as the new bio-based solvent, Cyrene™, which is derived from waste cellulose and is employed as an alternative to solvents that are widely used but are under increasing regulatory restriction due to their associated toxicity.

The focus is not just on the current life of our products, as we also look ahead to end-of-life considerations and potential future product lives as well. The application of single-use products – many of which pose a challenge to recycle in the current infrastructure – is growing as life science markets are expanding and adopting new technologies. We have therefore developed innovative recycling programs, which led to the recycling of more than 2,738 metric tons of our customers' products from 2015 to 2018.

Performance Materials: increasing the sustainability of manufacturing processes and end products

In 2018, our Performance Materials launched the new liquid crystal technology SA-VA (Self-Aligned Vertical Alignment). We have been developing the materials and process in the scope of close technical partnerships with our customers. SA-VA is an eco-friendly and resource-conserving technology that requires less energy and creates fewer waste products than conventional technologies during display manufacture. SA-VA also provides a more efficient display manufacturing process. Since SA-VA technology can be applied at lower temperatures, it is also suitable for sensitive materials such as those used in premium products, or for forward-looking applications such as flexible displays.

Organic light-emitting diodes (OLEDs) likewise increase the energy efficiency of displays while also providing brilliant colors and razor-sharp images. To further enable unique display applications and efficient production of large-area OLED displays, we are developing high-performance OLED materials for vacuum evaporation methods or printing processes.

To utilize our market and technological leadership in liquid crystals beyond applications in energy-saving displays, we started manufacturing liquid crystal window modules at a new site in Veldhoven (Netherlands). According to initial measurement results, our smart windows can cut energy use in climate-controlled buildings by up to 40% and replace conventional sun shading solutions. In this way, we help builders to save resources and costs. These windows can be manually or automatically controlled to darken and provide sun protection or can create privacy by switching from transparent to opaque. In contrast to competing technologies, our newly branded Eyrise™ products switch within seconds and are highly color-neutral. Architects and builders can customize the desired color to suit the setting. In response to market demand, we have prioritized solar control during 2018, and we have three sophisticated architectural projects in the pipeline. We were able to realize the first commercial project in October 2018: large solar control windows for the company Orkla in Oslo (Norway). Furthermore, we presented a selection of these innovative architectural solutions at the trade fair "BAU 2019", where we focused on our eyrise™ technology. Among other things, we showed an iconic building design by renowned Brazilian architect Oscar Niemeyer. The building is currently being constructed for the company Kirow Ardelt in Leipzig (Germany).

For the semiconductor industry, we have developed a series of environmentally sustainable specialty chemicals and materials – including PFOS-free antireflective and photoresist coatings.

In the cosmetics industry, we are addressing the continuing trend for ingredients that meet stringent sustainability criteria. Our portfolio of fillers eliminates the need for microplastic particles that are heavily criticized for polluting waters and damaging marine life. We are also committed to continuously increasing the energy efficiency of our production processes. Our cosmetic formulations comply with strict criteria. By the end of 2018, 68 of our cosmetic pigments and active ingredients were certified according to Ecocert's COSMOS standard for organic and natural cosmetics.

Strategic sphere of activity: Broad Minds

The promotion of science, education and culture in an integrated manner constitutes one of the central concerns of our engagement in society. This is in line with our 350-year tradition of advancing art and culture. In this way we champion characteristics that are indispensable for our business activities as a high-tech company: creativity, the passion for new discoveries and curiosity, together with the courage to transcend boundaries.

Boosting scientific education

We view education as a key component of culture – and vice versa. Education can help us understand culture. But culture can also build a bridge to education; it can stimulate curiosity and creativity. We therefore support educational projects at many of our sites and grant scholarships, for instance, or help define the curricula of selected classes in schools. We want to spark an interest in science, particularly among young people. This is why we have been supporting the "Jugend forscht" (Young Researchers) competition for more than 35 years. Since 1996, we have been organizing the state-level competition for the German Federal State of Hesse. In 2018, we hosted the nationals for the third time.

Through our Junior Labs, we want young people to enjoy conducting experiments. These learnings labs at the Technical University of Darmstadt combine classroom instruction with trending topics and modern research methods. In 2018, around 2,500 school students used the chemistry laboratory and around 1,000 school students experimented in the biology laboratory.

In 2017, we launched a pilot project for the continuing education of teachers in order to transfer our commitment to STEM education in an international context for the first time. We started in India, followed by projects in Chile, Kenya and Tanzania in 2018. By the end of the year, we had trained almost 100 teachers who act as multipliers and will reach thousands of school students.

As part of SPARK, our global volunteer program, employees from our Life Science business sector share their skills and experience with students and support our local communities. The program is intended to spark curiosity in science and inspire students to consider a STEM-related career. In 2018, over 2,800 employees invested more than 19,000 hours in the program, reaching over 66,000 young people. As part of SPARK, in 2018 we once again sent our Curiosity Cube™ on a journey through the United States and Canada. This is a freight container that transforms into a mobile laboratory and is equipped with state-of-the-art technology. Directed by our employees, school students can use it to carry out scientific experiments. In 2018, the Cube traveled approximately 30,000 kilometers across the United States and engaged students in 108 communities. 94% of schools visited fall under the "Title 1" category, where students mainly come from low-income backgrounds.

The Deutsche Philharmonie, sponsored by Merck KGaA, Darmstadt, Germany

The Deutsche Philharmonie, sponsored by Merck KGaA, Darmstadt, Germany, is our musical ambassador. We consider classical music to be the universal language that brings people together; as such, it is an important part of our culture. The concerts of this professional ensemble represent an integral part of the cultural life in the vicinity of our Group headquarters in Darmstadt and remain highly popular, with around 31,000 people attending them in 2018. In the orchestra workshop, children and young people gained their first experience in a professional orchestra. We also fostered enthusiasm for classical music among young people through seat cushion concerts for children aged four years and above as well as through youth concerts. In addition, the orchestra again toured internationally. Concerts took place in Austria, the United States and China in 2018. In Beijing, the musicians held an orchestra workshop with music students at the local university. The subsequent concert in front of an audience of around 1,700 was a huge joint success.

Promoting literature

Like music, literature is an important mediator between cultures. That is why we support five literary prizes around the world. The awards primarily recognize those authors who build bridges between cultures, as well as between literature and science. We awarded four of the prizes in 2018: The Johann Heinrich Merck Award for Literary Critique and Essay of Merck KGaA, Darmstadt, Germany, in Germany went to author and translator Martin Pollack. The Italian Premio Letterario of Merck KGaA, Darmstadt, Germany, was awarded to natural scientist, author and professor Carl Safina, and to physicist and science historian Lucio Russo. The winners of the Japanese Kakehashi Literature Award of Merck KGaA, Darmstadt, Germany, were author Clemens J. Setz and his translator Ayano Inukai. The Translation Award of Merck KGaA, Darmstadt, Germany, in Russia went to authors Nina Federowa, Ekaterina Aralova, Natalia Stillmark and Tatiana Zborovskaja. The Tagore Literature Award of Merck KGaA, Darmstadt, Germany, in India will once again be offered in 2019.

Responsibility for our products

The safety of our products is at the core of our corporate responsibility. When used properly, they must pose no risk to customers, patients, consumers or the environment. Our goal is to ensure a positive benefit/risk profile for our products, which is why we regularly examine safety across their entire life cycle and continuously take steps to minimize risks. We provide patients, consumers and customers with extensive informational material so that they can use our products in a safe, responsible and proper manner.

In our pharmaceutical marketing activities, the focus is always on the health and well-being of patients because we want them to receive effective and high-quality treatment. All guidelines pertaining to marketing and advertising are part of our Group-wide compliance program, which is complemented by our internal guidelines and various voluntary commitments that, in many cases, far exceed the applicable statutory regulations.

Safety of our chemical products

Numerous regulations are in place to ensure that chemicals pose no risk to humans or the environment. Compliance with these regulatory requirements is an important part of our work. Through a Group-wide policy, we have established global processes for defining, directing and implementing product safety, as well as the corresponding management structures. We incorporate all relevant national and international chemical regulations into our policies and guidelines, and adhere to them. This includes the EU chemicals regulation REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) and CLP (Classification, Labelling and Packaging of Substances and Mixtures, EU GHS). Furthermore, we are committed to transparency. For instance, in line with the Global Product Strategy, an international initiative of the chemical industry, we provide our customers with product safety summaries for hazardous materials.

In 2018, we successfully completed the third and final phase of the REACH registration process by registering all substances annually produced or imported in quantities ranging from one to 100 metric tons with respect to the risks they pose in terms of their use, storage, transport and disposal. All the chemical substances concerned in our portfolio were registered on schedule. This process also includes substances added to our portfolio from the Sigma-Aldrich acquisition.

Safety of our Healthcare products

Patient safety has a top priority in everything we do. During the entire life cycle of our medicines, we provide patients and physicians with up-to-date risk-benefit evaluations. To this end, company experts process safety-relevant information from various sources such as clinical trials, adverse reaction reports and scientific literature. Ultimate responsibility for the safety of our biopharmaceuticals is borne by our Global Chief Medical Officer, with support from the Medical Safety and Ethics Board. Our Global Patient Safety unit continuously monitors and evaluates the safety and risk-benefit ratio of our medicines worldwide (pharmacovigilance). For products in our Allergopharma business, we have also developed comprehensive clinical efficacy and safety profiles that we continuously update. For the safety of patients, we have established a global pharmacovigilance system that we are always working to enhance.

Quality of our products

Our goal is to provide customers and patients at all times with high-quality original products. Through our quality vision – “Quality is embedded in everything we do!” – we remind our employees of their responsibility – across all business sectors, all Group functions and all levels of the company.

Supplier management

We procure many raw materials, packaging materials, technical products, components and services worldwide. Our overarching goal is to protect the stability of these supply chains and always provide our customers with the best products and services, while offering them optimal quality and service. Our supplier management focuses on compliance with fundamental environmental and social standards, in addition to high quality, delivery reliability and competitive prices. They are primarily derived from the core labor standards of the ILO (International Labour Organisation), from the UN Global Compact and from the Code of Conduct of the BME (German Federal Association for Materials Management, Purchasing and Logistics).

Our Group Procurement Policy and Responsible Sourcing Principles define our procurement practices. Due to the global focus of our procurement, we are continuously working to ensure adherence to our supply chain standards.

As a member of the industry initiative “Together for Sustainability” (TfS), we are able to use the supplier self-assessments and audit results shared among all member companies, who in turn abide by all restrictions stipulated within competition law. Through the shared platform approach, we have access to the sustainability assessment scorecards of more than 10,700 companies as well as over 1,000 audits reports.

Responsibility for our employees

Our employees contribute to groundbreaking progress in science and technology across the world. They are the basis of our success and therefore play a central role for the success of our business. In accordance with our company values, we live a culture of mutual esteem and respect. To remain successful in the future we want to attract people to our company who contribute their curiosity, their courage and spirit of invention. We therefore place a strategic focus on employee development, leadership and performance management. Furthermore, we strive to foster diversity among our employees (more information can be found under “People”).

Responsibility for the environment

We seek to impact the environment as little as possible while doing business. This especially includes efficiently conserving resources such as energy, water and raw materials while also continuously reducing our emissions and waste.

Environmental management system

In our Corporate Environment, Health and Safety Policy, which is applicable Group-wide, we have defined our principles and strategies for environment, health and safety. It is an integral component of our EHS management system, which is certified annually by external auditors in accordance with the international standard ISO 14001. At all our sites, local EHS managers oversee operational environmental protection measures. These employees continually receive training and obtain additional qualifications. Since our businesses are constantly changing, our environmental management system is subject to internal and external audits on a regular basis to ensure that the ISO 14001 requirements are still being met. In 2018, we obtained an ISO 14001 group certificate for the tenth consecutive year. This certificate covers 81 sites around the world.

All reported environmental key figures do not include data on the Consumer Health business, since these operations were transferred to Procter & Gamble – effective December 1, 2018 – and have been classified as discontinued operations within the meaning of IFRS 5 since April 2018.

Focus areas: Energy efficiency, greenhouse gas emissions, water, waste and recycling

Climate impact and resource scarcity are key challenges facing society in the 21st century. As a responsible company, it is especially important for us to do our part. We have therefore set ourselves the goal of reducing total direct and indirect greenhouse gas emissions by 20% by 2020 (2006 baseline), irrespective of production growth. In 2018, the CDP (formerly the Carbon Disclosure Project) gave our efforts for the sustainable use of energy a "C" rating (2017: B). The CDP assesses companies in terms of their performance and transparency in climate impact and water management.

ENERGY CONSUMPTION[1, 2]

In gigawatt hours	2015	2016	2017	**2018**
Total energy consumption	**2,141**	**2,117**	**2,194**	**2,232**
Direct energy consumption	**1,343**	**1,330**	**1,319**	**1,322**
Natural gas	1,200	1,260	1,254	1,256
Liquid fossil fuels[3]	110	36	32	32
Biomass and self-generated renewable energy	33	34	33	34
Indirect energy consumption	**798**	**787**	**875**	**910**
Electricity	702	692	729	761
Steam, heat, cold	96	95	146	149
Total energy sold	**0.3**	**0.3**	**0.1**	**0.0**
Electricity	0.3	0.3	0.1	0.0
Steam, heat, cold	0.0	0.0	0.0	0.0

In terajoules	2015	2016	2017	**2018**
Total energy consumption	**7,708**	**7,621**	**7,898**	**8,035**
Direct energy consumption	**4,835**	**4,788**	**4,748**	**4,759**
Natural gas	4,320	4,536	4,514	4,522
Liquid fossil fuels[3]	396	130	115	115
Biomass and self-generated renewable energy	119	122	119	122
Indirect energy consumption	**2,873**	**2,833**	**3,150**	**3,276**
Electricity	2,527	2,491	2,624	2,740
Steam, heat, cold	346	342	526	536
Total energy sold	**1.1**	**1.1**	**0.4**	**0.0**
Electricity	1.1	1.1	0.4	0.0
Steam, heat, cold	0.0	0.0	0.0	0.0

[1] In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the energy consumption has been calculated based on the corporate structure as of December 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).
[2] All reported environmental key figures do not include data on the Consumer Health business, since these operations were transferred to Procter & Gamble – effective December 1, 2018 – and have been classified as discontinued operations within the meaning of IFRS 5 since April 2018.
[3] Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel and gasoline.

TOTAL GREENHOUSE GAS EMISSIONS (SCOPE 1 AND 2 OF THE GHG PROTOCOL)[1, 2]

In metric kilotons	2006[3]	2015	2016	2017	2018
Total CO_2eq[4] emissions	**786**	**722**	**689**	**704**	**698**
thereof					
direct CO_2eq emissions	378	391	384	373	354
Indirect CO_2eq emissions	408	331	305	331	344
Biogenic CO_2 emissions	**0**	**13**	**14**	**13**	**13**

[1] In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the greenhouse gas emissions have been calculated based on the corporate structure as of December 31 of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).
[2] All reported environmental key figures do not include data on the Consumer Health business, since these operations were transferred to Procter & Gamble – effective December 1, 2018 – and have been classified as discontinued operations within the meaning of IFRS 5 since April 2018.
[3] Baseline for our emission targets is 2006.
[4] eq = equivalent.

To achieve our climate impact mitigation goals, we have launched the EDISON program, which consolidates all our climate impact mitigation and energy efficiency activities. Through the more than 360 EDISON projects initiated since 2012, we aim to annually save around 177 metric kilotons of CO_2 in the medium term. Overall, thanks to the EDISON projects we have saved approximately 89,000 megawatt hours of energy since 2012.

At the same time, we are pushing forward with the changeover to renewable energies. In 2017, we installed a solar voltaic system in Burlington, Massachusetts, United States. It has an installed capacity of 182 kilowatts and generated 136,000 kilowatt hours in 2018. Energy management plays a key role in our efforts for energy efficiency and climate impact mitigation. Our production sites in Darmstadt and Gernsheim account for 29% of our global energy consumption. Both these facilities have fulfilled the international energy management standard ISO 50001 since 2012. Currently, 12 of our production sites have a certified energy management system. We are working to implement further measures to achieve our climate goal. For example, we are steadily reducing our process-related emissions in our Life Science business sector through process optimization. In 2018, this enabled us to save 16,000 metric kilotons of CO_2 equivalents.

Alongside energy efficiency and climate protection, we also focus on water. Since 2016, we have been pursuing the goal of implementing a sustainable water management system at sites with high consumption levels by 2020. At sites with relevant water use located in areas of high water stress, we are aiming to cut our water consumption by 10% by 2020 (2014 baseline). At the end of 2018, we had lowered our water consumption at the relevant sites by 11% in comparison with 2014. In 2018, the CDP gave our efforts to conserve water a "B–" rating (2017: B). Natural resources are becoming scarcer. We therefore want to use raw materials as efficiently as possible and to limit the loss of raw materials. In this way, we intend to minimize the environmental impacts of our waste as far as possible. In 2016, we developed a company Waste Score, which allows us to compare the amount of waste our sites are producing and monitor the development of the amount of waste we produce. Based on this score, we have set ourselves the goal of reducing the environmental impact of our waste by 5% by 2025 (2016 baseline). For this purpose, we continuously analyze the improvement potential of our production processes and disposal routes. In 2018, we also established two expert panels on the topic of waste management. They regularly discuss best practice examples and thus facilitate an exchange of experience between our global sites.

Responsibility for society

We see ourselves as part of society – both at our individual sites and worldwide. Taking responsibility towards society is an integral part of our entrepreneurial approach. We believe that we can make an important contribution to the community through our knowledge, our skills and our products.

Our social responsibility activities are primarily focused on those areas in which we have problem-solving expertise stemming from our core businesses. We are thus engaged in health and culture projects and furthermore support education, especially in the natural sciences. Additionally, we provide disaster relief and support people in need in the areas in which we operate.

Our subsidiaries are engaged in a wide variety of local projects. We have defined a general set of criteria for selecting projects, and the decisions concerning specific projects are made by our subsidiaries. In 2018, we spent a total of € 36 million on community engagement activities. For the first eleven months this amount includes the Consumer Health business, which was divested as of December 1, 2018. This figure does not include contributions from our charitable organization.

To mark our 350-year anniversary, we stepped up our commitment and carried out more than 350 charitable projects in 60 countries in 2018. In more than 60% of all initiatives our colleagues joined us in our efforts, whether through donations in cash or in kind or through their active collaboration in projects.

Research and Development

We conduct research and development (R&D) worldwide in order to develop new products and services designed to improve the quality of life of patients and to satisfy the needs of our customers. Further optimizing the relevance and efficiency of our research and development activities – either on our own or in cooperation with third parties – is one of our top priorities.

In 2018, approximately 7,200 employees worked for our company researching innovations to serve long-term health and technology trends in both established and growth markets (in 2017: approximately 6,800).

Our company spent around € 2.2 billion on research and development (R&D) in 2018 (2017: around € 2.1 billion). In our research and development activities, we focus on both in-house research and external collaborations that enable us to increase the productivity of our research while simultaneously reducing financial outlay. The organizational set-up of our R&D activities reflects the structure of our company with three business sectors.

Healthcare

BIOPHARMA

Oncology and Immuno-Oncology

Oncology and immuno-oncology are core focus areas in our R&D portfolio. With an emphasis on biomarker-driven research, we aim to deliver personalized treatments and a transformative pipeline. Translational research is embedded into the whole R&D process, with several projects addressing unmet needs in hard-to-treat cancers through innovative treatment approaches and novel combinations. In 2018, we achieved a number of significant milestones across our oncology and immuno-oncology pipeline.

We continue to develop much-needed new treatment options for patients with hard-to-treat cancers and have made key progress in this area with avelumab, an anti-PD-L1 antibody that we are co-developing and co-commercializing with Pfizer. To date, avelumab has received approval in 46 countries across the world under the brand name Bavencio®. In 2018, approvals were granted in several countries, including Australia and Brazil, for Merkel cell carcinoma (MCC) as well as Israel for MCC and urothelial carcinoma (UC) and Canada for UC.

In September, we announced positive top-line results from the pivotal Phase III JAVELIN Renal 101 study evaluating avelumab in combination with Inlyta® (axitinib), compared with Sutent® (sunitinib) as initial therapy for patients with advanced renal cell carcinoma (RCC). As part of a planned interim analysis, an independent data monitoring committee confirmed that the trial showed a statistically significant improvement in progression-free survival (PFS) by central review for patients treated with the combination whose tumors had PD-L1+ expression greater than 1% (primary objective), as well as in the entire study population regardless of PD-L1 tumor expression (secondary objective). The detailed analysis of this clinical trial readout was presented at the 2018 European Society for Medical Oncology (ESMO) Congress. The US Food and Drug Administration (FDA) granted Breakthrough Therapy Designation for avelumab in combination with Inlyta® for treatment-naive patients with advanced RCC in December 2017.

Through our strategic alliance with Pfizer, we continue to explore the therapeutic potential of avelumab. Our clinical development program JAVELIN comprises more than 30 clinical programs, including various Phase III trials, involving over 9,000 patients across more than 15 different tumor types. In addition to MCC, UC and RCC, these cancers include breast, gastric/gastro-esophageal junction and head and neck cancers, non-small cell lung cancer and ovarian cancer.

We provided an update on our Phase III JAVELIN Lung 200 trial in February, Phase III JAVELIN Ovarian 200 trial in November and Phase III JAVELIN Ovarian 100 trial in December. While these studies did not meet or were not expected to meet their pre-specified primary endpoints of overall survival (JAVELIN Lung 200), superior overall survival or PFS (JAVELIN Ovarian 200) and PFS (JAVELIN Ovarian 100), the data are being further examined to better understand the results.

As part of our ongoing commitment to developing new treatment options for patients with hard-to-treat cancers who would otherwise have a low chance of survival, and to exploring all potential options, we entered into various new strategic collaborations in 2018 with avelumab. The first was in July, when our collaboration with Vyriad to evaluate avelumab in combination with Voyager-V1, an oncolytic virus therapy, in a Phase I clinical trial in patients with solid tumors was announced. A few days later, we announced a collaboration with Leap Therapeutics to investigate avelumab in combination with Leap Therapeutics' GITR agonist, TRX518, and chemotherapy in a Phase I/II clinical trial in advanced solid tumors including expansion populations in patients with relapsed/refractory ovarian, breast and prostate cancers.

In September, together with Pfizer, we entered into a clinical trial collaboration and supply agreement with Checkmate Pharmaceuticals to evaluate CMP-001, a TLR9 agonist, in combination with avelumab.

The collaboration will evaluate the safety and effectiveness of CMP-001 administered in combination with avelumab in selected previously treated patients with advanced squamous cell carcinoma of the head and neck (SCCHN) whose disease has progressed.

Also in September, we announced a collaboration with Immutep to evaluate avelumab in combination with eftilagimod alpha ("efti" or "IMP321"), an investigational LAG-3Ig fusion protein, in a Phase I trial in patients with advanced solid malignancies. Shortly afterwards, in October we entered into a clinical trial collaboration agreement with Daiichi Sankyo Company to study the combination of avelumab and/or our investigational DNA damage repair (DDR) inhibitor with [fam-] trastuzumab deruxtecan (DS-8201), an investigational HER2-targeting antibody drug conjugate, in patients with HER2-expressing or mutated solid tumors.

Finally, in November, we entered into two collaboration agreements. The first was with Kyowa Hakko Kirin to study avelumab with Kyowa Hakko Kirin's novel IDO inhibitor, KHK2455, in a Phase I clinical trial of patients with solid tumors. The second agreement was with Immunicum to investigate avelumab in combination with ilixadencel, an off-the-shelf, cell-based, cancer immune primer, in a planned multi-indication Phase Ib/II clinical trial of patients with advanced head and neck cancer and gastric adenocarcinoma.

In 2018, we celebrated several important milestones for our leading oncology pipeline molecules we discovered in-house, including tepotinib, an investigational oral MET inhibitor, and M7824, an investigational bifunctional immunotherapy.

In March, tepotinib received its first regulatory designation when the Japanese Ministry of Health, Labor and Welfare (MHLW) granted SAKIGAKE "fast-track" designation to tepotinib for patients with advanced non-small cell lung cancer (NSCLC) harboring MET exon 14 skipping mutations. The SAKIGAKE designation promotes research and development in Japan, aiming at early practical application for innovative pharmaceutical products, medical devices and regenerative medicines, and can reduce a drug's review period down from 12 months to a target of 6 months. The SAKIGAKE designation system is a core component of the MHLW's "Strategy of SAKIGAKE". The system's objective is to designate drugs that have the potential of prominent effectiveness against serious and life-threatening diseases in order to make them available to patients in Japan ahead of the rest of the world.

In August, we initiated a trial to investigate M7824 compared with pembrolizumab as a first-line treatment in patients with PD-L1-expressing advanced NSCLC. In December, the FDA and the European Medicines Agency (EMA) granted orphan drug designation (ODD) to M7824 for the treatment of biliary tract cancer (BTC). The FDA's ODD follows the recent presentation of the first clinical data for M7824 in BTC at the ESMO Congress (see below). BTC is a collective term for a group of rare and aggressive gastrointestinal cancers, including intrahepatic cholangiocarcinoma, extrahepatic cholangiocarcinoma and gallbladder carcinoma. Approximately 16,000 cases of BTC are estimated to occur every year in the United States. These cancers present late in the majority of patients and treatment options are limited. The median survival rate in the advanced setting is less than one year and the objective tumor response with commonly used chemotherapy is typically less than 10% with a short duration of response.

Our integrated R&D capacity is strongly supported by external innovation to complement our pipeline, strengthen our technology base and enhance our scientific capabilities. In 2018, we initiated new pipeline collaborations to further diversify our development risks and enable a more efficient pipeline prioritization.

In January, we announced a multi-project and licensing deal with Cancer Research UK's Commercial Partnerships Team and The Institute of Cancer Research (ICR), London, to discover and develop new anticancer drugs. Together we will collaborate on three independent research projects spanning discovery to preclinical candidate nomination. This work will progress the discovery and development of potential cancer drugs, as well as develop biomarkers for target engagement and patient selection. Under the terms of the deal, we have worldwide rights to take molecules discovered through the collaboration forward into clinical development. Cancer Research UK and the ICR will receive milestone payments based on the achievement of research and development, regulatory and sales goals plus royalty payments on net sales of future products discovered or developed under the agreement. Any payments made to Cancer Research UK and the ICR will be invested in future lifesaving research.

In April, we announced a development and risk-sharing collaboration with the SFJ Pharmaceuticals Group (SFJ), a U.S.-based company focused on increasing R&D output and productivity through innovative models. In a novel innovation model recently emerging in the biopharma industry, SFJ – one of the pioneers of such collaborations – will finance and be responsible for Phase II/III development of abituzumab, our IgG1 monoclonal antibody, as a first-line treatment for metastatic colorectal cancer (mCRC) in combination with Erbitux® and chemotherapy.

Additionally, we are currently assessing the potential of investigating tepotinib in combination with novel therapies for the treatment of advanced heptocellular carcinoma (HCC) after the two HCC Phase II trials met their primary endpoints, with clinical activity demonstrated both as first-line and second-line treatment and safety findings in line with earlier studies.

At the 2018 ASCO Annual Meeting (June 1–5 in Chicago, Illinois, United States), we shared results from our increasingly broad oncology portfolio, from immuno-oncology to DDR approaches, in a wide range of hard-to-treat cancers. Representing seven therapeutic agents and eight tumor types, we showcased the significant potential in not only later-stage priority programs, but also in early pipeline programs that could make a real difference for patients. We presented data across our oncology and immuno-oncology pipeline for molecules including avelumab and Erbitux®, and pipeline updates

on M7824, tepotinib, the p70S6K/AKT targeted agent M2698, the DNA-PK inhibitors M3814 and M6620.

Multiple presentations on avelumab at ASCO included two-year safety and efficacy data in metastatic MCC for avelumab from the pivotal JAVELIN Merkel 200 trial, as well as data in NSCLC and UC. Pipeline updates at ASCO also included early clinical results for tepotinib patients with NSCLC harboring MET exon 14 skipping mutations, M7824 in patients with HPV-associated cancers and NSCLC, M6620 in NSCLC and advanced solid tumors as well as data for M3814 and M2698 in solid tumors.

At the 2018 ESMO Congress (October 19 – 23 in Munich, Germany), we presented a total of 41 abstracts representing eight therapeutic agents and 14 tumor types. The data presented showcased the diversity of our pipeline, with results from a number of high-priority clinical development programs.

They included the first presentation of data from the pivotal Phase III study JAVELIN Renal 101 evaluating avelumab in combination with axitinib compared with sunitinib as initial therapy for patients with advanced RCC. For avelumab, updated data in MCC and advanced gastric or gastroesophageal junction cancer were also presented.

Additionally, new data for M7824 were presented from expansion cohorts of two ongoing Phase I clinical trials, including the first presentation data for SCCHN, BTC and esophageal cancers. In addition, updated data for M7824 in NSCLC and gastric cancer were shared. Data presented for tepotinib included results from three Phase II trials, two in advanced HCC and one in NSCLC, providing further evidence of this precision medicine's promising clinical activity in solid tumors. In DDR, results were presented from a Phase I trial investigating M6620 (formerly VX-970) in combination with gemcitabine in patients with advanced NSCLC; and two Phase I trials of DNA-dependent protein kinase inhibitor M3814. From the broader pipeline, results were also shared from the Phase I/II trial of M7583, a Bruton's tyrosine kinase (BTK) inhibitor, in patients with B cell malignancies, as well as a retrospective analysis of the Phase I/II Poseidon study investigating abituzumab in patients with mCRC.

Moreover, data from our legacy brand Erbitux® (cetuximab) were presented, adding to the growing body of real-world evidence supporting the therapy's role as a standard of care in RAS wild-type mCRC, first-line recurrent or metastatic SCCHN and for patients with locally advanced SCCHN who may not be able to tolerate cisplatin-based regimens in full.

Neurology & Immunology

Multiple sclerosis (MS) is one of the world's most common neurological disorders. Despite the emergence of several therapies in the last two decades, there are still significant unmet needs for MS patients, particularly those with highly active relapsing MS (RMS).

On July 30, we announced that a resubmission of the New Drug Application (NDA) for cladribine tablets as a potential treatment for patients with relapsing forms of MS was accepted for review by the FDA. The acceptance indicates that the FDA found the company's resubmission sufficiently complete to permit a substantive review. The resubmission was in response to the Complete Response Letter issued by the FDA in 2011 requesting an improved understanding of safety risks and the overall benefit-risk profile. The NDA acceptance follows global approvals of cladribine tablets under the trade name Mavenclad® in more than 40 countries since August 2017, including the European Union (EU), Canada, Australia, Israel, Argentina, United Arab Emirates, Chile and Lebanon. In 2018, Mavenclad® was approved in a total of 11 countries. Additional filings in other countries are planned.

The results from the key magnetic resonance imaging (MRI) findings of the CLARITY Extension study of Mavenclad® (cladribine tablets) were published in January in the journal Therapeutic Advances in Neurological Disorders. The findings suggest that two-year treatment with Mavenclad® (given over 20 days) has a durable effect on MRI during observation in years 3 and 4.

On March 7, we announced positive results from our Phase IIb study in RMS of evobrutinib, an investigational, highly specific, oral BTK inhibitor and the first BTK inhibitor to show clinical proof-of-concept in RMS. The study met its primary endpoint, demonstrating that oral evobrutinib resulted in a clinically meaningful reduction of gadolinium-enhancing T1 lesions on MRI scans measured at weeks 12, 16, 20 and 24 in comparison to patients receiving placebo.

In April, data for Mavenclad® and Rebif® (interferon beta-1a) were presented at the American Academy of Neurology (AAN) 70th Annual Meeting, April 21 – 27 in Los Angeles (California, United States). Mavenclad® data presented included poster presentations highlighting analyses of the CLARITY, CLARITY Extension and ORACLE-MS trials evaluating long-term safety and durable efficacy in patients with MS.

In May, the Multiple Sclerosis Journal published data outlining the effects of Mavenclad® treatment on patients with highly active RMS. The data showed that Mavenclad® reduced the risk of 6-month Expanded Disability Status Scale (EDSS) progression by 82% vs placebo.

In June, 14 abstracts were presented further characterizing the complementary profiles of Mavenclad® and Rebif® at the 4th Congress of the European Academy of Neurology (EAN) in Lisbon, Portugal.

In October, we presented 23 abstracts, including new safety and efficacy data on Mavenclad®, Rebif® and investigational therapy evobrutinib at the 34th Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) in Berlin, Germany. The data presented at ECTRIMS build on the existing real-world and clinical evidence around the safety and efficacy of Mavenclad® and reaffirm a positive benefit-risk profile of the oral treatment, which is taken for a maximum of 20 days over two years.

Based on an integrated analysis of patients from the CLARITY, CLARITY EXT and ORACLE-MS trials, including two additional years of data from the long-term PREMIERE Registry, the treatment emergent adverse event (TEAE) profile associated with Mavenclad® in patients with RMS was confirmed, with no new safety findings. Late-breaking data from the multi-sponsored European IFNβ Pregnancy Registry and Nordic health registers demonstrated that treatment with interferon beta formulations – including Rebif® – before conception or during pregnancy did not affect outcomes for the pregnancy or for the infant. Positive late-breaking data from the 24-week results of the double-blind, randomized, placebo-controlled, 48-week, Phase II study of evobrutinib in patients with RMS were presented at ECTRIMS. The study met its primary endpoint, with evobrutinib 75mg QD (once daily) and 75mg BID (twice daily) significantly reducing the number of gadolinium-enhancing T1 (T1 Gd+) lesions measured at weeks 12, 16, 20 and 24 in comparison to patients receiving placebo.

In addition, following the #MSInsideOut campaign launch on World MS Day at the end of May, we premiered the MS Inside Out Documentary film executively produced by Shift.ms during an event on October 11. At the event, we shone a light on the untold stories of MS, as well as revealing the findings from a new global MS carers survey conducted in collaboration between leading international carer organizations IACO (International Alliance of Carer Organizations) and Eurocarers. The data presented at ECTRIMS further demonstrated the need for a deeper understanding of those affected by MS and their carers.

We also announced in Berlin (Germany) the winners of the annual Grant for Multiple Sclerosis Innovation (GMSI) Award, which supports the advancement of science and medical research in the field of MS and provides a grant of up to € 1,000,000 per year to one or more selected research projects. The winners were Professor Franca Deriu of the University of Sassari (Italy); Professor Jennifer Gommerman and Dr. Valeria Ramaglia of the University of Toronto (Canada); Professor Edgar Meinl of the Institute of Clinical Neuroimmunology of the University of Munich (Germany); as well as Dr. Gerd Meyer zu Hörste and Professor Heinz Wiendl of Münster University Hospital (Germany).

At the Osteoarthritis Research Society International (OARSI) 2018 World Congress – held in April in Liverpool (United Kingdom) – 16 abstracts, including two oral presentations, were presented. Our presence at OARSI reflects the company's dedication to helping optimize outcomes for patients living with chronic progressive diseases, with the goal of developing novel disease-modifying therapies for osteoarthritis (OA). Oral presentations on sprifermin offer further insights supporting its dose-response structural effect in patients with knee OA, observed in earlier studies.

At the European Lupus Society in March (Düsseldorf, Germany), data were presented on atacicept, a recombinant fusion protein thought to target the cytokines APRIL and BLyS. Two oral presentations of analyses of the Phase II ADDRESS II clinical trial assessing atacicept in patients with systemic lupus erythematosus (SLE) reported attainment of low-disease activity and reduction of flares in patients with high SLE disease activity.

Fertility

At the Grant for Fertility Innovation (GFI) ceremony at the annual meeting of the European Society of Human Reproduction and Embryology (ESHRE) in Barcelona, Spain, we confirmed our commitment to supporting potential breakthrough research projects in the field of fertility. With an amount of € 300,000, the GFI is again supporting the advancement of medical science, aiming to bring innovation to life. The two winners – Louise Glover from Ireland and Cinzia Di Pietro from Italy – received their awards during the ceremony, which was also attended by Louise Brown, the world's first person to be conceived using in vitro fertilization (IVF), as well as IVF pioneer Professor Bruno Lunenfeld.

General Medicine & Endocrinology

During 2018, we received further authorizations for Glucophage® (metformin) for the reduction in the risk or delay of the onset of type 2 diabetes when intensive lifestyle changes have failed. We now have this indication in 40 countries, among them Brazil, United Kingdom, Singapore and Saudi Arabia. Global roll-out in other countries is ongoing.

In July, the EU worksharing procedure was finalized and the German Federal Institute for Drugs and Medical Devices (BfArM) recommended the approval of our new formulation of Euthyrox® (levothyroxine) in 21 EU countries. The German BfArM decision was based on a study demonstrating bioequivalence between the old and new formulations and a dose form proportionality study with the new formulation. The new formulation came at the request of several health authorities worldwide. It was introduced in France in March 2017 and Switzerland in April 2018. Since October the product has been available on the Turkish market. Following the positive recommendation from BfArM, which is acting as a representative of all 21 EU countries involved in the EU worksharing procedure, we expect the new formulation of Euthyrox® to be available in these countries from 2019 onwards.

On September 28, we announced the recipients of the Grant for Growth Innovation (GGI) for 2018 during the 57th European Society of Paediatric Endocrinology (ESPE) meeting in Athens, Greece. Applications were reviewed by an independent scientific steering committee consisting of six internationally renowned endocrinologists and researchers. Research groups based in Finland and Italy were each awarded a grant for innovation projects in the field of growth and growth disorders.

BIOPHARMA PIPELINE

as of December 31, 2018

Therapeutic area Compound	Indication	Status
Neurology		
Cladribine tablets (lymphocyte-targeting agent)	Relapsing multiple sclerosis	Registration[1]
Evobrutinib (BTK inhibitor)	Multiple sclerosis	Phase II
Oncology		
Tepotinib (MET kinase inhibitor)	Non-small cell lung cancer	Phase II
Tepotinib (MET kinase inhibitor)	Hepatocellular cancer	Phase II
M2698 (p70S6K and Akt inhibitor)	Solid tumors	Phase I
M3814 (DNA-PK inhibitor)	Solid tumors	Phase I
M6620 (VX-970, ATR inhibitor)	Solid tumors	Phase I
M4344 (VX-803, ATR inhibitor)	Solid tumors	Phase I
M3541 (ATM inhibitor)	Solid tumors	Phase I
M8891 (MetAP2 inhibitor)	Solid tumors	Phase I
M7583 (BTK inhibitor)	Hematological malignancies	Phase I
Immuno-Oncology		
Avelumab (anti-PD-L1 mAb)	Non-small cell lung cancer, 1st line	Phase III
Avelumab (anti-PD-L1 mAb)	Gastric cancer, 1st line maintenance	Phase III
Avelumab (anti-PD-L1 mAb)	Ovarian cancer, 1st line	Phase III[2]
Avelumab (anti-PD-L1 mAb)	Urothelial cancer, 1st line maintenance	Phase III
Avelumab (anti-PD-L1 mAb)	Renal cell cancer, 1st line	Phase III
Avelumab (anti-PD-L1 mAb)	Locally advanced head and neck cancer	Phase III
Avelumab (anti-PD-L1 mAb)	Merkel cell carcinoma, 1st line	Phase II
Avelumab (anti-PD-L1 mAb)	Solid tumors	Phase II[3]
Avelumab (anti-PD-L1 mAb)	Non-small cell lung cancer	Phase II[3]
Avelumab (anti-PD-L1 mAb)	Urothelial cancer	Phase II[3]
Abituzumab (pan-αv integrin inhibiting mAb)	Colorectal cancer, 1st line	Phase II[4]
M7824 (anti-PD-L1/TGF-β trap)	Non-small cell lung cancer, 1st line	Phase II
Avelumab (anti-PD-L1 mAb)	Solid tumors	Phase I
Avelumab (anti-PD-L1 mAb)	Hematological malignancies	Phase I
M9241 (NHS-IL12, cancer immunotherapy)	Solid tumors	Phase I
M7824 (anti-PD-L1/TGF-β trap)	Solid tumors	Phase I

BIOPHARMA PIPELINE

as of December 31, 2018

Therapeutic area

Compound	Indication	Status
Immunology		
Sprifermin (fibroblast growth factor 18)	Osteoarthritis	Phase II
Atacicept (anti-BLyS/anti-APRIL fusion protein)	Systemic lupus erythematosus	Phase II
Atacicept (anti-BLyS/anti-APRIL fusion protein)	IgA nephropathy	Phase II
Evobrutinib (BTK inhibitor)	Rheumatoid arthritis	Phase II
Evobrutinib (BTK inhibitor)	Systemic lupus erythematosus	Phase II
M1095 (ALX-0761, anti-IL-17 A/F nanobody)	Psoriasis	Phase II[5]
M6495 (anti-ADAMTS-5 nanobody)	Osteoarthritis	Phase I
M5049 (immune receptor inhibitor)	Immunology	Phase I
General Medicine		
M5717 (PeEF2 inhibitor)	Malaria	Phase I

More information on the ongoing clinical trials can be found at www.clinicaltrials.gov. Pipeline products are under clinical investigation and have not been proven to be safe and effective. There is no guarantee any product will be approved in the sought-after indication.

[1] As announced on July 30, 2018, the U.S. Food and Drug Administration (FDA) accepted the resubmission of the New Drug Application (NDA) for cladribine tablets.

[2] Avelumab in combination with talazoparib.

[3] Avelumab combination studies with talazoparib, axitinib, ALK inhibitors, chemotherapy or novel immunotherapies.

[4] As announced on May 2, 2018, in an agreement with SFJ Pharmaceuticals Group, abituzumab will be developed by SFJ for colorectal cancer through Phase II/III clinical trials.

[5] As announced on March 30, 2017, in an agreement with Avillion, anti-IL-17 A/F nanobody will be developed by Avillion for plaque psoriasis and commercialized by our company.

ADAMTS-5	A disintegrin and metalloproteinase with thrombospondin motifs
Akt	Protein kinase B
APRIL	A proliferation-inducing ligand
ATM	Ataxia Telangiectasia Mutated kinase
ATR	Ataxia Telangiectasia and Rad3-related kinase
BLyS	B-lymphocyte stimulator
BTK	Bruton's tyrosine kinase
IgA	Immunoglobulin A
IL	Interleukin
mAb	Monoclonal antibody
MetAP2	Methionine aminopeptidase 2
PD-L1	Programmed cell death ligand 1
PeEF2	*Plasmodium* eukaryotic elongation factor 2
PK	Protein kinase
TGFβ	Transforming growth factor β

Allergopharma
Allergopharma, our allergy business, is one of the leading manufacturers of diagnostics and prescription drugs for allergen immunotherapy. As experts, we are determined to fully understand allergies as well as be able to discover new solutions and therapeutic concepts. In close cooperation with research institutions and other partners throughout the world, we gain valuable insights regarding the complex immunological mechanisms responsible for allergy development. And we pursue new paths in developing innovative treatments. Thus, we want to create the best conditions today for the next generation of products for optimally taking care of patients suffering from allergies.

Life Science

Across our three Life Science business units of Research Solutions, Process Solutions and Applied Solutions, our R&D teams are dedicated to finding innovative solutions to our customers' toughest challenges. In our Life Science business sector, we invest significantly in R&D, with more than 1,750 employees working in various R&D functions around the world.

In 2018, we continued to focus on delivering the promise of accelerating access to health for people everywhere. We launched nearly 13,000 products, including nearly 6,000 chemicals, while aiming to:

- Improve and expand our portfolio
- Invest in new and disruptive technologies for the long term
- Partner with the global scientific community
- Meet customer needs

Advancing the global availability of our CRISPR technology
In early 2018, we received two patents for our CRISPR technology: the first from the Korean Intellectual Property Office and the second from the Israel Patent Office. These patents address cutting of the chromosomal sequence of eukaryotic cells (such as mammalian and plant cells) and insertion of an external or donor DNA sequence into those cells using CRISPR.

In April, we were granted a patent for this CRISPR insertion technology in China. Shortly thereafter, a paper we co-authored entitled, "Ethical Considerations in the Manufacture, Sale and Distribution of Genome-Editing Technologies," was published in *The American Journal of Bioethics*. The paper highlights the importance of science-based bioethics in genome editing and novel processes to ensure products meet the highest standards.

To complete an active year advancing the intellectual property (IP) of our CRISPR technology, in October and December, respectively, we were awarded Australian and European CRISPR patents for foundational genome-editing technology. The patents covered paired Cas9 nickase technology to reduce off-target effects, advance gene therapy and research. A second patent covering CRISPR insertion was also awarded to our company by the European Patent Office in December.

These patents expand the foundational CRISPR cutting and integration IP necessary to correct genetic defects in gene therapy patients and to fix diseased genes while not affecting healthy ones. Further, this allows us to license CRISPR-related patents to interested parties and further supports genome-editing research under ethical and legal standards. In total, we have achieved foundational CRISPR patents in seven markets, including Canada and Europe.

Partnerships and agreements to broaden our reach
In March, we signed a Memorandum of Understanding (MoU) with Schneider Electric, a global specialist in energy management and automation. The MoU aims to automate biopharmaceutical processes for China's biopharmaceutical industry and to help our biopharma customers in their quest for reliable, less expensive and better medical solutions.

In May, we announced a collaboration with Solvias, a Swiss contract research and service provider, to offer our PyroMAT™ System, a new Monocyte Activation Test (MAT) kit for pyrogen detection. The system offers a high-quality, ready-to-use in vitro method that does not require live animal testing and detects the broad spectrum of pyrogens. The new kit also eliminates the laboratory work required to maintain the cell line.

In June, we signed an agreement with HistoCyte Laboratories Ltd, Tyne and Wear, United Kingdom, to be the exclusive multinational distributor of the company's portfolio of cell lines in the United States and other select geographies. For our customers, the agreement provides a cost-effective and practical solution to the problem of tissue heterogeneity.

As we began the second half of 2018, we entered into a global cooperation agreement with InnoCore Pharmaceuticals to provide its proprietary SynBiosys® biodegradable polymer platform to develop sustained release solutions for biologicals in injectable formulations. This proprietary technology allows the development of injectable sustained release biological formulations with conserved bioactivity of these sensitive molecules.

An expanded portfolio to benefit our customers
We launched innovations across all segments of our portfolio throughout 2018. In January, Applied Solutions released Steritest NEO, a new product that replaces the current Steritest EZ for sterility testing, which is a flagship for our business. In February, Process Solutions introduced Viresolve® Barrier capsule filters designed to remove viruses, mycoplasma and bacteria from cell culture media, protecting against bioreactor contamination. These filters are a key component of our Viral Safety Assurance program to mitigate the risk of viral contamination in upstream bioprocesses and minimize the potential impact on drug supply and patient safety.

In April, Applied Solutions launched our new CellStream™ benchtop flow cytometry system, a compact, customizable flow cytometer that uses a camera for detection. The system expands the limits of sensitivity, allowing scientists to tailor their instruments to their needs in immunology, cancer research and many other areas.

In May, Applied Solutions also released its new PyroMAT™ in vitro system for Pyrogen Detection, a new robust and sensitive solution for pyrogen detection. It is the only cell-line based Monocyte Activation Test (MAT) provided as a ready-to-use kit on the market, providing an alternative to animal-based testing. In July, we released Milli-Q® HX 7000 SD, a new series of all-in-one water purification systems to purify, store, distribute, monitor and control a type 2 pure water supply entirely from one Milli-Q® HX 7000 SD system.

Over the course of 2018, we expanded our nanomaterials portfolio with the launch of more than 250 new products. Our portfolio includes inorganic and carbon nanomaterials for biomedical applications, novel 2D inorganics and alternative energy materials for use in flexible electronics, implantable wearable sensors, batteries and solar energy generation.

Nanomaterials possess unique properties that drive the development of advanced technology. In biomedical research, nanomaterials are used to develop probes for high-sensitivity assays and imaging. In theranostics, innovative nanomaterials enable breakthroughs in nanomedicines for cancer therapies by improving therapeutic efficacy and tumor-specific delivery, and minimize side-effects to improve patient care. In applications beyond life science such as energy and electronics, the unique properties of nanomaterials enable more vibrant displays; they will also make enhanced energy storage and flexible and wearable electronics a reality.

In September, Process Solutions announced three new products to help biomanufacturers navigate the evolving biopharma landscape with increased speed, greater flexibility and enhanced quality. The Eshmuno® CP-FT resin is a first-of-its kind CEX chromatography resin for the flow-through removal of aggregates from mAb therapeutics. Two modified amino acids (Phospho-L-Tyrosine Disodium Salt EMPROVE® EXPERT, L-Cysteine S-Sulfate Sodium Sesquihydrate EMPROVE® EXPERT) simplify feeding and reduce total volume in cell culture.

In October, Applied Solutions released the new Milli-Q® IQ 7003/7005 Integrated Ultrapure & Pure Water System. It is a fully integrated Type 1 and Type 2 water purification solution that is intelligent, easy to use and environmentally friendly.

In November, Process Solutions launched its new BioContinuum™ platform to advance biotherapeutic drug manufacturing through improved efficiency, simplified plant operations, and greater quality and consistency. This continuous bioprocessing platform integrates what are typically batch-based, separate manufacturing steps into a connected process, enabling continuous flow from the addition of raw materials through product harvest, purification and testing. Pilot studies suggest that conversion to continuous manufacturing may reduce manufacturing costs by up to 50%.

Recognized for award-winning innovation

As a result of our long-standing efforts in Asia, in March we were named the “Best Bioprocessing Supplier” and we received the “Best Bioprocessing Supplier Award for Single-use Systems” at the Asia-Pacific Bioprocessing Excellence Awards 2018 ceremony in Singapore.

In April, our Millistak+® HC Pro portfolio won an INTERPHEX Exhibitor Award for Best Technological Innovation. The Millistak+® HC Pro portfolio is a family of synthetic depth filters providing cleaner, more consistent depth filtration media than other DE- and cellulose-based filter offerings.

In October, we won two 2018 Convention on Pharmaceutical Ingredients (CPhI) awards. Our Parteck® MXP Excipient won the “Excellence in Excipients” category and our modified amino acids won the “Excellence in Bioprocessing and Manufacturing” category.

In November, our BioReliance® Viral and Gene Therapy Assay Portfolio and proxy-CRISPR technology took top honors for innovation at the R&D 100 Awards. These awards honor the 100 most innovative and significant technologies introduced in the past year. Over the past six years, we have won nine R&D 100 awards.

Performance Materials

With our Performance Materials business sector, we are the market and technology leader in most of our businesses. As a science and technology company we are, in many cases, able to offer innovative products and solutions, which allow us to stand out from the competition. Successful Research & Development (R&D) is therefore a material part of the strategy deployed by Performance Materials. In 2018, the part of our R&D activities that is not close to the products in the business units was combined with a central innovation unit, Early Research & Business Development. Our goals in taking this step were to sharpen our focus on our customers' needs as well as to centrally decide on the assessment of projects and the related use of resources as part of an integrated approach to research and development.

The unit develops a technology vision for Performance Materials and supports the business units in identifying projects with growth potential and tapping new markets. We evaluate the economic success of our projects and expand our activities to encompass neighboring areas in growing markets.

Display Solutions

In our Display Solutions business unit, our liquid crystal technology UB-FFS (ultra-brightness fringe-field switching) continues its successful growth thanks to new product qualifications and rising demand in the liquid crystal displays (LCD) sector for mobile devices, especially mobile phones and tablet PCs.

The development of high-resolution 4K and 8K TV sets continues to pose a challenge to the light efficiency of LC displays. We are therefore actively working to expand UB-FFS technology with our UB-Plus liquid crystal materials.

Our aim is to increase the efficiency of applications for large-format TV sets and display panels by 10% to 15%. The liquid crystal technology PS-VA (polymer-stabilized vertical alignment) remains predominant when it comes to large-format TV sets. Here, our latest materials provide additional performance benefits and improve the processing efficiency in the production of TV sets that are based on PS-VA technology. Moreover, we have successfully demonstrated our manufacturing expertise with respect to the new liquid crystal technology SA-VA (self-aligned vertical alignment). We are now focusing our attention on applications for spezialized display products from the premium segment through to TV applications produced in large numbers, as this technology offers the high contrast and image quality of the PS-VA technology while also enabling improvements in display design and panel production, for example through the reduction of waste and energy consumption in the production of LCDs.

Semiconductor Solutions

The technology area of gas-phase deposition materials (such as atomic layer deposition, ALD) is an area with high growth rates for our Semiconductor Solutions business unit. Thanks to increased research activities in collaboration with original equipment manufacturers and chip producers, we are steadily improving our positioning. Our research projects seek to identify new materials for metallization processes with low resistance and various dielectric characteristics for faster and better processors, servers and data storage density.

We have also invested in the development of advanced removers used in the photolithographic process to provide customers with a green alternative in compliance with upcoming environmental regulations.

We are currently refocusing our product portfolio to better meet the requirements of our customers operating in various compound semiconductor markets such as sensors, radio frequency filters or integrated circuits. Our conductive paste materials offer value propositions to our customers as compared with existing interconnect materials, which are reaching end-of-life status.

To better support our customers, we have expanded our research capacities in the United States, Germany and Taiwan, and are planning further research and production capacity expansions in Korea, Japan and China.

Surface Solutions

In our business with pigments for the automotive industry, we are currently focusing on the development of achromatic pigments. The latest example is our Iriodin® Icy White Pristine for silky, three-coat white stylings. Furthermore, we have expanded our regional application labs to better support the marketing of our innovative clear-coat additives, for example those manufactured on a polysilazane basis. As part of the Smart Effects initiative, we are focusing the development of cosmetic pigments on matte effects (Allure series) and luster effects (Lights series). In addition, active ingredients of natural origin are a focal topic for new cosmetic solutions.

People

"Bring Your Curiosity to Life" – our promise as an employer describes how we collaborate, how we advance our business, how our employees can develop within the company and who we are. Our development into a global science and technology company over the past 350 years would not have been possible without the passion, creativity and curiosity of our employees. And we are certain that our current and future employees safeguard our economic success. They create innovations for patients and customers, and secure our ability to compete. For this reason, the development of all our employees is such an important concern to us. In short, we are working to create an environment where people are able to develop and to reach their full potential.

A career with Merck KGaA, Darmstadt, Germany, is enriching – both from a professional and a personal perspective. We offer the necessary framework conditions that meet the individual needs of our employees, that encompass an exciting range of tasks and advanced training possibilities, furthering flexible forms of cooperation and a culture of mutual esteem and respect. The latter is particularly important as our workforce represents a broad range of nationalities, cultures, religions and age groups as well as a variety of personal and professional backgrounds. We are convinced that this diversity paired with a corporate culture based on mutual respect strengthens our innovative potential and contributes to our success.

OVERVIEW OF OUR HEADCOUNT FIGURES

As of December 31, 2018, we had 51,749 employees worldwide[1] (2017: 52,941). In 2018, we were represented by a total of 207 legal entities with employees in 66 countries.[2]

DISTRIBUTION OF EMPLOYEES

by region

Driving innovation through curious people

As a science and technology company, we are always looking for new solutions and working to continuously evolve our approaches. Engaged, curious employees are key to our ability to innovate – and therefore also for our success. We need a corporate culture that broadens the knowledge base of our employees, one that creates exciting opportunities and motivates them to take a proactive role in shaping the development of our company.

FOSTERING INNOVATIVE POTENTIAL

Curiosity and a focus on new ideas provide a fruitful basis for innovation and have a positive impact on company performance. In order to create a place – supplementing classic research and development, where we can develop ideas into viable businesses beyond the current scope – we opened the modular Innovation Center in Darmstadt back in 2015. It serves as the prototype for our Innovation Center that we opened in March 2018 as part of the 350-year anniversary festivities. The Innovation Center offers our employees the opportunity to explore new ideas in an inspiring setting and to work on selected projects. Sufficient scope and adequate support, also in the form of a suitable working environment, actively promote the innovative strength of our employees. The strategic orientation of our innovation activities is determined by innovation fields that are related to our business fields and provide potential for revolutionary technologies and business ideas. In 2018, in addition to the existing innovation field of Biosensing and Interfaces, we defined two further fields: Clean Meat and Liquid Biopsy technologies.

In order to contribute external ideas and offer the opportunity of open innovation for our innovation projects, we are building strong relationships with external partners in all industries and target the start-up community via our Accelerator.

Apart from initiatives to generate ideas and advance projects, the Innovation Center offers our employees various training courses on topics such as innovative methods, creative techniques and developing business models. In 2018, initial projects in the Innovation Center reached a milestone by becoming minimum viable products. This includes a solution where our company anchors real objects, such as products, in a blockchain to make supply chains secure and thus protect companies as well as end consumers.

[1] The Consumer Health business was transferred to Procter & Gamble (P&G) on December 1, 2018, and was already classified as a discontinued operation according to IFRS 5 in April 2018. With the completion of the sale, around 3,300 employees joined P&G.
[2] The Group also has employees at sites which are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

VALUING CULTURAL DIVERSITY

We are a global science and technology company with employees who represent a varied cross-section of gender identities, nationalities, cultures, religions, age groups and sexual orientations. They contribute their professional backgrounds, individual life experience and perspectives to their work. We believe that a diverse workforce – paired with a respectful corporate culture – strengthens our ability to innovate and contributes significantly to our business success.

Our Chief Diversity Officer is responsible for the strategic management of diversity and inclusion. The Diversity Council, a body consisting of senior leaders from all business sectors and selected Group functions, is specifically working on the implementation of our diversity strategy, revised in 2018. Key elements of this are recruiting people representing a breadth of qualifications, skills and experiences as well as developing and retaining these people. In addition, we support specific employee networks in order to foster exchange among like-minded individuals. Apart from our women's networks in various countries, we also support networks that promote the interests of the LGBTIQ (lesbian, gay, bisexual, trans, intersex, questioning) community as well as African-American and international employees. Our carer network brings together employees from all over the world who care for a relative.

Our aim is to raise awareness for diversity and inclusion among our employees. We piloted initial training sessions in 2018 to create awareness of unconscious bias, which will be rolled out globally in 2019. Accordingly, around 380 employees have already been given the opportunity to identify their own unconscious thought patterns and stereotypes to help them avoid any unconscious unfair treatment resulting from such bias. We also introduced the Job Analyzer, an online tool that allows job advertisements to be checked for critical wordings prior to their publication, thus fostering gender-neutral communication with those applying for jobs.

As a global employer with intercultural expertise, people from a total of 136 nations work for our company; 24.1% of our employees are German citizens and 73.9% of our employees work outside Germany. At our headquarters in Darmstadt, 11% of our staff comes from 89 different countries.

Women currently make up 44% of our workforce. However, the ratio of women to men varies widely across the different regions, businesses and functions. We are therefore working to raise the proportion of women wherever they are underrepresented, taking into account the situation typical for the industry as well as regional differences.

Demographic change is posing challenges to the society in Germany as well as several other EU countries, the United States, China and Japan. The average age of our employees is slightly above 41. We assume that this figure will continue to rise in the coming years and are preparing for this situation. As part of our range of "Health and Well-being" offers, we specifically promote employee physical and psychological well-being. These offers vary from country to country and are adapted to local circumstances. In addition, we offer multifaceted continuing education throughout our employees' careers.

In Germany, we signed the "Charta der Vielfalt" (Diversity Charter) in 2013, the "Charta der Gleichstellung" (Equal Opportunity Charter) in 2015 and the Inclusion Action Plan of the German Mining, Chemical and Energy Industrial Union (IG BCE) in 2017. By joining these initiatives, we underscore our commitment to fairness and tolerance in the workplace.

Furthering and asking more of talent

We endeavor to identify and develop the abilities of our employees early on. Our objective is to extensively develop current and future employees and offer them interesting advanced training opportunities in order to prepare them for more challenging tasks.

A HOLISTIC RECRUITMENT APPROACH

When filling job vacancies, we pursue a holistic recruitment approach coupled with globally uniform and binding procedures. This starts with an internal job posting before external channels such as job portals and recruitment agencies are used. This process enables us to offer employees better development opportunities. For employees with leadership responsibility, we offer targeted interview coaching to support them in selecting candidates and to establish uniform quality standards.

A globally accessible welcome portal is available to new employees in order to help them prepare for their new job at Merck KGaA, Darmstadt, Germany, and to support their onboarding phase. To further improve the onboarding process, supervisors, Human Resources and new employees can exchange information and documents before their first day of work. In addition, all new employees are assigned an experienced colleague who can help them to familiarize themselves with the daily working routine. Our managers are also given detailed information such as onboarding plans and process descriptions to support them with this task.

VOCATIONAL TRAINING TO RECRUIT YOUNG PEOPLE

In 2018, we again maintained a constant, high vocational training rate in Darmstadt, our largest site. A total of 562 young people were enrolled in vocational training in 24 different occupations at our headquarters in the reporting period. We give unlimited employment contracts to all employees in vocational training who work in occupations for which we have sustainable demand. On average, the post-vocational training hiring rate – taking voluntary terminations into account – was more than 90% over the past five years. We also offer vocational training at other sites in Germany, in which a total of 60 young employees participated.

We promote the professional and social expertise of our employees in vocational training through numerous regional and global project activities. This included the support of a foundation for street children in South Africa in 2018. Furthermore, through our "Start in die Ausbildung" (Starting vocational training) program, we help prepare young people who have not been able to find a vocational training position. The number of interns increased slightly compared to the previous year with 21 participants aged between 16 and 25 years. Although they have a school leaving qualification, they had been searching for a vocational training position for at least one year without success.

Since 2016, we have also been working on a specially developed program to help refugees enter the job market. As part of the "Integrating refugees through training" program, a further group of twelve young people who were forced to flee their home countries started language, technical, cultural, and career-related training to prepare them for vocational training and thus for the labor market.

TARGETED ADVANCED TRAINING AND MAXIMIZING PERFORMANCE CAPABILITY

Our focus on systematic personnel development allows us to sustainably strengthen the performance potential within our company and to increase the motivation of our people. Only by expanding the abilities of each individual can we count on innovative and curious employees and managers in the future and flexibly respond to different requirements.

Employee development at our company is founded on regular exchanges and a culture in which employees aspire to high levels of performance and engagement. As the basis for internal strategic talent management, the performance and potential management process is globally aligned for all employees in accordance with the same principles and is part of a shared IT system. We systematically combine talent recognition with performance assessments based on employee target agreements, as we are convinced that ongoing feedback helps all employees to grow in terms of their performance and potential. Regular individual assessments permit us to more readily identify high-potential employees and to further them accordingly. Clear objectives, differentiated and open feedback, and individual development plans are thus important prerequisites for both the personal development of every individual and the success of the company.

Furthermore, we have established our "Science Network". Due to the broad positioning of our company, we do not have a central research and development organization that unites expertise across our businesses. Through this project we are promoting the establishment of a science community within the company to accelerate the exchange of innovative ideas and facilitate collaboration among all our R&D employees. One element of this project is the "Continuous Performance Dialogues" between 1,300 employees and their supervisors to align performance and potential appraisals with research and development needs. Other aspects focus on the advanced training of experts and their career paths and on the transfer of knowledge within the network.

Global classroom training courses and workshops developed specifically for teams help our employees develop and build individual abilities in line with new requirements and perspectives. In 2018, more than 4,100 employees participated. Digital solutions in the form of more than 3,735 e-learning and languages courses are available to our employees. To enable our employees to realize their full potential, we also provide local business- and function-related offers. All measures are documented in a globally standardized development plan.

Individual development opportunities are also supported by our job architecture. It applies globally and enables us to harmonize all positions and to simplify their classification. This job architecture defines three fundamental career types: managers, experts and project managers. They are all equivalent. Employees who wish to advance in their careers and aim for a top position within the company can also do so via the expert and project manager career paths.

Building empowered leaders

One of the major duties of our managers is to motivate and encourage employees to show their innovative strength. A dialog in a spirit of partnership, the development of strategic competencies and the continuous further development of our leaders help to build trust and to strengthen our company's success over the long term.

STRATEGIC COMPETENCY DEVELOPMENT

A transparent competency model is a further pillar of our personnel development efforts. Managers and employees should show strategic competence by being purposeful, future-oriented, innovative, results-driven, collaborative and empowering. By demonstrating these qualities, our managers can build a strong culture of collaboration based on curiosity, creativity and trust. In addition, our leaders are expected to set an example by living our company values and taking responsibility for their own decisions. Based on this competency model, we have defined six leadership behaviors that summarize the conduct we expect from our leaders.

To assess the performance and potential of every individual and to establish an effective leadership culture, regular and differentiated feedback is of utmost importance. In this way, employees and supervisors can develop a shared vision, execute the business strategy and further develop a unifying corporate culture.

USING THE OPPORTUNITIES PROVIDED BY DIGITALIZATION

The digital transformation has been leaving its mark on the world of work for a long time now. New, agile ways of working are thus increasingly gaining in importance. At our company, we want to support this trend actively, which is why we are offering our employees many opportunities for digital and innovative working.

Using the big data applications developed by People Analytics within Human Resources, managers receive quick and targeted answers to personnel-related questions. In addition to the traditional master data, the software also holds information on compensation, performance and potential as well as on commitment or succession planning and is able to link this data. This means that leaders have a comprehensive data set at their disposal, which they are able to use taking into account data protection provisions. The analyses are based on algorithms and allow the early identification of trends (predictive analysis) and data-based decisions.

Our manager and employee self-services are another good example of modern working methods. Employees can use these services to manage their own data, retrieve information and perform personnel-related tasks independently.

Digitalization also features in our training and advanced training programs as IT skills are becoming increasingly important. At the same time, digital media create new ways of learning. For this reason, we are integrating topics such as 3D printing and artificial intelligence into our training content with increasing frequency. We are also increasingly relying on new kinds of learning and innovation methods, such as scrum or design thinking.

DIVERSITY AND MANAGEMENT

In order to manage our global and diverse organization, we need managers who can build international teams and promote international collaboration so as to contribute to a productive and flexible working environment. We seek managers whose inclusive leadership style also reflects different employee and customer traits. This opens up career opportunities for talented employees from all areas of our company and ensures a broad experience base as well as differentiated decision-making.

At our company, many teams work across sites and internationally. The diversity of competencies and experiences among the team members offers tremendous potential that our leaders can make use of. Internationality and a global mindset characterize our company culture and are therefore mirrored by our international management team. In 2018, 63.6% of our executives were not German citizens. Altogether, 70 different nationalities are represented in such positions.

Our goal for the period until 2021 is to maintain the proportion of women leaders at a stable level of 30%, and we are working to further increase the representation of women in leadership positions and business units where they are still underrepresented. To achieve this objective, during the reporting period we formed special teams that are responsible for developing goals and measures at departmental level to help us move female candidates into positions in different areas and hierarchies. At the end of 2018, women occupied 32.3% of leadership roles Group-wide. These figures are steadily increasing across the company as a whole, but not consistently across business units, Group functions and hierarchical levels. The report on stipulations to promote the proportion of women in leadership positions at Merck KGaA, Darmstadt, Germany, pursuant to section 76 (4) and section 111 (5) of the German Stock Corporation Act (AktG) can be found in the Corporate Governance section of this report.

MANAGEMENT PROGRAMS FOR EXECUTIVES

We use targeted advanced training to nurture our top talent and senior executives. The eight-month International Management Program strengthens the leadership competencies and global thinking of top talent at the start of their career. In cooperation with leading international universities, our Company University has been offering a cross-regional, modular advanced training program since 1999. To date, 397 members of top management have taken part. Furthermore, our company cooperates globally with academic institutions in order to support employees who wish to earn an MBA. In 2015, we launched management programs specifically for people managers in growth markets, which focus on business management and Group-

specific topics. These programs are offered in China, the Middle East, Africa and Latin America, for example. Moreover, in 2018 we ran the "Managerial Foundation Program" (MFP) for new people managers in 20 countries with 795 participants. The "Advanced Management Program" (AMP) for experienced leaders ("managers of managers") builds on the MFP and was attended by 242 people managers in five countries. For the top management we also offer a "Global Leadership Program" (GLP). This program addresses issues such as leadership culture and prepares participants for the leadership challenges of tomorrow. Since 2016, 678 leaders have participated in the GLP.

In 2018, we once again expanded our workforce pool to internally fill management positions when they become vacant. In 2018 once again, most management position vacancies were filled by internal candidates. In addition, we recruited highly qualified external executives in order to add new perspectives to our long-standing in-house expertise.

Differentiated solutions to support employee well-being

As an employer, we take on responsibility for the well-being of our people and offer a wide range of opportunities to optimize work-life balance and to protect their health and safety.

FOSTERING WORK-LIFE BALANCE

As a responsible employer, the physical and mental well-being of our employees is extremely important to us. To enable employees to plan their lives independently and to stabilize their long-term satisfaction at a high level, providing a flexible and health-oriented working environment is a special focus of our human resources work.

A healthy work-life balance is a crucial precondition for the performance ability and motivation of our people. We plan to roll out a Group-wide guideline on flexible working in 2019. At present, we offer our employees at many sites around the world various flexible and innovative working models. The Mywork at Merck KGaA, Darmstadt, Germany, working model allows employees at the German sites in Darmstadt and Gernsheim, for example, to freely choose their working hours and location in agreement with their teams and supervisors. In addition, we also introduced the Mywork at Merck KGaA, Darmstadt, Germany, for Merck Accounting Solutions & Services Europe GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Export GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Schuchardt OHG, Hohenbrunn, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Selbstmedikation GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Chemicals GmbH GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. Employees no longer record their time electronically and must document their hours only if they exceed their standard working hours within the agreed working time framework. At the end of December 2018, a total of 5,698 employees made use of this model. In 2018, 4.8% of our employees worldwide worked part-time, 12.5% of whom are men.

By offering information, advice and assistance in finding childcare and nursing care as home and garden services, we help employees to reconcile the demands of their professional and personal lives. At various sites, employees benefit from childcare options that we subsidize. For example, a daycare center has been operating at the Darmstadt site, looking after children between the ages of one and twelve, for over 50 years. The adjacent new building houses a nursery for up to 60 children between the ages of one and three years. During the orientation phase, our employees can make use of additional offices for parents at the daycare center. In addition, a good ratio of staff to children is important to us to reliably supervise the children.

A TRANSPARENT AND FLEXIBLE EMPLOYEE REWARD SYSTEM

At our company, we reward the performance of every individual through appropriate and competitive total compensation. For years, we have been achieving this through global processes and programs that are supported by digital platforms. We also offer our managers flexible, market- and needs-oriented compensation tools. These support well-informed decisions and thus provide comprehensible, performance- and position-based compensation. Apart from monetary compensation components, we also offer our employees attractive fringe and social benefits. Our fringe benefits feature globally under the internal "benefits4me" brand. Its offerings comprise three pillars:

- Company benefits including a company pension
- Health and well-being
- Service offers

Specific benefit packages are in place at a national level to meet the different needs of our employees using well-established management mechanisms. Focusing more closely on individualized fringe and social benefits in the future will continue to enable our employees to individually choose those benefits that best meet their personal situation and stage of life.

A CONSTANT FOCUS ON HEALTH AND SAFETY

Workplace safety and health protection are the highest priority at Merck KGaA, Darmstadt, Germany. It is especially important to us to do everything in our power to prevent workplace-related illnesses and accidents. We apply the lost time injury rate (LTIR) as an indicator to determine the success of measures aimed at accident prevention as well as occupational health and safety. This key performance indicator describes the number of workplace accidents resulting in lost time of one day or more per one million working hours. After having reached the goal of 2.5 that we had set in 2010, in 2015 we set ourselves a new, ambitious goal: By 2020 we intend to sustainably lower the LTIR to 1.5. With an LTIR of 1.3 in 2018, we overachieved this goal.

Since 2010, we have been using the "BeSafe!" program to further expand our occupational safety activities. Uniform standards as well as local modules to meet specific safety requirements at individual sites can help achieve a steady improvement in the current situation. The program focuses on engaging managers in the safety culture and building their buy-in; it aims to make safety an intrinsic value and empower our employees to take responsibility for their own safety. In 2018, we continued to sensitize our employees to workplace hazards through numerous awareness campaigns.

Since 2010, our company has been presenting the Safety Excellence Award annually in order to underscore the importance of safety. It is granted to all production sites with no workplace accidents on record for the year; in 2018, it was awarded to 62 out of 90 sites.

REGULAR GLOBAL EMPLOYEE SURVEYS

We want to create a working environment that empowers our employees to think outside of the box and find new solutions, opening the door to creative ideas and the discovery of new market opportunities. In order to promote this and to allow us to carry out even better comparisons both within the company and with our competitors, we conduct Group-wide employee engagement surveys every year. In this way we ensure a regular exchange between employees, leaders and the top management. The honest feedback we receive from staff shows us whether the aforementioned measures and initiatives are successful as well as highlighting areas where we can improve further.

In October 2018, the global employee engagement survey was again conducted in 22 languages and the status of implementation reviewed. Around 45,000 employees (86%) took part. Our Group-wide score, which indicates how attached our employees feel to the company, was 61%. We are thus on a par with other pharmaceutical and chemical companies. These surveys are supplemented by smaller "snapshot surveys", where employees are asked about selected strategic issues or projects.

The results are used to identify strategic focus areas and they feed into the company-wide work on an ongoing basis.

OVERVIEW OF EMPLOYEE FIGURES[1]

			Group (overall) Dec. 31, 2016	Group (overall) Dec. 31, 2017	**Group (overall) Dec. 31, 2018[2]**
Number of employees	global, total		50,414	52,941	51,749
	by region	Asia-Pacific (APAC)	10,754	11,294	10,486
		Europe	24,438	25,980	25,792
		Latin America	4,140	4,050	3,340
		Middle East and Africa (MEA)	1,045	1,097	1,153
		North America	10,037	10,520	10,978
Number of employees (FTE – full-time equivalents)	global, total		49,652.7	52,223.5	51,039.8
	by region	Asia-Pacific (APAC)	10,725.3	11,272.1	10,462.9
		Europe	23,727.1	25,302.5	25,126.8
		Latin America	4,136.5	4,046.2	3,339.5
		Middle East and Africa (MEA)	1,041.8	1,096.1	1,151.1
		North America	10,022.0	10,506.7	10,959.6
Number of countries			66	66	66
Number of legal entities	global, total		215	217	207
Number of nationalities	global, total		129	131	136
Number of nationalities working in Germany			91	97	95
Percentage of employees with German citizenship			23.1%	23.2%	24.1%
Percentage of employees working outside Germany			75.3%	74.9%	73.9%
Percentage of employees with global managers			9.7%	10.2%	10.6%
Percentage of women in the workforce	global, total		42.8%	43.1%	44.0%
	in Germany		38.6%	39.1%	38.9%
Percentage of women in leadership positions (= role 4 or higher)	global, total		28.8%[3]	30.3%[3]	32.3%[5]
	in Germany		28.7%[3]	29.7%[3]	30.9%[5]
Percentage of executives (= role 4 or higher)	global, total		5.7%[3]	6.0%[3,4]	6.5%[5]
	Percentage of executives who are not German citizens		64.7%[3]	64.4%[3]	63.6%[5]
	Number of nationalities		70[3]	65[3]	70[5]
Number of employees in vocational training in Germany			576	588	604
Vocational training rate			5.1%	4.4%	4.1%
Number of employees in the model (Germany) of the Mywork at Merck KGaA, Darmstadt, Germany			4,507	5,267	5,698
Percentage of employees working part-time	global, total		4.7%	4.6%	4.8%
	Men		10.6%	10.7%	12.5%
Percentage of employees aged 17 – 29 years	global, total		14.7%	14.5%	14.5%
Percentage of employees aged 30 – 49 years	global, total		62.5%	62.1%	61.1%
Percentage of employees aged 50+	global, total		22.8%	23.4%	24.4%
Average age globally			41.3	41.4	41.7
Average age by region	Asia-Pacific (APAC)		36.7	36.9	36.9
	Europe		42.4	42.5	42.8
	Latin America		39.9	40.3	40.4
	Middle East and Africa (MEA)		39.3	39.4	39.2
	North America		44.3	44.1	44.1
	Germany		42.9	43.0	43.3
Average length of service	global, total		9.9	9.8	10.0
Average length of service in Germany			14.2	14.0	14.5

[1] The Group also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by the Group and therefore may deviate from figures in the financial section of this report.

[2] The Consumer Health business was transferred to Procter & Gamble (P&G) on December 1, 2018, and was already classified as a discontinued operation according to IFRS 5 in April 2018. With the completion of the sale, around 3,300 employees joined P&G.

[3] Not including Sigma-Aldrich legal entities in Germany or Allergopharma.

[4] Ratio adjusted retrospectively.

[5] Not including the Sigma-Aldrich legal entity in Steinheim (Germany) or Allergopharma.

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Report on Economic Position

Macroeconomic and Sector-Specific Environment

According to the most recently available figures from the International Monetary Fund (IMF), the global economy faced rising growth expectations in 2018. Forecast growth in 2019 is expected to be slightly below the level of the two previous years. Although the global economy thus continues to expand, growth in the third quarter of 2018 fell short of expectations in a number of economies. Risks to global growth include, in particular, a further rise in trade barriers and the outflow of capital from emerging economies.

Expressed in figures, according to the latest IMF forecasts global gross domestic product (GDP) rose by 3.7% in 2018, equivalent to a slight decline in the growth rate in comparison with 2017 (3.8%). Strong regional differences and differences between industrial nations and emerging economies could be seen. Industrial nations registered a slight weakening of growth to 2.3% (2017: 2.4%). At 4.6% (2017: 4.7%), growth in the emerging economies and developing countries also declined slightly. The GDP of the United States, the world's largest economy, grew by 2.9% (2017: 2.2%). By contrast, the eurozone recorded a weakening of GDP growth to 1.8% (2017: 2.4%). The emerging economies of Asia registered stable growth of 6.5% (2017: 6.5%). As in 2017, India at 7.3% (2017: 6.7%) and China at 6.6% (2017: 6.9%) were the strongest growth drivers. In the industrialized countries of Asia, the GDP of Japan grew by 0.9% (2017: 1.7%) and that of Taiwan by 2.7% (2017: 2.9%). Korea registered growth of 2.8% (2017: 3.1%).

Organic sales growth of the Group was above the IMF's global growth expectations in 2018 and came to 6.1%. It was supported by all regions. Asia-Pacific accounted for the largest share of growth across the Group at around 42%, followed by Europe at 24.6%, North America at 20.2%, Latin America at 11.5% and the Middle East and Africa at 1.8%. Growth was driven primarily by the Healthcare and Life Science business sectors, while Performance Materials came in slightly above the 2017 figure. Growth in the Asia-Pacific region was supported by all business sectors. Healthcare and Life Science made a positive contribution in Europe as well as in the Latin America region. Growth in North America was principally the result of operations in the Life Science business sector.

	Development 2018[1]	Development 2017
Healthcare		
Global pharmaceutical market	4.8%	2.7%
Market for multiple sclerosis therapies[2]	2.6%	7.4%
Market for type 2 diabetes therapies[2]	9.7%	9.2%
Market for fertility treatment[2]	9.2%	7.4%
Market for the treatment of colorectal cancer[3]	5.1%	–0.7%
Life Science		
Market for laboratory products	3.6%	3.4%
Share of biopharmaceuticals in the global pharmaceutical market[2]	27.9%	25.9%
Performance Materials		
Growth of wafer area for semiconductor chips	7.6%	10.0%
Growth of LC display surface area[4]	8.6%	6.0%
Global sales of cosmetics and care products	3.3%	3.5%
Global automobile sales volumes	0.0%	2.2%

[1] Predicted development. Final development rates for 2018 were not available for all industries when this report was prepared.
[2] Growth rates based on market data in local currency, translated at a constant euro exchange rate. The IQVIA market data on the growth of indications are based on current figures, including the third quarter of 2018. Annual growth based on the values for the past 12 months. The type 2 diabetes market excludes the United States, since this market is insignificant to the Group.
[3] Growth rates based on market data stated in U.S. dollars. Market data from EvaluatePharma on the growth of indications are based on published company reports and are subject to exchange rate fluctuations.
[4] Growth of display area is a pure volume indicator, which is counteracted by a negative price momentum.

HEALTHCARE

In the latest study published in October 2018 by the pharmaceutical market research firm IQVIA entitled "Market Prognosis 2018–2022", the growth of the global pharmaceutical market for 2018 is quantified at 4.8%. By comparison, in 2017, sales growth was only 2.7%. As was already the case in 2017, the EMEA and Latin America regions were the main contributors to growth in 2018. North America also fueled growth. In the United States, growth accelerated substantially to 5.2% (2017: 1.4%). Latin America continued to see strong growth of 8.3% (2017: 8.0%). The EMEA region generated growth of 5.0% (2017: 3.6%). The Asia-Pacific region recorded a slight increase in growth to 3.2% (2017: 2.8%).

Not only the growth of the pharmaceutical sector as a whole, but also in particular the development of the biopharmaceutical market is relevant for our business. According to IQVIA, the market volume of biological pharmaceuticals was approximately € 249 billion in 2018. In recent years, the share of the global pharmaceutical market accounted for by these products has grown continuously and already amounted to 27.9% in 2018 (2017: 25.9%). Globally, the largest share, or 37.8%, was attributable to the U.S. market.

The developments in the therapeutic areas of relevance to the Group generally reflect robust growth, albeit with different trends. The market for the therapeutic area type 2 diabetes excluding the United States showed a positive trend with a growth rate of 9.7% (2017: 9.2%) and those for fertility and the treatment of colorectal cancer also saw positive growth rates of 9.2% (2017: 7.4%) and 5.1% (2017: –0.7%), respectively, whereas the market for multiple sclerosis patients registered a weakening of growth to 2.6% (2017: 7.4%).

LIFE SCIENCE

Our Life Science business sector is a leading supplier of products and services for both research and applied laboratory applications, as well as for formulating, purifying, manufacturing and quality-assuring drug therapies of chemical and biological origin.

According to the market research firm Frost & Sullivan, the laboratory product market relevant to Research Solutions and Applied Solutions achieved growth of 3.6% in 2018 (2017: 3.4%). Strong growth continued over the course of the year and was driven primarily by customers in the biopharmaceutical industry, specifically emerging biotech companies. The European market grew by 2.4% compared with the previous year (2017: 3.5%). The weakening of growth is attributable to continuing uncertainties, for example resulting from Brexit. The market in the United States grew by 4.2% (2017: 3.1%), driven by increased National Institutes of Health (NIH) funding and the tax reform. The emerging countries recorded higher growth rates, particularly in China and India. The Chinese market grew by 7.0% (2017: 7.8%). Although Chinese GDP growth is slowing down and the tariff and trade relationships have led to uncertainties in procurement, China remains interested in financing scientific tools and in product investments in the laboratory area, which are considered key priorities of the 13th Five-Year Plan. India generated growth of 8.2% (2017: 8.0%) with laboratory products, and is focusing more strongly on supporting academic and government research.

The demand for Process Solutions products depends heavily on the sales of biopharmaceutical companies with biologics as well as on the productivity of their research & development activities.

According to IQVIA, the market volume of biotechnological pharmaceuticals grew in 2018 to € 249 billion (equivalent to 27.9% of the global pharmaceutical market). Around 7,800 biotechnological drug candidates were in preclinical phase 2 of clinical development. In 2018, monoclonal antibodies accounted for around 25% of these drug candidates (2017: 23%). Biosimilars are a small, but fast-growing part of the pharmaceutical market. For 2018, annual sales of biosimilars were estimated at US$ 5.95 billion; this figure is expected to increase to US$ 23.63 billion by 2023.

PERFORMANCE MATERIALS

The semiconductor industry is the most important market for business with material for integrated circuits (IC Materials). The growth rates of the wafer area for semiconductor chips is independent of cyclical prices, for example for memory, and is a good indicator of demand for semiconductor materials. According to the global industry association SEMI, the area of delivered wafers rose by just under 8% in 2018, mainly thanks to consistently strong demand from consumers. Sales of semiconductor manufacturers, which have grown even more sharply, are affected by the price trend of DRAM and NAND memory chips.

With its Liquid Crystals business, the Group is the leading producer of liquid crystal mixtures for the display industry. The growth rates of display surfaces totaled on average around 7% in 2017 and 2018, according to surveys by market researchers at IHS Display-Search. This growth was mainly attributable to increasing average display size amid slightly declining sales volumes. Liquid crystals will continue to play a key role in the display industry in the future. OLED technology, for which the Group also ranks among the leading material suppliers, is gaining importance in the high-quality display sector.

The markets for automotive coatings and cosmetics are crucial to our Pigments business. As reported by IHS, global automobile sales in 2018 remained at the 2017 level. Only a few emerging economies recorded growth while Europe, North America and China showed a slightly negative trend after high 2017 figures. In the second half of 2018, in particular, economic relationships between the United States and China together with political uncertainties in Europe contributed to a weakening of demand. According to Statista, global sales of cosmetics and care products rose by approximately 3%.

Review of Forecast against Actual Business Developments

The forecast of the Group for fiscal 2018 published in the Annual Report for fiscal 2017 comprised the three business sectors of Healthcare, Life Science and Performance Materials. On September 5, 2017, our company had announced that it was examining strategic options for its Consumer Health business. This analysis had not been completed by the time the 2017 Annual Report was prepared, and as of December 31, 2017, the Executive Board concluded that a divestment of the Consumer Health business within twelve months was not regarded as highly likely. As a result, the forecast at the time included the Consumer Health business.

On April 19, 2018, we announced the signing of an agreement to divest our global consumer health business to Procter & Gamble (P&G) for around € 3.4 billion in cash. At the time, the transaction was expected to be signed at the end of the fourth quarter of 2018. Signing took place on November 30, 2018. In order to ensure the systematic continuation of the forecast from the 2017 Annual Report and assess the further development with respect to the Consumer Health business, we presented our forecast for the expected sales and earnings of the Group and our Healthcare business sector as of the first quarter of 2018 both with and without the Consumer Health business. In its report on the second quarter of 2018, the Consumer Health business was classified as a "discontinued operation" in accordance with IFRS 5. Consequently, the prior-year figures and the figures for the first quarter of 2018 were adjusted accordingly, as was our forecast. At the same time, the key drivers of the forecast – organic sales and EBITDA pre growth for the Group and for the business sectors together with their exchange rate effects in each case – remained unchanged.

Due to this portfolio change, the following analysis reflects the new structure of the Group: it takes the Consumer Health business into account as "discontinued operation".

NET SALES

For 2018, we had forecast moderate organic net sales growth for the Group. In the second half of 2018, we recorded more dynamic sales growth in all business sectors than expected at the start of the year; this means that for 2018 as a whole we realized a strong organic rise in net sales of +6.1%, thereby slightly exceeding our forecast.

Due to the emerging unfavorable development of the exchange rate between the euro and the U.S. dollar and various currencies in the growth markets at the start of the year, we anticipated a moderately negative exchange rate effect on our net sales. At the same time, we assumed that the charges would be greater in the first half than in the second half of 2018. This assessment was confirmed: the negative exchange rate effect in 2018 as a whole was –3.9%. From the middle of 2018 onward a perceptible easing of the exchange rate between the euro and the U.S. dollar was observed, as expected, although a number of different currencies in the growth markets, particularly the Latin American currencies, showed a less favorable than expected development in the second half of 2018.

Healthcare

In 2018, our Healthcare business sector generated solid organic sales growth of +5.2% (or € 324 million), thus meeting our forecast of moderate organic growth. Sales growth in 2018 was supported by the continuation of good organic sales growth in the General Medicine & Endocrinology and Fertility business units in our growth markets (€ 179 million) and the contribution to sales made by our newly approved products Bavencio® and Mavenclad®, which slightly exceeded our expectations. Both products together generated sales of € 160 million in 2018 and thus contributed € 138 million to organic sales growth.

Life Science

For our Life Science business sector, at the beginning of the year we had forecast solid organic sales growth, slightly above expected medium-term market growth of around +4% per year. The business sector achieved very strong organic growth of +8.8% in 2018. This means that it exceeded the top end of our forecast of between +7% and +8% that we had raised in our report on the third quarter of 2018, thanks to the very positive organic sales development in the fourth quarter of 2018. As expected, Process Solutions was the most dynamic business unit, delivering the largest contribution to organic sales growth within Life Science. As expected, Applied Solutions and Research Solutions also contributed positively to the organic sales performance, albeit to a significantly lesser extent than Process Solutions.

Performance Materials

Contrary to our original expectation of a slight to moderate decline in organic sales, the Performance Materials business sector generated a slight increase in organic sales of +1.7% in 2018. Since the third quarter of 2018, various capacity expansion projects by our customers in the display industry have prompted an increase in

demand for our liquid crystal materials in the Display Solutions business unit. Prompted by this development and by sales growth of Semiconductor Solutions in line with our expectations, we raised our estimate of organic sales growth to between –1% and +1% in our report on the third quarter of 2018. This temporary upturn continued in the liquid crystal business in the fourth quarter of 2018, as a result of which organic sales growth of the Performance Materials business sector in 2018 slightly exceeded our updated forecast range, at +1.7%.

EBITDA PRE

For 2018 we expected a slight organic decline in EBITDA pre over the prior year for the Group. Furthermore, because of the difficult foreign exchange environment, we expected negative exchange rate effects to depress EBITDA pre by between –4% and –6% over the prior year. In 2018, EBITDA pre came to € 3,880 million, equivalent to a decrease of –10.5% compared with the prior year (2017: € 4,246 million). The organic decline of –1.6% entailed by this figure was in line with our forecast. By contrast, at –8.9% the foreign exchange effect on EBITDA pre in 2018 as a whole was substantially more negative than expected at the start of the year, although it was in line with the range of between –8% and –10% which we had adjusted in the course of our reporting on the third quarter of 2018. The expected advantageous development of the euro against the U.S. dollar in the second half of 2018 was more than offset by the continuing depreciation of various emerging market currencies versus the euro, particularly of the Latin American currencies. During this period in 2018, the Argentine peso and the Brazilian real performed significantly worse than we had expected at the start of the year.

Healthcare

For our Healthcare business sector we are forecasting a slight organic decrease in EBITDA pre over the prior year due to the continuing rise in research and development expenses to develop our pipeline, particularly in immuno-oncology, and the disappearance of exceptional income from the prior year and a slight decline in organic EBITDA pre over the prior year. In addition, we had expected moderately negative exchange rate effects. In 2018, EBITDA pre in Healthcare amounted to € 1,556 million (2017: € 1,773 million). This is equivalent to a decline of –12.2% over 2017; the organic drop of –1.6% corresponded to the forecast we issued at the start of the year. The exchange rate effects had a substantially greater negative impact than expected at the start of the year. As a result, in our reporting on the third quarter of 2018 we changed our forecast range to between –9% and –11% and closed out the year 2018 at –10.7%.

Life Science

For Life Science we had expected organic EBITDA pre growth to be similarly dynamic as in 2017 at around +8% due to the expected organic sales growth and continuing realization of synergies from the acquisition of Sigma-Aldrich, which remain on schedule. With € 1,840 million, the business sector delivered organic growth of +7.0% and was thus below the forecast range we had given at the beginning of the year. The exchange rate developments depressed EBITDA pre by –3.9% and thus corresponded to our forecast of a moderately negative exchange rate effect.

Performance Materials

Owing to the expected corrections in the Display Solutions business, we forecast an organic percentage decline in EBITDA pre for the Performance Materials business sector totaling a mid-teen percentage figure at the start of the year. For the exchange rate effects we moreover projected a moderately negative charge on EBITDA pre over 2017. For 2018 as a whole, Performance Materials achieved EBITDA pre of € 786 million. This corresponded to a drop of –19.8% over 2017, of which –12.9% was attributable to the organic business performance and a further –6.9% to exchange rate developments. Both key financial indicators were thus within the ranges we had indicated at the start of the year.

Corporate and Other

EBITDA pre of Corporate and Other, which reached a level of € –381 million in 2018, was within our forecast range of € –360 million to € –400 million that we specified at mid-year. Compared with the prior-year figure of € –292 million this corresponded to a rise in costs of 30.6%. This development was primarily attributable to losses from our currency hedging, which were higher in the second half of 2018 than had been expected at the start of the year. We did, however, reach the forecast we issued at the start of the year, which provided for an increase in expenses for Corporate and Other amounting to a low single-digit percentage figure.

BUSINESS FREE CASH FLOW

For 2018, we expected business free cash flow of the Group to see a low double-digit percentage decline. We met this forecast with a decrease of 21.4%. The Healthcare business sector reported a decline of 22.0% compared with the previous year, which was lower than the single-digit percentage fall we had forecast at the start of the year. This development was primarily attributable to the sale of the Consumer Health business, which had not yet been anticipated when the forecast was made at the start of the year. The transfer of the EBITDA pre of the divested business had a particularly significant impact. The business free cash flow of the Life Science business sector was more or less stable, declining by 0.7%. This is in line with the small percentage decrease we had forecast. For the Performance Materials business sector we anticipated a double-digit decline in 2018. The drop of 35.1% – essentially the result of lower EBITDA pre – thus corresponded to our expectations.

GROUP

	Net sales	EBITDA pre	Business free cash flow	EPS pre
Actual results 2017 in € million	14,517	4,246	3,193	€ 5.92
Forecast for 2018 in the 2017 Annual Report[1]	Moderate organic growth Moderately negative exchange rate effect	Slight organic decline Moderately negative foreign exchange effect of –4% to –6%	Low double-digit percentage decline	
Main comments	Moderate organic growth in Healthcare due to strong dynamics in growth markets as well as increasing sales of Mavenclad® and Bavencio® Solid organic growth in Life Science, slightly above expected market growth Slight to moderate organic decrease in Performance Materials owing to the ongoing adjustment processes in the Liquid Crystals business Negative foreign exchange effect, driven primarily by the exchange rate of the U.S. dollar and currencies of various growth markets	In Healthcare continued high investments in research and development as well as in marketing and sales; absence of positive one-time effects from the previous year Organic sales growth and continued realization of planned synergies from the integration of Sigma-Aldrich in Life Science Ongoing adjustment processes in the Liquid Crystals business that will not be offset despite the enhanced diversification of Performance Materials and active cost management Moderately negative foreign exchange effect, particularly owing to the development of the U.S. dollar and currencies of various growth markets	Lower EBITDA pre and investments in property, plant and equipment, as well as digitalization initiatives, higher inventories due to changes in the product mix and volume growth	
Forecasts for 2018 in the interim report:				
Q1/2018	Organic growth +3% to +5% Exchange rate effect –4% to –6% ~15,000 to 15,500 (excluding Consumer Health ~14,000 to 14,500)	Organic decline –1% to –3% vs. 2017 Exchange rate effect –5% to –7% ~3,950 to 4,150 (excluding Consumer Health ~3,750 to 4,000)	~2,460 to 2,770 (excluding Consumer Health ~2,310 to 2,620)	EPS pre € 5.30 to € 5.65 (excluding Consumer Health business € 5.00 to € 5.40)
Q2/2018	~14,100 to 14,600 Organic growth +3% to +5% vs. 2017 Moderately negative foreign exchange effect –3% to –5%	~3,750 to 4,000 Organic decline –1% to –3% vs. 2017 Exchange rate effect –5% to –7%	~2,380 to 2,670	€ 5.00 to € 5.40
Q3/2018	~14,400 to 14,800 Organic decline +4% to +6% vs. 2017 Moderately negative foreign exchange effect –3% to –5%	~3,700 to 3,900 Organic decline –1% to –3% vs. 2017 Exchange rate effect –8% to –10%	~2,340 to 2,630	€ 5.00 to € 5.30
Results 2018 in € million	14,836 (+2.2%: +6.1% Organic, 0.0% Portfolio, –3.9% Currency)	3,800 (–10.5%: –1.6% Organic, 0.0% Portfolio, –8.9% Currency)	2,508 –21.4%	5.10 –13.9%

[1] The 2018 forecast in the 2017 Annual Report included the Consumer Health business.

Figures in € million unless otherwise specified.

HEALTHCARE

	Net sales	EBITDA pre	Business free cash flow
Actual results 2017 in € million	6,190	1,773	1,314
Forecast for 2018 in the 2017 Annual Report[1]	Moderate organic growth Moderately negative exchange rate effect		Single-digit percentage decline
Main comments	Organic sales growth in growth markets will compensate for the organic decline in Rebif® sales, which is expected to be in the high single-digit percentage range Continued price pressure in Europe and also in the Asia-Pacific as well as Middle East and Africa regions Bavencio® and Mavenclad® will contribute visibly to sales growth Solid organic growth of our Consumer Health business Negative foreign exchange effect, driven primarily by the exchange rate of the U.S. dollar and currencies of various growth markets	Continued high investments in research and development as well as in marketing and sales; absence of positive one-time effects from the previous year Negative foreign exchange effect, particularly owing to the development of the U.S. dollar and currencies of various growth markets	Decline in EBITDA pre Increase in working capital due to product mix effects
Forecasts for 2018 in the interim report:			
Q1/2018	Moderate organic growth Moderately negative foreign exchange effect	Organic decline of –1% to –2% Exchange rate effect –5% to –7% ~1,770 to 1,830 (excluding Consumer Health ~1,580 to 1,650)	~1,140 to 1,240 (excluding Consumer Health ~1,000 to 1,080)
Q2/2018	Moderate organic growth +3% to +5% Moderately negative foreign exchange effect –4% to –6%	~1,580 to 1,650 Organic decline of –1% to –2% Exchange rate effect –5% to –7%	~1,060 to 1,140
Q3/2018	Solid organic growth +4% to +5% Moderately negative foreign exchange effect –4% to –6%	~1,540 to 1,600 Organic decline of –1% to –2% Significantly negative foreign exchange effect –9% to –11%	~1,030 to 1,110
Results 2018 in € million	6,246 (+0.9%: +5.2% Organic, 0.0% Portfolio, –4.3% Currency)	1,556 (–12.2%: –1.6% Organic, 0.0% Portfolio, –10.7% Currency)	1,025 –22.0%

[1] The 2018 forecast in the 2017 Annual Report included the Consumer Health business.
Figures in € million unless otherwise specified.

LIFE SCIENCE

	Net sales	EBITDA pre	Business free cash flow
Actual results 2017 in € million	5,882	1,786	1,402
Forecast for 2018 in the 2017 Annual Report[1]	Solid organic growth, slightly above expected market growth Moderately negative foreign exchange effect	Organic earnings growth with a similar dynamic as in 2017 Moderately negative foreign exchange effect	Slightly below the prior-year level
Main comments	Process Solutions is likely to remain the strongest growth driver, followed by Applied Solutions Research Solutions will also contribute positively to organic sales development, albeit to a smaller extent No significant portfolio effect from the acquisition of Natrix Separations Negative foreign exchange effect, particularly owing to the development of the U.S. dollar	Positive development resulting from expected sales growth Continuation of the planned realization of synergies from the Sigma-Aldrich acquisition Negative foreign exchange effect, particularly owing to the development of the U.S. dollar	Improved EBITDA pre Higher inventories reflect the expected sales growth and changed product mix
Forecasts for 2018 in the interim report:			
Q1/2018	Organic growth slightly above the medium-term market average of 4% p.a. Moderately negative foreign exchange effect	Organic growth at around the previous year's level of +8% Exchange rate effect −4% to −6% ~1,820 to 1,870	~1,310 to 1,400
Q2/2018	Organic growth of +5% to +6%, slightly above medium-term average market growth of 4% p.a. Moderately negative foreign exchange effect −3% to −5%	~1,830 to 1,880 Organic growth of around +8% Exchange rate effect −3% to −5%	~1,310 to 1,400
Q3/2018	Organic growth +7% to +8%, considerably above medium-term average market growth of 4% p.a. Moderately negative foreign exchange effect −3% to −5%	~1,830 to 1,880 Organic growth of around +8% Exchange rate effect −3% to −5%	~1,300 to 1,390
Results 2018 **in € million**	6,185 (+5.2%: +8.8% Organic, 0.0% Portfolio, −3.6% Currency)	1,840 (+3.0%: +7.0% Organic, 0.0% Portfolio, −3.9% Currency)	1,393 −0.7%

[1] The 2018 forecast in the 2017 Annual Report included the Consumer Health business.
Figures in € million unless otherwise specified.

PERFORMANCE MATERIALS

	Net sales	EBITDA pre	Business free cash flow
Actual results 2017 in € million	2,446	980	906
Forecast for 2018 in the 2017 Annual Report[1]	Organically slightly to moderately below the year-earlier level Moderately negative foreign exchange effect	Organic percentage decline in the mid teens range Moderately negative foreign exchange effect	Double-digit percentage decline
Main comments	Volume increase in all businesses; strong dynamics particularly in Advanced Technologies and IC Materials Market share adjustment and price decline in the Liquid Crystals business Negative exchange rate effect, especially due to the forecast development of the U.S. dollar and currencies in key Asian markets	The decline in market shares and prices in the Liquid Crystals business cannot be offset by growth of the other businesses and active cost management Negative foreign exchange effect, particularly owing to the development of the U.S. dollar and currencies in key Asian markets	Decline in EBITDA pre, sustained high investments in property, plant and equipment and higher inventory levels due to volume increases
Forecasts for 2018 in the interim report:			
Q1/2018	Slight to moderate organic decline Moderately negative foreign exchange effect	Organic decline –14% to –16% vs. 2017 Exchange rate effect –8% to –10% ~725 to 765	~480 to 550
Q2/2018	Slight to moderate organic decline –2% to –4% Moderately negative foreign exchange effect –3% to –5%	~745 to 785 Organic decline –14% to –16% Exchange rate effect –6% to –8%	~510 to 580
Q3/2018	Organic sales performance at the level of 2017, i.e. –1% to +1% Moderately negative foreign exchange effect –3% to –5%	~745 to 785 Organic decline –14% to –16% Exchange rate effect –6% to –8%	~510 to 580
Results 2018 in € million	2,406 (–1.7%: +1.7% Organic, 0.0% Portfolio, –3.4% Currency)	786 (–19.8%: –12.9% Organic, 0.0% Portfolio, –6.9% Currency)	588 –35.1%

[1] The 2018 forecast in the 2017 Annual Report included the Consumer Health business.
Figures in € million unless otherwise specified.

CORPORATE AND OTHER

	EBITDA pre	Business free cash flow
Actual results 2017 in € million	–292	–429
Forecast for 2018 in the 2017 Annual Report[1]	Low double-digit percentage increase	–
Main comments	The increase in costs is attributable to investments in innovation and digitalization initiatives; these costs were previously incurred in the business sectors and are now recorded centrally under Corporate and Other In contrast, expected currency hedging gains should have a compensating effect in 2018	
Forecasts for 2018 in the interim report:		
Q1/2018	~ –360 to –320	~ –490 to –440
Q2/2018	~ –400 to –360	~ –500 to –550
Q3/2018	~ –400 to –360	~ –500 to –450
Results 2018	–381	–497
in € million	30.6%	15.9%

[1] The 2018 forecast in the 2017 Annual Report included the Consumer Health business.
Figures in € million unless otherwise specified.

Course of Business and Economic Position

Group

Overview of 2018

- Group net sales increased to € 14.8 billion; strong organic growth (6.1%) was reduced by negative exchange rate effects (–3.9%)
- All business sectors contributed to the Group's organic sales growth
- EBITDA pre declined by –10.5% and came to € 3.8 billion (2017: € 4.2 billion)
- At 25.6% (2017: 29.3%), EBITDA pre margin of the Group did not achieve prior-year profitability
- Earnings per share pre declined to € 5.10 (2017: € 5.92)
- Decrease in business free cash flow to € 2.5 billion (2017: € 3.2 billion)
- Net financial liabilities reduced by –33.9% to € 6.7 billion (December 31, 2017: € 10.1 billion)

GROUP

Key figures[1]

			Change	
€ million	**2018**	2017	€ million	in %
Net sales	14,836	14,517	319	2.2%
Operating result (EBIT)[2]	1,727	2,423	–696	–28.7%
Margin (% of net sales)[2]	11.6%	16.7%		
EBITDA[2]	3,528	4,164	–636	–15.3%
Margin (% of net sales)[2]	23.8%	28.7%		
EBITDA pre[2]	3,800	4,246	–446	–10.5%
Margin (% of net sales)[2]	25.6%	29.3%		
Profit after tax	3,396	2,615	781	29.9%
Earnings per share (€)	7.76	5.99	1.77	29.5%
Earnings per share pre (€)[2]	5.10	5.92	–0.82	–13.9%
Business free cash flow[2]	2,508	3,193	–685	–21.4%

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

DEVELOPMENT OF NET SALES AND RESULTS OF OPERATIONS

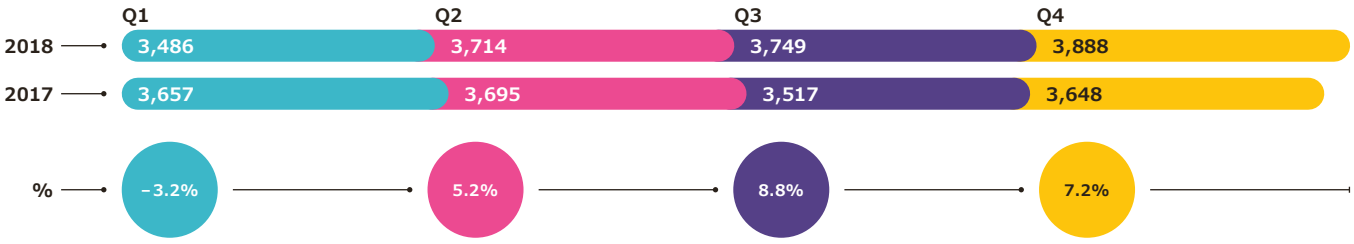
The presentation of net sales refers to the continuing business areas of the Group. Net sales of the Consumer Health business were no longer reported in Group sales, as this business was to be classified as a discontinued operation pursuant to IFRS 5. The prior-year periods were adjusted accordingly (further information on the sale of the Consumer Health business is included in Note (5) "Acquisitions and divestments" in the notes to the Note to the Consolidated Financial Statements.

In 2018, net sales of the Group increased by € 319 million or 2.2% to € 14,836 million (2017: € 14,517 million). This rise was attributable to organic sales growth of € 882 million, or 6.1%, to which all business sectors contributed. The stronger euro led to negative exchange rate effects of € –563 million or –3.9% in 2018, which affected all regions. In particular, this affected the regions North America due to the exchange rate development of the U.S. dollar, as well as Asia-Pacific as a result of negative exchange rate effects of the Chinese renminbi, the Korean won and the Taiwan dollar, and the region of Latin America.

The net sales in the individual quarters as well as the respective organic growth rates in 2018 are presented in the following graph:

GROUP

Net sales and organic growth[1] by quarter[2,3]
€ million/organic growth in %

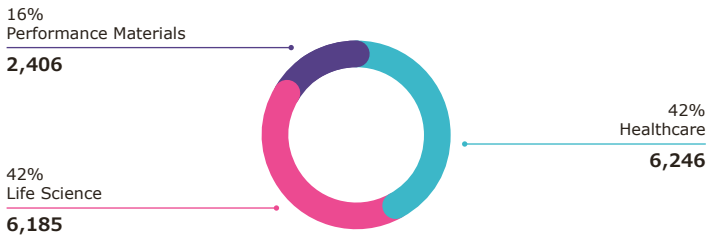


[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.
[3] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

Based on organic sales growth of 5.2%, net sales of the Healthcare business sector rose by € 56 million, or 0.9%, to € 6,246 million (2017: € 6,190 million). Healthcare therefore remained the strongest business sector in terms of sales with a share of 42% (2017: 43%) of Group sales. In 2018, the share of Group sales accounted for by Life Science increased by 2 percentage points to 42% (2017: 40%). With organic growth of 8.8% and a total increase in net sales of 5.2% to € 6,185 million (2017: € 5,882 million), the Life Science business sector recorded the sharpest rise in sales. Net sales of the Performance Materials business sector declined by –1.7% to € 2,406 million in 2018 (2017: € 2,446 million), as organic growth of 1.7% was more than offset by negative exchange rate effects of –3.4%. Performance Materials thus accounted for 16% (2017: 17%) of Group net sales.

GROUP

Net sales by business sector – 2018
€ million/% of net sales



GROUP

Net sales by business sector[1]

€ million	2018	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Healthcare	6,246	42%	5.2%	–4.3%	–	0.9%	6,190	43%
Life Science	6,185	42%	8.8%	–3.6%	–	5.2%	5,882	40%
Performance Materials	2,406	16%	1.7%	–3.4%	–	–1.7%	2,446	17%
Group	**14,836**	**100%**	**6.1%**	**–3.9%**	**–**	**2.2%**	**14,517**	**100%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

In 2018, the Group recorded the following regional sales performance:

GROUP

Net sales by region[1]

€ million	2018	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Europe	4,559	31%	4.9%	–1.5%	–	3.5%	4,406	30%
North America	3,818	26%	4.7%	–4.5%	–	0.2%	3,810	26%
Asia-Pacific (APAC)	4,965	33%	7.8%	–3.5%	–	4.3%	4,761	33%
Latin America	950	6%	10.2%	–14.8%	–	–4.6%	996	7%
Middle East and Africa (MEA)	544	4%	2.9%	–2.9%	–	–	544	4%
Group	**14,836**	**100%**	**6.1%**	**–3.9%**	**–**	**2.2%**	**14,517**	**100%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

The consolidated income statement of the Group is as follows:

GROUP

Consolidated Income Statement[1]

					Change	
€ million	2018	in %	2017	in %	€ million	in %
Net sales	**14,836**	**100.0%**	**14,517**	**100.0%**	**319**	**2.2%**
Cost of sales	–5,382	–36.3%	–5,071	–34.9%	–311	6.1%
Gross profit	**9,454**	**63.7%**	**9,446**	**65.1%**	**8**	**0.1%**
Marketing and selling expenses	–4,384	–29.5%	–4,349	–30.0%	–35	0.8%
Administration expenses	–993	–6.7%	–899	–6.2%	–95	10.5%
Research and development costs	–2,225	–15.0%	–2,108	–14.5%	–117	5.6%
Remaining operating expenses and income	–126	–0.8%	332	2.3%	–458	>100.0%
Operating result (EBIT)[2]	**1,727**	**11.6%**	**2,423**	**16.7%**	**–696**	**–28.7%**
Financial result	–266	–1.8%	–294	–2.0%	28	–9.6%
Profit before income tax	**1,461**	**9.8%**	**2,129**	**14.7%**	**–668**	**–31.4%**
Income tax	–368	–2.5%	428	3.0%	–796	>100.0%
Profit after tax from continuing operations	**1,093**	**7.4%**	**2,557**	**17.6%**	**–1,464**	**–57.3%**
Profit after tax from discontinued operation	**2,303**	**15.5%**	**57**	**0.4%**	**2,246**	**>100.0%**
Profit after tax	**3,396**	**22.9%**	**2,615**	**18.0%**	**781**	**29.9%**
Non-controlling interests	–22	–0.2%	–10	–0.1%	–12	>100.0%
Net income	**3,374**	**22.7%**	**2,605**	**17.9%**	**769**	**29.5%**

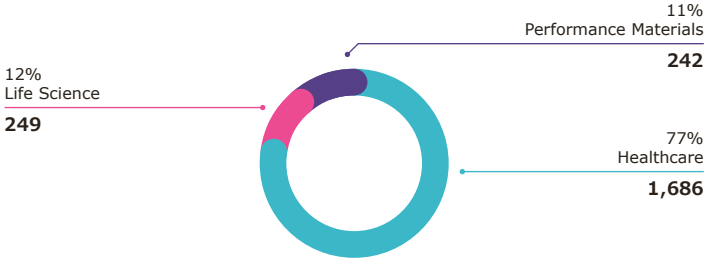
[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

In 2018, gross profit of the Group came to € 9,454 million and thus exceeded the 2017 figure of € 9,446 million only slightly. The positive development of this key indicator for the Life Science business sector, which generated an increase of € 169 million, was eaten up by declining profits in the other two business sectors. The gross margin of the Group, i.e. gross profit as a percentage of net sales, amounted to 63.7% (2017: 65.1%).

Group research and development costs rose by 5.6% to € 2,225 million and led to a research spending ratio (research and development costs as a percentage of net sales) of 15.0% (2017: 14.5%). Accounting for an unchanged 77% of Group R&D spending (2017: 77%), Healthcare remained the most research-intensive business sector of the Group.

GROUP

Research and development costs by business sector[1] – 2018
€ million/in %



[1] Not presented: Research and development costs of € 47 million allocated to Corporate and Other.

Other operating expenses and income showed an expense balance of € 126 million in 2018, after an income balance of € 332 million in 2017. This strong change was mainly due to developments in the Healthcare business sector (see explanations under "Healthcare"). In particular, the gain on the divestment of the Biosimilars business activities amounting to € 319 million had a positive effect in 2017. Detailed information about the development and composition of other operating expenses and income can be found in Note (12) "Other operating income", Note (13) "Other operating expenses" and Note (38) "Management of financial risks" in the Notes to the Consolidated Financial Statements.

The increase in provisions for obligations from long-term variable compensation programs (Long-Term Incentive Plan) negatively impacted the operating result in 2018; the increase in the intrinsic value of the Share Units of Merck KGaA, Darmstadt, Germany – depending on the fields of activity of the eligible participants – was reflected in the respective functional costs (see Note (26) "Other provisions").

The improvement in the negative financial result by € 28 million or 9.6% to € –266 million (2017: € –294 million) resulted mainly from higher interest income. Details with respect to the development of finance income and finance expenses of the Group are shown in Note (32) "Financial result/net profit and losses from financial instruments" in the Notes to the Consolidated Financial Statements.

Income tax expense came to € 368 million in 2018 and resulted in a tax ratio of 25.2%. The income balance of € 428 million in 2017 was due to one-time effects from deferred taxes in connection with the tax reform in the United States. Further information on income taxes are included in Note (14) "Income taxes" in the Notes to the Consolidated Financial Statements.

Profit after tax from discontinued operation of € 2,303 million (2017: € 57 million) included the Consumer Health business, which must be reported separately in the Group income statement pursuant to IFRS 5. In 2018, this profit figure also includes the gain on the divestment of the Consumer Health business amounting to € 2,244 million. Further information on the divestment of the Consumer Health business is found in Note (5) "Acquisitions and divestments" in the Notes to the Consolidated Financial Statements.

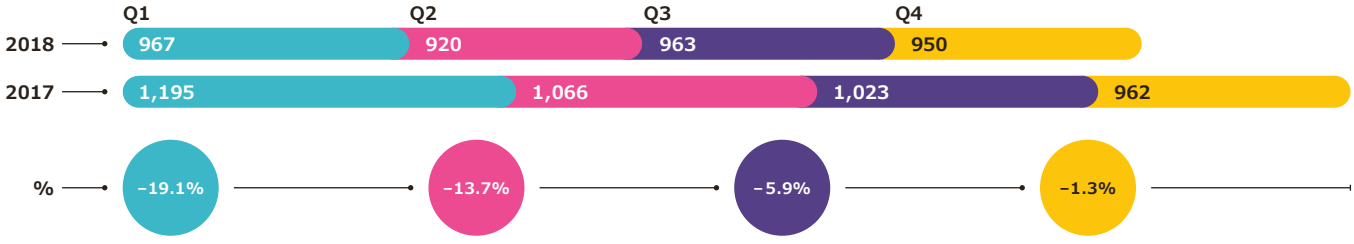
Thanks to the gain on the divestment of the Consumer Health business, in particular, net income rose by € 769 million to € 3,374 million (2017: € 2,605 million). In 2017, an exceptional tax income in connection with the tax reform in the United States of € 906 million boosted net income. Earnings per share increased accordingly to € 7.76 (2017: € 5.99).

EBITDA pre, the key financial indicator used to steer operating business, declined by € –446 million or –10.5% to € 3,800 million (2017: € 4,246 million). Unfavorable foreign exchange effects lowered EBITDA pre by –8.9%. Relative to net sales, the EBITDA pre margin was 25.6% in 2018 (2017: 29.3%). The reconciliation of the operating result (EBIT) to EBITDA pre is presented in the chapter entitled "Internal Management System".

The development of EBITDA pre in the individual quarters in comparison with 2017 as well as the respective growth rates are presented in the following overview:

GROUP

EBITDA pre[1] and change by quarter[2,3]
€ million/change in %

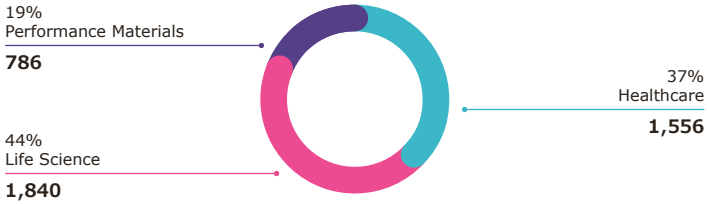


[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.
[3] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

The decrease in Group EBITDA pre was attributable to the Healthcare and Performance Materials business sectors. By contrast, in Life Science the good business development had a positive effect on this key figure. Consequently, at € 1,840 million (2017: € 1,786 million) the business sector for the first time generated the highest EBITDA pre of all the business sectors within the Group. This meant that the share of Group EBITDA pre accounted for by Life Science (not taking into account the € –381 million reduction due to Corporate and Other) rose to 44% (2017: 39%). EBITDA pre of Healthcare declined by –12.2% to € 1,556 million. The business sector thus contributed 37% (2017: 39%) to EBITDA pre for the Group. With an EBITDA pre of € 786 million (2017: € 980 million), the share of this Group key performance indicator attributable to Performance Materials decreased to 19% (2017: 22%).

GROUP

EBITDA pre[1] by business sector[2] – 2018
€ million/in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Not presented: Decline in Group EBITDA pre by € –381 million due to Corporate and Other.

GROUP

Balance sheet structure

	Dec. 31, 2018		Dec. 31, 2017		Change	
	€ million	**in %**	€ million	in %	€ million	in %
Non-current assets	**27,652**	**75.0%**	**28,166**	**79.1%**	**–513**	**–1.8%**
of which:						
Goodwill	13,764		13,582		183	
Other intangible assets	7,237		8,317		–1,080	
Property, plant and equipment	4,811		4,512		299	
Other non-current assets	1,840		1,755		85	
Current assets	**9,236**	**25.0%**	**7,455**	**20.9%**	**1,781**	**23.9%**
of which:						
Inventories	2,764		2,632		133	
Trade accounts receivable	2,931		2,923		8	
Current financial assets	24		90		–66	
Other current assets	1,345		1,221		124	
Cash and cash equivalents	2,170		589		1,582	
Total assets	**36,888**	**100.0%**	**35,621**	**100.0%**	**1,267**	**3.6%**
Equity	**17,233**	**46.7%**	**14,066**	**39.5%**	**3,167**	**22.5%**
Non-current liabilities	**11,138**	**30.2%**	**12,919**	**36.3%**	**–1,782**	**–13.8%**
of which:						
Provisions for pensions and other post-employment benefits	2,336		2,257		80	
Other non-current provisions	780		788		–7	
Non-current financial liabilities	6,681		8,033		–1,352	
Other non-current liabilities	1,340		1,842		–502	
Current liabilities	**8,517**	**23.1%**	**8,635**	**24.2%**	**–117**	**–1.4%**
of which:						
Current provisions[1]	600		457		143	
Current financial liabilities	2,215		2,790		–576	
Trade accounts payable/Refund liabilities	2,238		2,195		43	
Other current liabilities[1]	3,464		3,191		273	
Total equity and liabilities	**36,888**	**100.0%**	**35,621**	**100.0%**	**1,267**	**3.6%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

The total assets of the Group amounted to € 36,888 million as of December 31, 2018 (December 31, 2017: € 35,621 million), representing an increase of 3.6% or € 1,267 million. One main reason for this rise was the cash inflow from the sale of the Consumer Health business amounting to € 3,052 million. Details of this transaction and its impact on the consolidated balance sheet are included in Note (5) "Acquisitions and divestments" in the Notes to the Consolidated Financial Statements. Due to exchange rate developments, total assets rose by around € 0.8 billion. This development was primarily the result of the trend of the exchange rate between the euro and the U.S. dollar, which had an impact on intangible assets, in particular.

The rise in net working capital of 2.9% to € 3,486 million (2017: € 3,387 million) was mainly attributable to the slight build-up in inventories.

GROUP

Working capital[1]

€ million	Dec. 31, 2018	Dec. 31, 2017	Change € million	Change in %
Trade accounts receivable	2,931	2,923	8	0.3%
Receivables from royalties and licenses	29	28	1	1.8%
Inventories	2,764	2,632	133	5.0%
Trade accounts payable/Refund liabilities	–2,238	–2,195	–43	1.9%
Working capital[1]	**3,486**	**3,387**	**99**	**2.9%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

The composition and the development of net financial debt were as follows:

GROUP

Net financial debt[1]

€ million	Dec. 31, 2018	Dec. 31, 2017	Change € million	Change in %
Bonds and commercial papers	7,286	8,213	–927	–11.3%
Bank loans	620	1,653	–1,034	–62.5%
Liabilities to related parties	824	767	57	7.4%
Loans from third parties and other financial liabilities	72	73	–1	–1.4%
Liabilities from derivatives (financial transactions)	90	113	–23	–20.6%
Finance lease liabilities	4	4	–	11.4%
Financial liabilities	**8,896**	**10,823**	**–1,928**	**–17.8%**
less:				
Cash and cash equivalents	2,170	589	1,582	>100.0%
Current financial assets	24	90	–66	–72.9%
Net financial debt[1]	**6,701**	**10,144**	**–3,443**	**–33.9%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

GROUP

Reconciliation of net financial debt[1]

€ million	2018	2017
January 1	**10,144**	**11,513**
Currency translation	126	–429
Dividend payments to shareholders and to E. Merck KG, Darmstadt, Germany[2]	768	624
Acquisitions[2]	–	17
Payments from the disposal of assets held for sale and from other divestments[2]	–3,129	–167
Free cash flow[1]	–1,301	–1,433
Other	93	19
Dec. 31	**6,701**	**10,144**

[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] According to the consolidated cash flow statement.

In 2018, equity of the Group rose by 22.5% or € 3,167 million to € 17,233 million (December 31, 2017: € 14,066 million). The increase reflected mainly the strong profit after tax of € 3,396 million (2017: € 2,615 million). In addition, the currency translation of foreign currency assets to the reporting currency (euro) had a positive effect. Dividend payments and the profit transfer to E. Merck KG, Darmstadt, Germany, reduced consolidated net equity accordingly (see "Consolidated Statement of Comprehensive Income" and "Consolidated Statement of Changes in Net Equity" in the Consolidated Financial Statements). The increase in equity led to an improvement in the equity ratio by 7 percentage points to 46.7% (December 31, 2017: 39.5%).

The composition of free cash flow as well as the development of the relevant items are presented in the following table:

GROUP

Free cash flow[1]

			Change	
€ million	**2018**	2017	€ million	in %
Cash flow from operating activities according to the cash flow statement	2,219	2,696	–477	–17.7%
Payments for investments in intangible assets	–106	–392	286	–72.9%
Payments from the disposal of intangible assets	67	4	62	> 100.0%
Payments for investments in property, plant and equipment	–910	–919	9	–0.9%
Payments from the disposal of property, plant and equipment	31	44	–12	–28.0%
Free cash flow[1]	**1,301**	**1,433**	**–132**	**–9.2%**

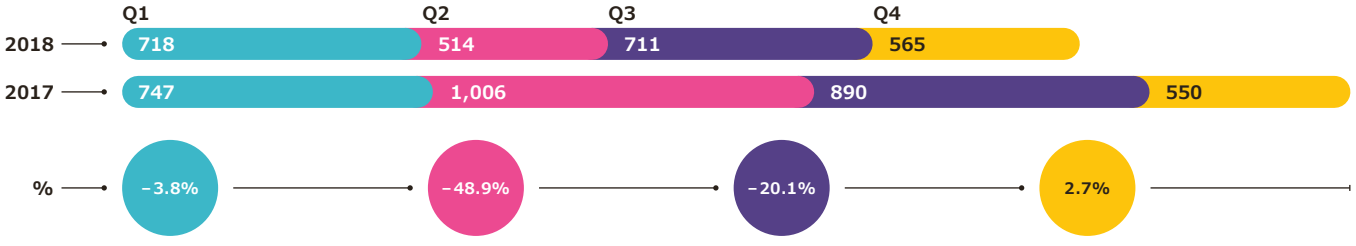
[1] Not defined by International Financial Reporting Standards (IFRSs).

Business free cash flow of the Group declined to € 2,508 million in 2018 (2017: € 3,193 million). This development was primarily due to the lower EBITDA pre, the increase in inventories and higher receivables as of the 2018 balance sheet date. The composition of this financial indicator is presented under "Internal Management System".

The distribution of business free cash flow across the individual quarters and the percentage changes in comparison with 2017 were as follows:

GROUP

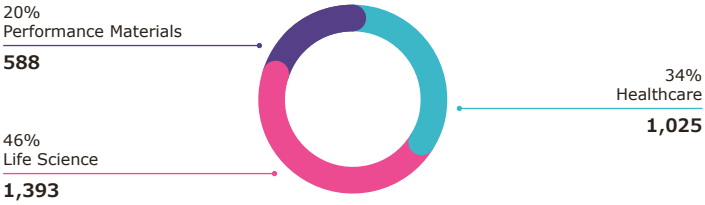
Business free cash flow[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

GROUP

Business free cash flow[1] by business sector[2] – 2018
€ million/in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Not presented: Decline in Group business free cash flow by € –497 million due to Corporate and Other.

The contributions of the operating business sectors to business free cash flow of the Group in 2018 developed as follows: Life Science generated business free cash flow amounting to € 1,393 million (2017: € 1,402 million). Consequently, with a 46% share (2017: 39%) of Group business free cash flow (excluding the decline of € –497 million due to Corporate and Other), Life Science was the business sector with the highest cash inflows. In 2018, the Healthcare business sector showed a decline of 22.0% to € 1,025 million (2017: € 1,314 million), thus contributing a share of 34% to Group business free cash flow (2017: 36%). With business free cash flow of € 588 million (2017: € 906 million), Performance Materials contributed 20% (2017: 25%) to this Group key performance indicator.

The investments in property, plant, equipment and software as well as advance payments for intangible assets included in the calculation of business free cash flow decreased in 2018 by –7.9% to € 932 million (2017: € 1,012 million). The investments in property, plant and equipment included therein amounted to € 890 million in 2018 (2017: € 936 million), of which € 480 million (2017: € 438 million) was attributable to strategic investment projects each with a project volume of more than € 2 million; the remainder was attributable to smaller investment projects.

Strategic investments made in 2018 included € 161 million (2017: € 212 million) to expand the Darmstadt site, of which the Healthcare business sector invested € 68 million, among other things in a new packaging center (€ 29 million).

Outside Germany, high levels of strategic investments were made particularly in China (€ 70 million) and the United States (€ 67 million). In China, the Healthcare business sector invested € 15 million in new production facilities and € 17 million in a new logistics center; the Life Science business sector invested € 29 million in new production facilities in China. In the United States, Life Science invested € 51 million, of which € 26 million in the expansion of the Sheboygan site in Wisconsin.

Our credit ratings from the independent rating agencies did not change in 2018. Our company is currently rated by Standard & Poor's, Moody's and Scope. Standard & Poor's has issued a long-term credit rating of A with a stable outlook, Moody's a rating of Baa1 with a stable outlook and Scope a rating of A–, likewise with a stable outlook. An overview of the development of our rating in recent years is presented in the Report on Risks and Opportunities.

The development of key balance sheet figures was as follows:

GROUP

Key balance sheet figures

in %		Dec. 31, 2018	Dec. 31, 2017	Dec. 31, 2016	Dec. 31, 2015	Dec. 31, 2014
Equity ratio[1]	Equity / Total assets	46.7%	39.5%	36.7%	33.8%	45.4%
Asset ratio[1]	Non-current assets / Total assets	75.0%	79.1%	80.0%	80.7%	59.7%
Asset coverage[1]	Equity / Non-current assets	62.3%	49.9%	45.9%	41.8%	76.0%
Finance structure[1]	Current liabilities / Liabilities (total)	43.3%	40.1%	37.5%	37.2%	46.5%

[1] Not defined by International Financial Reporting Standards (IFRSs).

OVERALL ASSESSMENT OF BUSINESS PERFORMANCE AND ECONOMIC SITUATION

2018 was a year of transition for our company in terms of the operating business activities of the Group. We generated solid results amid a challenging market environment. At the same time, important strategic decisions were made to allow us to generate profitable growth again in the future. The financial targets that we had set ourselves for 2018 were achieved. Satisfying organic growth of 6.1% enabled Group net sales to increase to € 14,836 million (2017: € 14,517 million). In 2018, EBITDA pre amounted to € 3,800 million (2017: € 4,246 million) and recorded an organic decline of –1.6% over the prior year.

Our Healthcare business sector benefited from the approval of Bavencio® and Mavenclad® in 2017. The steady further development and optimum use of our promising pipeline remains a high priority. In 2018, we also pushed ahead with the forming of alliances for selected active substances, such as the collaboration agreement with the SFJ Pharmaceuticals Group to develop abituzumab. The disposal of the Consumer Health business was successfully completed in 2018. The cash inflow it generated helped reduce net debt substantially and thereby strengthen our financial flexibility. As a result, despite investment activity remaining strong, we reduced our net financial debt by € –3,443 million to € 6,701 million (2017: € 10,144 million).

Net sales in Life Science showed a very strong performance in 2018. Following the integration of Sigma-Aldrich, which we completed in 2018, and our growth initiatives we are well-equipped for the future.

Our Performance Materials business sector launched the “Bright Future” transformation program in 2018 in order to pave the way for future growth.

Our key balance sheet figures showed a further improvement in 2018. For instance, the equity ratio rose by 7 percentage points to 46.7% (2017: 39.5%) and has thus reached a very good level. We will continue to assign high priority to the planned reduction of our financial liabilities. In 2018, there were no changes to our credit ratings by the independent rating agencies Standard & Poor’s (A with a stable outlook), Moody’s (Baa1 with a stable outlook) and Scope (A– with a stable outlook).

The economic position and business development of the Group can be assessed positively overall. A foundation has been laid for profitable organic growth going forward. We are seeking to help shape the important technological developments for our business sectors and take optimum advantage of the opportunities this creates.

Healthcare

HEALTHCARE

Key figures[1]

€ million	2018	2017	Change € million	Change in %
Net sales	6,246	6,190	56	0.9%
Operating result (EBIT)[2]	731	1,337	–605	–45.3%
Margin (% of net sales)[2]	11.7%	21.6%		
EBITDA[2]	1,492	2,028	–536	–26.4%
Margin (% of net sales)[2]	23.9%	32.8%		
EBITDA pre[2]	1,556	1,773	–217	–12.2%
Margin (% of net sales)[2]	24.9%	28.6%		
Business free cash flow[2]	1,025	1,314	–289	–22.0%

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

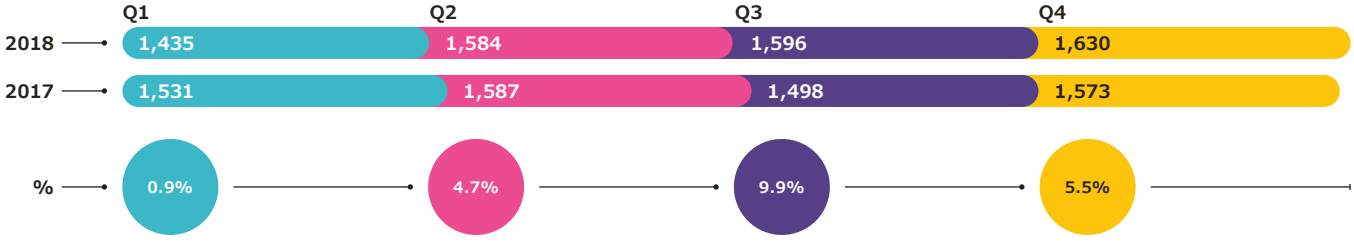
DEVELOPMENT OF NET SALES AND RESULTS OF OPERATIONS

In 2018, generated organic sales growth of 5.2%. After negative foreign exchange effects of –4.3%, net sales rose to € 6,246 million (2017: € 6,190 million). The foreign exchange effect resulted essentially from the development of the U.S. dollar, the Turkish lira, the Russian ruble and a number of Latin American currencies.

The net sales in the individual quarters as well as the respective organic growth rates in 2018 are presented in the following graph:

HEALTHCARE

Net sales and organic growth[1] by quarter[2,3]
€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.
[3] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

Net sales of the key product lines and products developed as follows in 2018:

HEALTHCARE

Net sales by major product lines/products[1]

€ million	2018	Share	Organic growth[2]	Exchange rate effects	Total change	2017	Share
Oncology	**944**	**15%**	**4.2%**	**–4.5%**	**–0.3%**	**946**	**15%**
of which: Erbitux®	816	13%	0.4%	–4.8%	–4.3%	853	14%
of which: Bavencio®	69	1%	>100.0%	–10.8%	>100.0%	21	0%
Neurology & Immunology	**1,529**	**24%**	**–1.1%**	**–4.2%**	**–5.4%**	**1,616**	**26%**
of which: Rebif®	1,438	23%	–6.5%	–4.1%	–10.7%	1,611	26%
of which: Mavenclad®	90	1%	>100.0%	–33.3%	>100.0%	5	0%
Fertility	**1,162**	**19%**	**11.1%**	**–5.0%**	**6.2%**	**1,094**	**18%**
of which: Gonal-f®	708	11%	5.3%	–4.8%	0.5%	704	11%
General Medicine & Endocrinology	**2,341**	**38%**	**5.8%**	**–4.4%**	**1.5%**	**2,308**	**37%**
of which: Glucophage®	733	12%	15.1%	–4.4%	10.7%	662	11%
of which: Concor®	475	8%	11.2%	–4.5%	6.7%	444	7%
of which: Euthyrox®	363	6%	1.9%	–3.8%	–1.9%	370	6%
of which: Saizen®	234	4%	–3.1%	–6.3%	–9.4%	259	4%
Other	**270**	**4%**				**226**	**4%**
Healthcare	**6,246**	**100%**	**5.2%**	**–4.3%**	**0.9%**	**6,190**	**100%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

Sales of the drug Rebif®, which is used to treat relapsing forms of multiple sclerosis, saw an organic sales decline of –6.5% in 2018. Including negative exchange rate effects of –4.1%, sales of € 1,438 million were recorded (2017: € 1,611 million). Sales in the biggest market, North America, declined by –5.0% in organic terms due to the persistently difficult competitive situation in the interferons market. A price increase made in February 2018 only partly offset this development. Consequently, sales in North America fell to € 920 million (2017: € 1,012 million). Competitive pressure in Europe was responsible for the organic sales decline of –11.7%. Taking into account slightly negative exchange rate effects, sales came to € 395 million (2017: € 456 million). The sales declines in the other regions, which generated total Rebif® sales of € 123 million (2017: € 142 million), were primarily due to negative exchange rate developments.

Sales of the oncology drug Erbitux® were stable in organic terms, and after negative exchange rate effects of –4.8%, sales decreased to € 816 million (2017: € 853 million). The negative organic development in Europe of –0.8% was the result of the difficult competitive setting and some price reductions. Erbitux® sales in the European market amounted to € 437 million (2017: € 447 million). Net sales of the oncology drug in the Asia-Pacific region were stable in organic terms (–0.3%). The drop in sales to € 255 million (2017: € 263 million) was attributable to negative exchange rate effects. Organic growth in Latin America was more than offset by very strong, negative foreign exchange rate effects, leading to a decline in sales to € 71 million (2017: € 87 million). In the Middle East and Africa, organic sales were at last year's level at € 54 million (2017: € 56 million).

HEALTHCARE

Sales and organic growth[1] of Rebif® and Erbitux® by region – 2018

		Total	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
Rebif®	€ million	1,438	395	920	12	48	62
	Organic growth[1] in %	–6.5%	–11.7%	–5.0%	–10.2%	–3.5%	4.3%
	% of sales	100%	28%	64%	1%	3%	4%
Erbitux®	€ million	816	437	–	255	71	54
	Organic growth[1] in %	0.4%	–0.8%	–	–0.3%	8.7%	0.1%
	% of sales	100%	53%	–	31%	9%	7%

[1] Not defined by International Financial Reporting Standards (IFRSs).

With the product Mavenclad®, a medicine for the oral short-course treatment of highly active relapsing multiple sclerosis, sales of € 90 million were generated in 2018 (2017: € 5 million). The product was approved in Europe in August 2017. Sales of Bavencio®, an immuno-oncology medicine, increased to € 69 million (2017: € 21 million).

Gonal-f®, the leading recombinant hormone used in the treatment of infertility, generated organic growth of 5.3%, to which the trend in the North America region, in particular, contributed with double-digit organic growth rates. Taking into account currency headwinds of –4.8%, global sales amounted to € 708 million (2017: € 704 million). The other products from the fertility portfolio also contributed to the increase in net sales with double-digit organic growth rates across all regions.

The General Medicine & Endocrinology franchise (including CardioMetabolic Care), which commercializes products to treat cardiovascular diseases, thyroid disorders, diabetes and growth disorders, among other things, generated organic growth of 5.8%. After negative foreign exchange effects of –4.4%, net sales rose to € 2,341 million (2017: € 2,308 million). Diabetes drug Glucophage®, the best-selling product in this area, made a significant contribution to this development with organic growth of 15.1%. While all regions reported positive growth, the Asia-Pacific region was the main driver of higher Glucophage® sales. A negative exchange rate effect of –4.4% reduced growth and resulted in total sales of € 733 million (2017: € 662 million). Double-digit organic growth rates (11.2%) were also achieved with beta-blocker Concor®. Despite adverse exchange rate effects (–4.5%), net sales of this medicine increased to € 475 million (2017: € 445 million). All regions contributed to this gratifying organic development, primarily Europe and Asia-Pacific. Euthyrox®, a medicine to treat thyroid disorders, recorded organic growth of 1.9%. However, this was not able to offset the exchange rate effect (–3.8%). As a result, sales at € 363 million fell slightly short of the prior-year figure (2017: € 370 million). Saizen®, the top-selling product in the Endocrinology franchise, generated sales of € 234 million (2017: € 259 million).

Net sales of the Healthcare business sector by region in 2018 developed as follows:

HEALTHCARE

Net sales by region[1]

€ million	2018	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Europe	2,203	35%	4.6%	–2.2%	–	2.4%	2,152	35%
North America	1,432	23%	0.1%	–4.2%	–	–4.1%	1,494	24%
Asia-Pacific (APAC)	1,501	24%	8.7%	–3.1%	–	5.6%	1,421	23%
Latin America	661	11%	10.9%	–14.5%	–	–3.7%	687	11%
Middle East and Africa (MEA)	448	7%	5.9%	–3.2%	–	2.8%	436	7%
Healthcare	**6,246**	**100%**	**5.2%**	**–4.3%**	**–**	**0.9%**	**6,190**	**100%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

[2] Not defined by International Financial Reporting Standards (IFRSs).

The results of operations developed as follows:

HEALTHCARE

Results of operations[1]

€ million	2018	in %	2017	in %	Change € million	Change in %
Net sales	**6,246**	**100.0%**	**6,190**	**100.0%**	**56**	**0.9%**
Cost of sales	–1,425	–22.8%	–1,340	–21.6%	–85	6.4%
Gross profit	**4,820**	**77.2%**	**4,850**	**78.4%**	**–30**	**–0.6%**
Marketing and selling expenses	–2,339	–37.4%	–2,373	–38.3%	34	–1.4%
Administration expenses	–301	–4.8%	–271	–4.4%	–30	11.0%
Research and development costs	–1,686	–27.0%	–1,600	–25.8%	–86	5.4%
Remaining operating expenses and income	237	3.8%	731	11.8%	–494	–67.6%
Operating result (EBIT)[2]	**731**	**11.7%**	**1,337**	**21.6%**	**–605**	**–45.3%**
Depreciation/amortization/impairment losses/reversals of impairment losses	761	12.2%	691	11.2%	69	10.0%
(of which: adjustments)	*(11)*		*(–51)*		*(63)*	*(>100%)*
EBITDA[2]	**1,492**	**23.9%**	**2,028**	**32.8%**	**–536**	**–26.4%**
Restructuring expenses	12		17		–5	–31.9%
Integration expenses/IT expenses	18		27		–9	–34.5%
Gains (–)/losses (+) on the divestment of businesses	26		–316		342	>100%
Acquisition-related adjustments	–		–		–	–
Other adjustments	8		16		–8	–51.0%
EBITDA pre[2]	**1,556**	**24.9%**	**1,773**	**28.6%**	**–217**	**–12.2%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

Gross profit of the Healthcare business sector was weighed down by foreign exchange rate effects in 2018. At € 4,820 million (2017: € 4,850 million) it remained flat, resulting in a gross margin of 77.2% (2017: 78.4%).

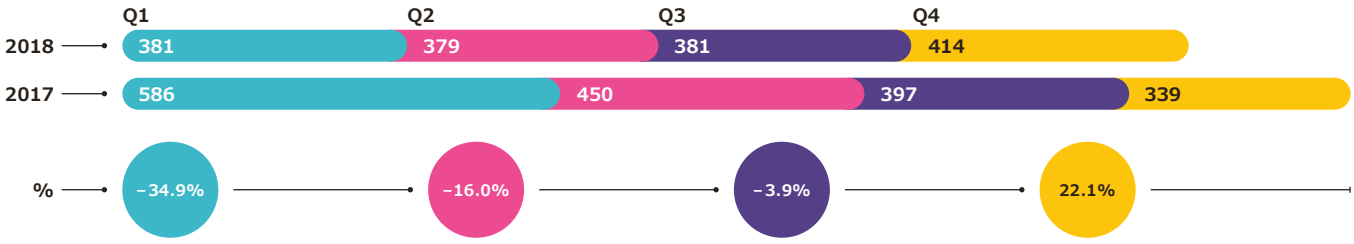
The decrease in marketing and selling expenses was due mainly to foreign exchange effects. Research and development costs reflected continued investments in the Biopharma development pipeline and amounted to € 1,686 million (2017: € 1,600 million). The decline in other operating expenses and income was due to multiple factors in both 2018 and 2017. Thus the 2017 figure included the gain on the divestment of the Biosimilars business amounting to € 319 million, which was adjusted when calculating EBITDA pre. The previous year's figures also included milestone payments for the approval of Bavencio® (€ 124 million) as well as income from an agreement on a one-time payment for future license payments (€ 116 million). The year 2018 included receipt of a milestone payment of € 50 million from BioMarin Pharmaceutical Inc., United States, in connection with the sale of PALYNZIQ® (Peg-Pal) in 2016. Moreover, income from license agreements and from the transfer of rights had a positive effect on the fourth quarter of 2018. The following impairments and reversals of impairment losses were also included in remaining other expenses and income. In 2017, the reversals of impairment losses on the intangible asset for cladribine of € 17 million as a result of the marketing authorization of Mavenclad® had boosted other operating expenses. In 2018, a reduction in the fair value of contingent consideration from the sale of the Biosimilars business led to expenses of € –27 million.

After eliminating depreciation, amortization, impairments and reversals of impairment losses as well as adjustments, EBITDA pre decreased by –12.2% to € 1,556 million (2017: € 1,773 million) in 2018. Negative foreign exchange effects of –10.7% had a material effect on the development of this key figure. The EBITDA pre margin relative to sales came to 24.9% (2017: 28.6%).

The development of EBITDA pre in the individual quarters in comparison with 2017 is presented in the following overview:

HEALTHCARE

EBITDA pre[1] and change by quarter[2,3]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.
[3] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

DEVELOPMENT OF BUSINESS FREE CASH FLOW

In 2018, business free cash flow amounted to € 1,025 million (2017: € 1,314 million). The decline was primarily attributable to lower EBITDA pre and a rise in receivables.

HEALTHCARE

Business free cash flow[1,2]

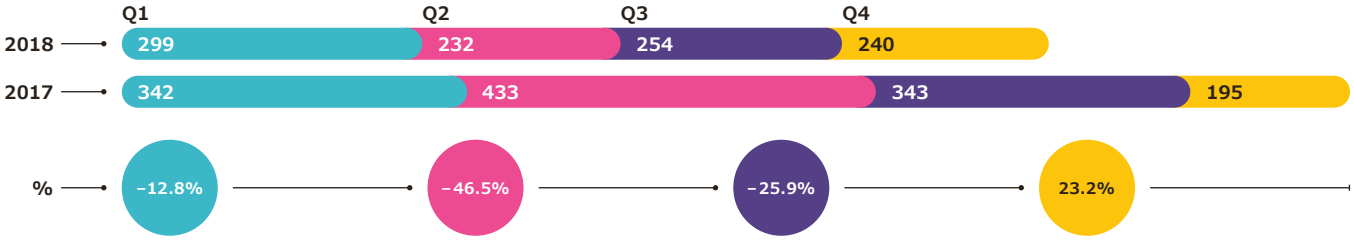
			Change	
€ million	**2018**	2017	€ million	in %
EBITDA pre[2]	1,556	1,773	–217	–12.2%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–395	–375	–19	5.2%
Changes in inventories	–55	–34	–21	63.1%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–81	–49	–32	64.6%
Business free cash flow[2]	**1,025**	**1,314**	**–289**	**–22.0%**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

The development of business free cash flow items in the individual quarters in comparison with 2017 is presented in the following overview:

HEALTHCARE

Business free cash flow[1] and change by quarter[2,3]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.
[3] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.

Life Science

LIFE SCIENCE

Key figures

€ million	2018	2017	Change € million	Change in %
Net sales	6,185	5,882	304	5.2%
Operating result (EBIT)[1]	1,036	834	202	24.2%
Margin (% of net sales)[1]	16.7%	14.2%		
EBITDA[1]	1,755	1,580	175	11.1%
Margin (% of net sales)[1]	28.4%	26.9%		
EBITDA pre[1]	1,840	1,786	54	3.0%
Margin (% of net sales)[1]	29.8%	30.4%		
Business free cash flow[1]	1,393	1,402	–9	–0.7%

[1] Not defined by International Financial Reporting Standards (IFRSs).

DEVELOPMENT OF NET SALES AND RESULTS OF OPERATIONS

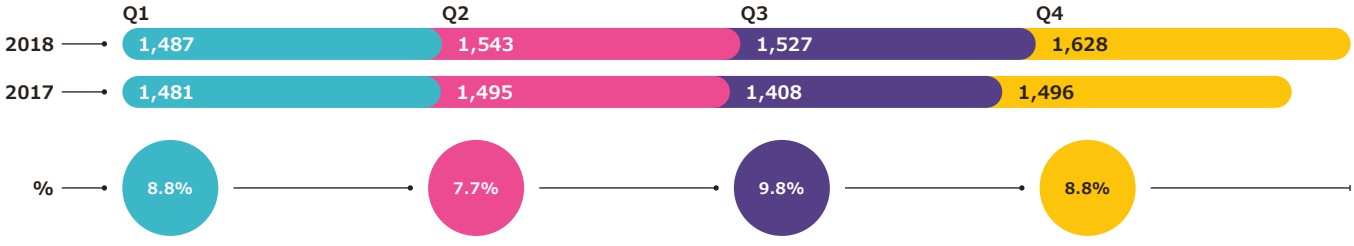
In 2018, Life Science posted organic sales growth of 8.8%, partially offset by negative foreign exchange effects of –3.6%. Net sales rose overall by 5.2% to € 6,185 million (2017: € 5,882 million).

All three business units of the business sector contributed favorably to the organic sales growth of Life Science. Process Solutions generated double-digit organic sales growth of 14.8%, attributable to high demand across the portfolio and was thus again the business sector's main growth driver in 2018. Applied Solutions continued to perform very well, posting organic growth of 6.3% and the Research Solutions business unit reported an organic sales increase of 4.1%.

The development of sales in the individual quarters in comparison with 2017 as well as the respective organic growth rates are presented in the following graph:

LIFE SCIENCE

Net sales and organic growth[1] by quarter[2]
€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

LIFE SCIENCE

Net sales by business unit[1]

€ million	2018	Share	Organic growth[2]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Process Solutions	2,487	40%	14.8%	–3.5%	–	11.3%	2,234	38%
Research Solutions	2,048	33%	4.1%	–3.6%	–	0.5%	2,038	35%
Applied Solutions	1,650	27%	6.3%	–3.8%	–	2.5%	1,609	27%
Life Science	**6,185**	**100%**	**8.8%**	**–3.6%**	**–**	**5.2%**	**5,882**	**100%**

[1] Previous year's figures have been adjusted due to an internal realignment.
[2] Not defined by International Financial Reporting Standards (IFRSs).

The Process Solutions business unit, which markets products and services for the entire pharmaceutical production value chain, generated double-digit growth of 14.8% and net sales of € 2,487 million (2017: € 2,234 million) in 2018. This means that Process Solutions accounted for 40% (2017: 38%) of Life Science net sales. All business areas of Process Solutions contributed to this strong performance. The key driver was the BioProcessing business unit, particularly in the Asia-Pacific and North America regions.

The Research Solutions business unit, which provides products and services to support life science work in pharmaceutical, biotechnology and academic research laboratories, recorded a moderate organic sales increase of 4.1% in 2018. Strong performance by both Lab & Specialty Chemicals and Reagents & Kits in particular led to the growth in net sales of Research Solutions, which increased to € 2,048 million (2017: € 2,038 million), representing 33% (2017: 35%) of the business sector's net sales. In regional terms, Asia-Pacific was the strongest growth driver for Research Solutions in 2018.

The Applied Solutions business unit generated strong organic sales growth of 6.3% with its broad range of products for researchers as well as scientific and industrial laboratories. Net sales increased to € 1,650 million (2017: € 1,609 million). Accordingly, the business unit contributed 27% (2017: 27%) to net sales of the Life Science business sector. The sales performance of Applied Solutions was driven by all business fields, and primarily by the North America and Asia-Pacific regions.

Net sales of the business sector by region developed as follows:

LIFE SCIENCE

Net sales by region

€ million	2018	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Europe	2,136	35%	6.4%	–0.8%	–	5.6%	2,022	34%
North America	2,173	35%	8.4%	–4.6%	–	3.8%	2,093	35%
Asia-Pacific (APAC)	1,532	25%	13.6%	–3.8%	–	9.8%	1,395	24%
Latin America	256	4%	10.5%	–16.5%	–	–6.0%	273	5%
Middle East and Africa (MEA)	88	1%	–8.7%	–1.7%	–	–10.4%	98	2%
Life Science	**6,185**	**100%**	**8.8%**	**–3.6%**	**–**	**5.2%**	**5,882**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

The results of operations of the Life Science business sector developed as follows:

LIFE SCIENCE

Results of operations

					Change	
€ million	**2018**	**in %**	2017	in %	€ million	in %
Net sales	**6,185**	**100.0%**	**5,882**	**100.0%**	**304**	**5.2%**
Cost of sales	–2,723	–44.0%	–2,588	–44.0%	–135	5.2%
Gross profit	**3,463**	**56.0%**	**3,294**	**56.0%**	**169**	**5.1%**
Marketing and selling expenses	–1,775	–28.7%	–1,734	–29.5%	–41	2.4%
Administration expenses	–282	–4.6%	–261	–4.4%	–22	8.3%
Research and development costs	–249	–4.0%	–241	–4.1%	–8	3.4%
Remaining operating expenses and income	–121	–2.0%	–224	–3.8%	104	–46.2%
Operating result (EBIT)[1]	**1,036**	**16.7%**	**834**	**14.2%**	**202**	**24.2%**
Depreciation/amortization/impairment losses/ reversals of impairment losses	719	11.6%	746	12.7%	–27	–3.6%
(of which: adjustments)	*(23)*		*(3)*		*(20)*	*(>100%)*
EBITDA[1]	**1,755**	**28.4%**	**1,580**	**26.9%**	**175**	**11.1%**
Restructuring expenses	3		5		–2	–45.0%
Integration expenses/IT expenses	86		114		–29	–25.0%
Gains (–)/losses (+) on the divestment of businesses	–8		1		–9	>100%
Acquisition-related adjustments	2		63		–61	–97.2%
Other adjustments	3		22		–19	–86.5%
EBITDA pre[1]	**1,840**	**29.8%**	**1,786**	**30.4%**	**54**	**3.0%**

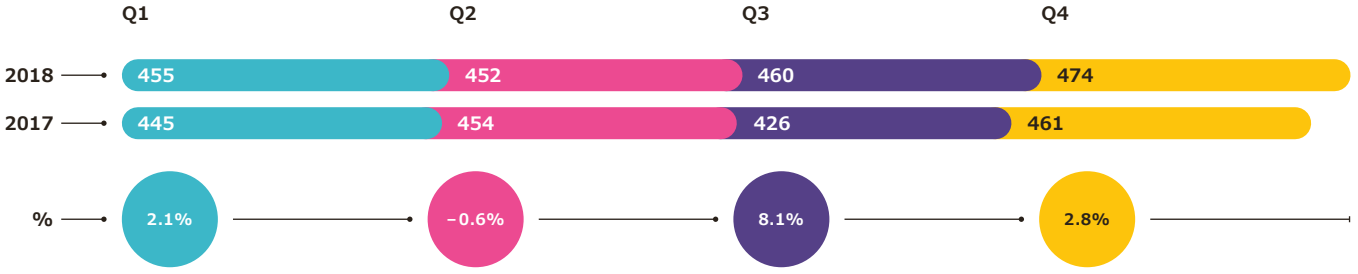
[1] Not defined by International Financial Reporting Standards (IFRSs).

Gross profit increased by 5.1% to € 3,463 million (2017: € 3,294 million). Despite currency headwinds, the strong increase was driven by organic growth in sales across all business units. Marketing and selling expenses increased by 2.4% to € 1,775 million (2017: € 1,734 million), while R&D expenses increased by 3.4% to € 249 million (2017: € 241 million). The decline in other operating expenses and income of –46.2% to € –121 million (2017: € –224 million) was the result of lower acquisition-related adjustments and a fall in adjustments for integration expenses/IT expenses that were included in this item. In comparison with 2017, the operating result (EBIT) of Life Science rose by € 202 million to € 1,036 million (2017: € 834 million). After eliminating depreciation and amortization as well as adjustments, EBITDA pre – the key indicator to assess the earning power – increased by 3.0% to € 1,840 million (2017: € 1,786 million). EBITDA pre improved by 7.0% over the prior year in organic terms, whereas negative foreign exchange rate effects depressed this key indicator by –3.9%.

The development of EBITDA pre in the individual quarters in comparison with 2017 is presented in the following overview:

LIFE SCIENCE

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

DEVELOPMENT OF BUSINESS FREE CASH FLOW

In 2018, the business free cash flow of the Life Science business sector remained stable at the previous year's level at € 1,393 million (2017: € 1,402 million). Essentially, the inventory build-up to support sales growth was offset by higher EBITDA pre and lower investments.

LIFE SCIENCE

Business free cash flow[1]

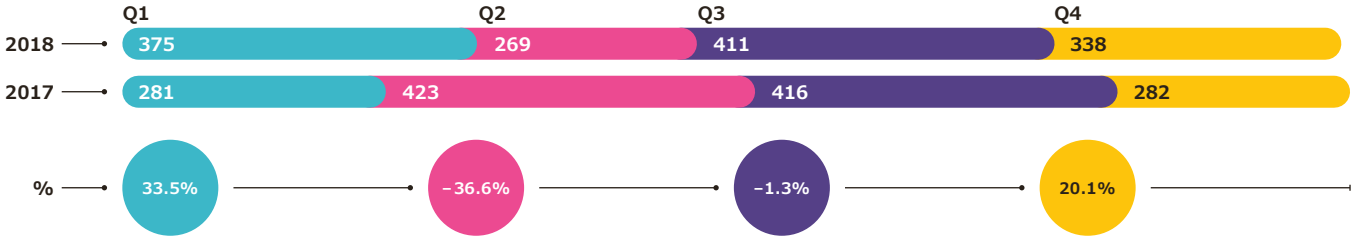
			Change	
€ million	**2018**	2017	€ million	in %
EBITDA pre[1]	1,840	1,786	54	3.0%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–315	–371	56	–15.1%
Changes in inventories	–116	28	–144	>100.0%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–17	–41	24	–59.3%
Business free cash flow[1]	**1,393**	**1,402**	**–9**	**–0.7%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

The development of business free cash flow items in the individual quarters in comparison with 2017 is presented in the following overview:

LIFE SCIENCE

Business free cash flow[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

Performance Materials

PERFORMANCE MATERIALS

Key figures

€ million	2018	2017	Change € million	Change in %
Net sales	2,406	2,446	–40	–1.7%
Operating result (EBIT)[1]	508	689	–181	–26.3%
Margin (% of net sales)[1]	21.1%	28.2%		
EBITDA[1]	769	947	–178	–18.8%
Margin (% of net sales)[1]	32.0%	38.7%		
EBITDA pre[1]	786	980	–194	–19.8%
Margin (% of net sales)[1]	32.7%	40.1%		
Business free cash flow[1]	588	906	–318	–35.1%

[1] Not defined by International Financial Reporting Standards (IFRSs).

DEVELOPMENT OF NET SALES AND RESULTS OF OPERATIONS

In 2018, net sales of the Performance Materials business sector decreased by –1.7% to € 2,406 million (2017: € 2,446 million). This drop was mainly attributable to adverse exchange rate effects of –3.4% or € 83 million. They resulted primarily from a weaker U.S. dollar over the previous year and declining Asian currencies such as the Taiwan dollar and the Japanese yen.

The Semiconductor Solutions business unit, which pools the business for materials to produce integrated circuits, generated strong organic sales growth in 2018, as expected.

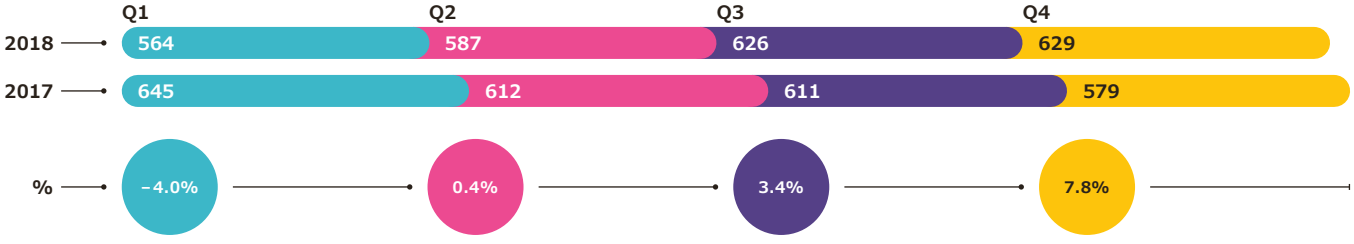
Sales in the Surface Solutions business unit fell short of expectations and were below the prior year's figure due to factors including the decline in demand for automobiles in Europe, North America and China.

The Display Solutions business unit recorded organic sales that were just positive owing to rising demand and strong growth in the OLED area and to non-recurring project-related liquid crystal sales, above all in the third and fourth quarters of 2018.

The net sales in the individual quarters as well as the respective organic growth rates in 2018 are presented in the following graph:

PERFORMANCE MATERIALS

Net sales and organic growth[1] by quarters[2]
€ million/organic growth in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

Net sales of the Performance Materials business sector by region developed as follows:

PERFORMANCE MATERIALS

Net sales by region

€ million	2018	Share	Organic growth[1]	Exchange rate effects	Acquisitions/ divestments	Total change	2017	Share
Europe	220	9%	–4.8%	–0.3%	–	–5.0%	231	9%
North America	214	9%	0.3%	–4.6%	–	–4.3%	223	9%
Asia-Pacific (APAC)	1,932	80%	2.9%	–3.5%	–	–0.7%	1,945	80%
Latin America	32	2%	–3.8%	–8.3%	–	–12.1%	37	2%
Middle East and Africa (MEA)	8	0%	–18.4%	–1.6%	–	–20.0%	10	0%
Performance Materials	**2,406**	**100%**	**1.7%**	**–3.4%**	**–**	**–1.7%**	**2,446**	**100%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

The development of results of operations is set out below:

PERFORMANCE MATERIALS

Results of operations

					Change	
€ million	2018	in %	2017	in %	€ million	in %
Net sales	**2,406**	**100.0%**	**2,446**	**100.0%**	**–40**	**–1.7%**
Cost of sales	–1,231	–51.2%	–1,145	–46.8%	–86	7.5%
Gross profit	**1,175**	**48.8%**	**1,301**	**53.2%**	**–127**	**–9.7%**
Marketing and selling expenses	–255	–10.6%	–242	–9.9%	–13	5.2%
Administration expenses	–90	–3.7%	–72	–2.9%	–18	25.1%
Research and development costs	–242	–10.1%	–225	–9.2%	–17	7.5%
Remaining operating expenses and income	–81	–3.3%	–73	–3.0%	–7	9.8%
Operating result (EBIT)[1]	**508**	**21.1%**	**689**	**28.2%**	**–181**	**–26.3%**
Depreciation/amortization/impairment losses/ reversals of impairment losses	261	10.9%	258	10.5%	3	1.3%
(of which: adjustments)	*(21)*		*(26)*		*(–5)*	*(–19.1%)*
EBITDA[1]	**769**	**32.0%**	**947**	**38.7%**	**–178**	**–18.8%**
Restructuring expenses	1		5		–4	–78.5%
Integration expenses/IT expenses	15		20		–6	–27.1%
Gains (–)/losses (+) on the divestment of businesses	–		1		–1	–
Acquisition-related adjustments	–		–		–	–
Other adjustments	1		7		–6	–89.5%
EBITDA pre[1]	**786**	**32.7%**	**980**	**40.1%**	**–194**	**–19.8%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

In 2018, gross profit was € 127 million below the previous year's level and amounted to € 1,175 million (2017: € 1,301 million), resulting in an expected reduction in the gross margin to 48.8% (2017: 53.2%). The development of the gross margin is essentially explained by the price declines observed in the display industry and by falling sales in the Surface Solutions business unit.

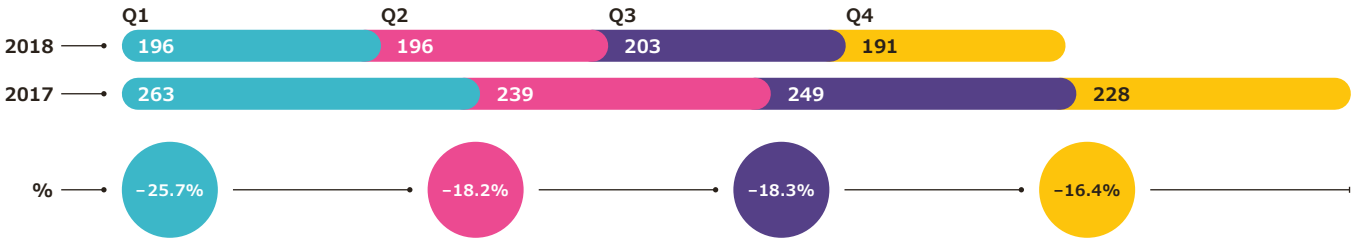
The operating result (EBIT) decreased to € 508 million in 2018 (2017: € 689 million). In addition to the sales and margin-related decline in gross profit, this was due to higher marketing and selling expenses as well as additional research and development costs. While the rise in marketing and selling expenses was primarily attributable to logistics costs, the increase in research costs was chiefly due to the tapping of new growth areas in materials for the production of integrated circuits.

EBITDA pre of the business sector declined by –19.8% to € 786 million (2017: € 980 million). The negative foreign exchange impact of –6.9% lowered this key performance indicator. Consequently, at 32.7%, the EBITDA pre margin was below the prior-year figure (2017: 40.1%).

The development of EBITDA pre in the individual quarters in comparison with 2017 is presented in the following overview:

PERFORMANCE MATERIALS

EBITDA pre[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

DEVELOPMENT OF BUSINESS FREE CASH FLOW

At € 588 million, the business free cash flow of the Performance Materials business sector in 2018 fell short of the prior-year figure (2017: € 906 million). This resulted from the reduction in EBITDA pre, a rise in receivables as of the 2018 balance sheet date that was primarily due to one-time project-related sales of liquid crystals in the fourth quarter of 2018, and higher inventories in the Surface Solutions business unit.

PERFORMANCE MATERIALS

Business free cash flow[1]

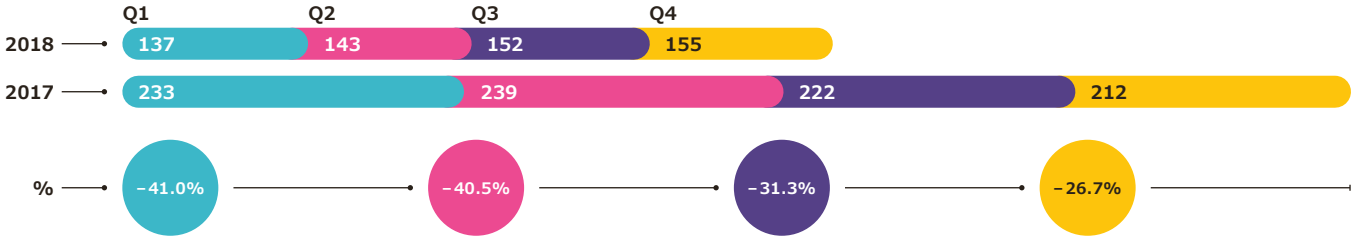
			Change	
€ million	**2018**	2017	€ million	in %
EBITDA pre[1]	786	980	–194	–19.8%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–118	–125	7	–5.6%
Changes in inventories	–44	–14	–30	>100.0%
Changes in trade accounts receivable and receivables from royalties and licenses	–36	65	–101	>100.0%
Business free cash flow[1]	**588**	**906**	**–318**	**–35.1%**

[1] Not defined by International Financial Reporting Standards (IFRSs).

The development of business free cash flow items in the individual quarters in comparison with 2017 is presented in the following overview:

PERFORMANCE MATERIALS

Business free cash flow[1] and change by quarter[2]
€ million/change in %



[1] Not defined by International Financial Reporting Standards (IFRSs).
[2] Quarterly breakdown unaudited.

Corporate and Other

Corporate and Other comprises Group administration expenses for central Group functions that cannot be directly allocated to the business sectors, such as Finance, Procurement, Legal, Communications and Human Resources. Corporate costs additionally encompass expenses for central, non-allocated IT functions, including expenses related to the expansion and harmonization of IT systems within the Group as well as research and development costs spanning business sectors.

CORPORATE AND OTHER

Key figures[1]

			Change	
€ million	**2018**	2017	€ million	in %
Operating result (EBIT)[2]	–548	–437	–111	25.5%
EBITDA[2]	–488	–391	–97	24.8%
EBITDA pre[2]	–381	–292	–89	30.6%
Business free cash flow[2]	–497	–429	–68	15.9%

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).

In 2018, administration expenses reported under Corporate and Other increased to € 320 million (2017: € 295 million). Cross-business research and development costs amounting to € 47 million in 2018 (2017: € 42 million), such as expenses for the Innovation Center, were allocated to Corporate. Other operating expenses (net) rose to € –197 million (2017: € –101 million), due among other things to a deterioration in the foreign exchange result. A reversal of an impairment loss for other receivables amounting to € 37 million had a positive effect on the operating result. The reversal was made in connection with contractual refund claims from the sale of the Generics business in 2007. After eliminating depreciation, amortization and adjustments, EBITDA pre amounted to € –381 million in 2018 (2017: € –292 million). The increase in negative business free cash flow to € –497 million (2017: € –429 million) was mainly due to the development of EBITDA pre.

Report on Risks and Opportunities

Risks and opportunities are inherent to entrepreneurial activity. We have put systems and processes in place to identify risks at an early stage and to counteract them by taking appropriate action. Within the company, opportunity management is an integral component of internal decision-making processes such as short- and medium-term planning and intra-year business plans.

Risk and opportunity management

Merck KGaA, Darmstadt, Germany, is part of a complex, global business world and is therefore exposed to a multitude of external and internal influences. Every business decision is therefore based on the associated risks and opportunities.

In our internal risk reporting, risks are defined as potential future events or developments that could lead to a negative deviation from our (financial) targets. In parallel, opportunities are defined as potential events or developments that imply a positive deviation from our planned (financial) targets. Identified future events and expected developments are taken into account in internal planning provided that it can be assumed that their occurrence is likely in the planning period. The risks and opportunities presented in the following risk and opportunities report are those potential future events that could respectively lead to a negative or positive deviation from the topics covered by planning.

RISK MANAGEMENT PROCESS

The objective of our risk management activities is to recognize, assess and manage risks early on and to implement appropriate measures to minimize them. The responsibilities, objectives and processes of risk management are described in our internal risk management guidelines. The business heads, managing directors of our subsidiaries and the heads of Group functions are specified as employees with responsibility for risks. The group of consolidated companies for risk reporting purposes is the same as the group of consolidated companies for the consolidated financial statements. Every six months, the risk owners assess their risk status and report their risk portfolio to Risk Management. We use special risk management software in the context of these activities.

Likewise, risk-mitigating measures are reported and assessed. The effectiveness of these measures and the planned implementation time frame are monitored by Group Risk Management.

The residual risk after the implementation of these measures is presented in the internal risk report as net risk.

Group Controlling & Risk Management forms the organizational framework for risk management and reports directly to the Group Chief Financial Officer. Group Risk Management uses the information reported to determine the current risk portfolio for the Group, presenting this in a report to the Executive Board, the Supervisory Board and the Finance Committee with detailed explanations twice per year. This also encompasses a probability-weighted aggregation of risks at Group level using a Monte Carlo simulation. Furthermore, significant changes in the assessment of the risks already known and new significant risks can be reported at any time and are communicated to the Executive Board on an ad hoc basis.

For reporting risks with a potential negative impact on our EBIT, a minimum threshold is set at a value of € 5 million in the standard process and at a value of € 25 million in the ad hoc process. Risks below these thresholds are steered independently within the business sectors. The relevant timeframe for internal risk reporting is five years. The effects of risks described in this report on risks and opportunities are presented as annual values. The assessment of the risks presented relates to December 31, 2018. There were no relevant changes after the balance sheet date that would have necessitated an amended presentation of the risk situation of the Group.

Within the scope of audits, Group Internal Auditing regularly reviews the performance of risk management processes within the units and, at the same time, the communication of relevant risks from the operating businesses to Group Risk Management.

OPPORTUNITY MANAGEMENT PROCESS

The risk management system described concentrates on business risks, and not on opportunities at the same time. The opportunity management process is integrated into our internal controlling processes and carried out in the operating units on the basis of the Group strategy. The businesses analyze and assess potential market opportunities as part of strategy and planning processes. In this context, investment opportunities are examined and prioritized primarily in terms of their potential value proposition in order to ensure an effective allocation of resources. We selectively invest in growth markets to leverage the opportunities of dynamic development and customer proximity at a local level.

If the occurrence of the identified opportunities is rated as likely, they are incorporated into the business plans and the short-term forecasts. Trends going beyond this or events that could lead to a positive development in the net assets, financial position and results of operations are presented in the following report as opportunities. These could have a positive effect on our medium-term prospects.

Risk and opportunity assessment

RISKS

The significance of risks is calculated on the basis of their potential negative impact on the forecast financial targets in conjunction with the probability of occurrence of the respective risk. In line with these two factors, risks are classified as “high”, “medium” or “low”.

The underlying scales for measuring these factors are shown below:

PROBABILITY OF OCCURRENCE

Probability of occurrence	Explanation
< 20%	Unlikely
20 – 50%	Possible
51 – 80%	Likely
> 80%	Very likely

DEGREE OF IMPACT

Degree of impact	Explanation
> € 50 million	Critical negative impact on the net assets, financial position and results of operations
€ 20 – 50 million	Substantial negative impact on the net assets, financial position and results of operations
€ 5 – < 20 million	Moderate negative impact on the net assets, financial position and results of operations
< € 5 million	Immaterial negative impact on the net assets, financial position and results of operations

The combination of the two factors results in the risk matrix below, which shows the individual risks and their significance to the Group.

RISK MATRIX

> € 50 million	Medium	Medium	High	High
€ 20 – 50 million	Medium	Medium	Medium	High
€ 5 – < 20 million	Low	Medium	Medium	Medium
< € 5 million	Low	Low	Low	Low
Impact / Probability of occurrence	< 20%	20 – 50%	51 – 80%	> 80%

OPPORTUNITIES

Opportunities are assessed in their respective specific business environment. General measures of the business functions are quantified during operational planning, usually in relation to sales, EBITDA pre and business free cash flow. Net present value, internal rate of return, the return on capital employed (ROCE) and the amortization period of the investment are primarily used to assess and prioritize investment opportunities. Similarly, scenarios are frequently set up to simulate the influence of possible fluctuations and changes in the respective factors on results. There is no overarching, systematic classification of the probability of occurrence and impact of opportunities.

Internal control system for the Group accounting process

The objective of the internal control system for the accounting process is to implement controls that provide assurance that the financial statements are prepared in compliance with the relevant accounting laws and standards. This system covers measures designed to ensure the complete, correct and timely conveyance and presentation of information that is relevant for the preparation of the consolidated financial statements and the combined management report.

KEY TOOLS

The internal control system aims to ensure the accuracy of the consolidated accounting process through functioning internal controls with reasonable assurance. The Group Accounting function centrally steers the preparation of the consolidated financial statements of Merck KGaA, Darmstadt, Germany, as the parent company of the Group. This Group function defines the reporting requirements that all our subsidiaries must meet. At the same time, this function steers and monitors the scheduling and process-related requirements of the consolidated financial statements. Group Accounting centrally manages all changes to the equity holding structure and correspondingly adapts the Group's scope of consolidation. The proper elimination of intragroup transactions within the scope of the consolidation process is ensured. Group-wide accounting guidelines form the basis for the preparation of the statutory financial statements of the parent company and of the subsidiaries, which are reported to Group Accounting; the guidelines are adapted in a timely manner to reflect changes in the financial regulatory environment and are updated in accordance with internal reporting requirements. For special issues, such as the accounting treatment of intangible assets within the scope of company acquisitions or pension obligations, external experts are additionally involved where necessary.

The individual companies have a local internal control system. Where financial processes are handled by a Shared Service Center, the internal control system of the Shared Service Center is additionally applied. Both ensure that accounting complies with IFRSs (International Financial Reporting Standards) and with the Group accounting guidelines.

Group Accounting provides support to the local contacts and ensures a consistently high quality of reporting throughout the entire reporting process.

For Group financial reporting purposes, most of our subsidiaries use standard SAP software. Consolidation software from SAP is also used for the elimination of intragroup transactions. A detailed authorization concept ensures the separation of duties with respect to both single-entity reporting and the consolidated financial statements. In principle, the accounting process is designed to ensure that all units involved adhere to the principle of dual control.

The effectiveness of our internal control system with regard to accounting and the compliance with financial reporting by the individual companies is confirmed by both the local managing director and the local chief financial officer when they sign the single-entity reporting. For the accounting treatment of balance sheet items, Group Accounting closely cooperates with Group Risk Management in order to correctly present potential balance sheet risks. All the structures and processes described are subject to regular review by Group Internal Auditing based on an annual audit plan set out by the Executive Board. The results of these audits are dealt with by the Executive Board, the Supervisory Board and the Finance Committee. The internal control system at our company makes it possible to lower the risk of material misstatements in accounting to a minimum. However, no internal control system – regardless of its design – can entirely rule out a residual risk.

Business-related risks and opportunities

POLITICAL AND REGULATORY RISKS AND OPPORTUNITIES

As a global company, we face political and regulatory changes in a large number of countries and markets.

Risk of more restrictive regulatory requirements regarding drug pricing and reimbursement

In the Healthcare business sector, the known trend towards increasingly restrictive requirements in terms of drug pricing, reimbursement and expansion of high-rebate groups is continuing. These requirements can negatively influence the profitability of our products, also through market referencing between countries, and jeopardize the success of market launches. Foreseeable effects are taken into account as far as possible in the business sector's plans. Close communication with health and regulatory authorities serves as a preventive measure to avert risks.

Remaining risks beyond the current plans resulting from restrictive regulatory requirements are classified as a medium risk owing to the possible critical or partly probable and moderate negative impact.

Risk of stricter regulations for the manufacturing, testing and marketing of products

Likewise, in our Life Science and Performance Materials business sectors, we must adhere to a multitude of regulatory specifications regarding the manufacturing, testing and marketing of many of our products. Specifically in the European Union, we are subject to the European chemicals regulation REACH. It demands comprehensive tests for chemical products. Moreover, the use of chemicals in production could be restricted, which would make it impossible to continue manufacturing certain products. We are constantly pursuing research and development in substance characterization and the possible substitution of critical substances so as to reduce the occurrence of this risk, and therefore view it as unlikely. Nevertheless, it is classified as a medium risk given its critical negative impact on the net assets, financial position and results of operations.

Risk of negative political and macroeconomic developments

The destabilization of political systems (as for example in Turkey or the Middle East), the possible establishment of trade barriers, sanctions and foreign exchange policy changes can lead to declines in sales in certain countries and regions. These risks are taken into account as far as possible in the business plans of the affected countries and regions and mitigated through product, industry and regional diversification.

Potential negative macroeconomic developments, for example in Argentina, can also impact our business. To minimize these impacts, corresponding measures pertaining to the sales strategy have been initiated in these countries.

The United Kingdom's intended exit from the European Union ("Brexit") gives rise to risks for our existing business in that country (2018: sales of € 636 million, 1,442 employees and 5 production sites), including the devaluation of the pound sterling, a weakening of the United Kingdom's economy, regulatory changes, the creation of trade barriers such as tariffs as well as, particularly in the event of a Brexit without a transition phase ("hard Brexit"), operational risks due to, for example, delays in the supply chain that could have an impact on our profitability. To analyze these risks and in order to counteract them early in a targeted manner, we established Group-internal working groups that considered various scenarios, including the possibility of a "hard Brexit". Mitigation measures exist for these scenarios, which shall ensure market access and the stability of the supply chain in the best possible way. They also include, for example, a relocation of the marketing authorization holder for drugs currently registered via the United Kingdom; changes to supply routes and the planned build-up of inventories of critical products, which are also designed to cushion the risk of delays in cross-border traffic, which is difficult to predict.

The net risk of negative political and macroeconomic developments is seen as possible and has critical negative effects on the net assets, financial position and results of operations. We thus rate this as a medium risk.

MARKET RISKS AND OPPORTUNITIES

We compete with numerous companies in the pharmaceutical, chemical and life science sectors. Rising competitive pressure can have a significant impact on the quantities that can be sold and prices attainable for our products.

Opportunities due to new technologies in the manufacturing of displays

We see opportunities in the medium- to long-term possibilities of significant market growth of OLED applications in high-quality display applications. We are building on more than ten years of experience in manufacturing organic light-emitting diode (OLED) materials as well as a strong portfolio of worldwide patents in order to develop ultrapure and extremely stable materials that are precisely tailored to customer requirements. The development in the OLED market is being driven by the diversification of applications for OLED displays. OLED technology is an established alternative to LCDs in small-area displays, for instance smartphones. However, owing to technological advances, OLED technology is being used in more and more large-area displays, such as televisions. In the future, OLED technology could also transform ceilings or walls in buildings into information boards. In order to realize such future applications, we are developing highly efficient OLED materials branded Livilux® for vacuum evaporation technology or printing processes. At the beginning of the second quarter of 2017, the HyperOLED project started within the scope of the Horizon 2020 initiative, an EU-funded program. As part of this project, together with four other partners, we will be developing high-performance, hyperfluorescence OLEDs for display and lighting applications over the next three years.

Furthermore, in 2018 we opened our new OLED Technology Center China in Shanghai. The new technology center will make tailored solutions for the development of innovative OLED applications available to local customers. It offers state-of-the-art equipment and clean room installations for the production and characterization of OLED construction elements. The site will service as venue for the collaboration between us and our customers to enable the joint development of ideal solutions for OLED display products.

Opportunities due to new application possibilities for liquid crystals

We are pursuing a strategy of leveraging our expertise as the global market leader in liquid crystals in order to develop new fields of application for innovative liquid crystal technologies. For instance, we are pressing ahead to capture the future markets for liquid crystal windows (LCWs) and mobile antennas. Thanks to licrivision™ technology, LCWs create new architectural possibilities. Through continuously variable brightness control, they can for example increase a building's energy efficiency. Moreover, the dynamic solar shading product eyrise™ s350 launched in the EU and North America allows solar shading to be managed while the windows remain transparent and color-neutral. Due to growing demand for dynamic glass, we see great potential for the new eyrise™ product brand. Antennas that can receive signals transmitted in the high frequency range can also be realized with the aid of corresponding liquid crystal mixtures. As a result, mobile data exchange could improve significantly in a wide variety of fields of application. Since novel liquid crystal materials for antennas are currently being developed, the market launch of liquid crystal antennas could take a few years.

Opportunities in the semiconductor industry

We see huge opportunities with our innovative Directed Self Assembly (DSA) technique for advanced lithography processing in Semiconductor Solutions. As semiconductor manufacturers continue to advance their device technologies, the image processing steps are becoming more complex and significantly more costly to enable device performance. Our novel DSA platform and recent material advancements enable improved device performance and reduce the cost of ownership (COO) to the customer. This has resulted in our company securing a leading position as Process of Record (POR) with several key semiconductor customers. Adoption of this disruptive lithography platform is expected to completely change how semiconductor manufacturing is conducted and could lead to a market leadership position for advanced lithography over the next few years.

We are developing new dielectric platforms in cooperation with our key customers for 3D NAND applications. There has been a change in 3D NAND device architecture and some of our customers are moving from floating gate to replacement gate. We are currently working with those customers on the new device architecture, which is expected to be introduced and ramped up in 2019 and beyond.

Opportunities from new active ingredients for cosmetics

In the current reporting year, we have systematically pushed ahead with the expansion of our research on cosmetic raw materials and supplies according to the principles of pharmaceutical drug development. The synergies from the knowledge and technology transfer from the Healthcare and Life Science Group areas have substantially improved the development times and efficiencies of new active ingredients for cosmetics. Taken together with the establishment of advanced 3D skin models, this results in a range of promising new cosmetic raw materials that are due to be launched over the coming quarters. Partnerships with leading providers from growth markets beyond Europe and North America increasingly play an important role when it comes to commercializing these products, which are offered for optimized management of the tanning or whitening of the skin, among other things.

Another growth driver is the growing demand for sustainably produced cosmetic raw materials that meet the substantially increased regulatory requirements on the main markets. Our company occupies a leading role in this field and is therefore increasingly used as a preferred supplier.

Opportunities from leveraging the e-commerce and distribution platform

With the acquisition of Sigma-Aldrich in 2015, we gained access to the leading life science e-commerce platform. Our customers are already benefiting from a portfolio of more than 300,000 products, including highly respected brands distributed via this e-commerce platform. We are further expanding this platform in order to continuously increase the number of products available on it. Making ordering processes faster and more convenient for our customers and offering support through individualized product recommendations could lead to higher sales volumes and enable us to win new customers. Consequently, this distribution channel could lead to an above-average development of sales in the medium term.

Risks due to increased competition and customer technology changes

In the Healthcare business sector, both our biopharmaceutical products and classic pharmaceutical business are exposed to increased competition from rival products (in the form of biosimilars and generics). In the Life Science and Performance Materials business sectors, risks are posed by not only cyclical business fluctuations but also changes in the technologies used or customer sourcing strategies, particularly with respect to liquid crystals. We use close customer relationships and in-house further developments as well as market proximity, including precise market analyses, as mitigating measures. Overall, owing to its possible occurrence with a critical negative impact, the market risk is classified as a medium risk.

Opportunities offered by digitalization and activities to boost innovative strength

Digital technologies are becoming increasingly important for our markets and our world of work. Therefore, in 2015, we launched strategic digital initiatives geared to improving the efficiency of our internal processes and to evaluating the opportunities of digitalization with regard to our products and customers. In addition to collaborations with external partners to expand e-health solutions for patients, such as our MSdialog platform, the Accelerator program, which is being driven by our Innovation Center, is one component of our innovation strategy.

In the Healthcare business sector, in 2018 we signed an agreement for a strategic collaboration with Chinese online company Alibaba Health, which is active in the healthcare sector. The collaboration seeks

to improve access to healthcare services for patients and their families in China. The online portal www.fertility.com was launched in June 2018. It comprises a portal for physicians and one for patients. This platform allows patients and physicians to access information they require from anywhere at any time. We also introduced two new technologies to increase efficiency in reproductive laboratories. QBOX IVF optimizes the data transfer between laboratory instruments and systems for electronic patient files, while Geri® Assess 2.0 introduces the automatic identification of major development steps of embryos and blastocysts, thereby increasing evaluation efficiency. We entered into a partnership with Medisafe, a start-up based in the United States. Together the companies aim to help cardiometabolic patients better manage medication intake and adhere to prescribed treatment regimens. In the countries of scope, our patients will have access to a customized version of Medisafe's mobile platform that could combine reminders, motivation and support systems, targeted content, coupons and interventions in their local language.

In November 2018, our Life Science business sector launched its new BioContinuum™ platform to optimize biotherapeutic drug manufacturing through improved efficiency, simplified plant operations, and greater quality and consistency. This new, adaptive platform of products, applications and expertise will allow customers to bring urgently needed therapies to patients, faster and more cost-effectively than ever before, and represents the next development step in the biopharmaceutical sector.

In 2018, we expanded our competencies with a PMatX incubator for electronics of the next generation in Israel in the Performance Materials area.

Opportunities provided by the CRISPR technology

The CRISPR technology is used in genome editing. In 2018, we were awarded several patents for this. Fundamental CRISPR patents exist in Australia, China, Europe, Israel, Canada, Singapore and South Korea.

The CRISPR technologies open up promising new avenues for medical research and the treatment of some of the most difficult diseases to treat, such as cancer as well as hereditary and rare diseases.

Opportunities offered by customer proximity

In June 2018, we opened North America's first BioReliance® End-to-End Biodevelopment Center for drug manufacturers in Burlington, Massachusetts. The center provides practical experience and offers expert advice for each stage of biotechnological development and manufacture.

The manufacture of biopharmaceuticals, or biomanufacturing, is a growing industry that is increasingly focused on optimized production and high quality. However, the drug development process is long and complex, and requires biotech companies to make significant financial investments.

The new center is one of three worldwide supporting our biotech partners in developing their processes from early clinical stages to commercialization by providing end-to-end solutions.

Other centers are in Martillac (France) and Shanghai (China).

In October 2018, we opened another state-of-the-art customer collaboration center (M Lab™ Collaboration Center) in São Paulo, Brazil. The center includes non-GMP pilot and bench scale labs for customers to engage in process development support, troubleshooting and hands-on training. It is one of nine such centers around the world, each of which allows pharmaceutical manufacturers to explore new ways to increase productivity, improve processes and mitigate risks. Other M Lab™ Collaboration Center locations include China, Singapore, Japan, South Korea, India, France and the United States.

RISKS AND OPPORTUNITIES OF RESEARCH AND DEVELOPMENT

For us, innovation is a major element of the Group strategy. Research and development projects can experience delays, expected budgets can be exceeded or targets can remain unmet. Research and development activities are of special importance to the Healthcare business sector. In the course of portfolio management, we regularly evaluate and, if necessary, refocus research areas and all R&D pipeline projects. Alliances with external partners and the outlicensing of programs also form part of the catalog of measures for the efficient allocation of resources. The conclusion and continuation of these partnerships and externalizations play an important role. A deviation from the strategic targets defined in this area could have a critical negative impact on net assets, financial position and results of operations. The occurrence of a risk of this magnitude is considered unlikely, which means that this is a medium risk.

Special mention should be made of the strategic alliance formed in 2014 between our company and Pfizer Inc. as a research and development opportunity in the Healthcare business sector. We co-developed Bavencio® with Pfizer. Following its approval for the treatment of patients with metastatic Merkel cell carcinoma and locally advanced or metastatic urothelial cancer in 2017, it was not approved for any additional indications this year.

Mavenclad® was approved in 2017 by the European Commission. It is the first short-course oral treatment approved in Europe for the treatment of relapsing multiple sclerosis in patients with high disease activity. In 2018, approvals were also granted in the Middle East and Africa (United Arab Emirates) and Latin America (Argentina). Looking forward, we aim to seek approval for Mavenclad® in the United States.

In addition to marketing already approved medicines, we are pushing ahead with research projects in other important therapeutic areas. The portfolio of projects is evaluated on a regular basis. This may also lead to inlicensing or outlicensing or further strategic alliances.

For example, in 2018 a combination of BAVENCIO® (avelumab) and INLYTA® (axitinib) was shown to significantly extend the time to disease progression or death in patients with untreated, advanced renal cell carcinoma, according to the results of a Phase III trial. Based on the results, our company and Pfizer are planning to submit an application for approval in the United States.

We received fast-track designation for Tepotinib in Japan. The molecule may have the potential to treat patients with advanced non-small cell lung cancer (NSCLC) harboring MET exon 14 skipping mutations.

The expenses currently being incurred, especially in our Healthcare research and development, are already reflected in the current plans. The same applies to net sales generated by the products Bavencio® and Mavenclad® for approved indications on the relevant markets, as well as to the planned approval of Mavenclad in the United States. Further approvals may result in an increased sales potential.

Risks of discontinuing development projects and regulatory approval of developed medicines

Sometimes development projects are discontinued after high levels of investment at a late phase of clinical development. Decisions – such as those relating to the transition to the next clinical phase – are taken with a view to minimizing risk. We are currently not aware of any risks beyond general development risks that could significantly affect the net assets, financial position and results of operations.

Furthermore, there is the risk that regulatory authorities either do not grant or delay approval or grant only restricted approval. Additionally, there is the risk that undesirable side effects of a pharmaceutical product could remain undetected until after approval or registration, which could result in a restriction of approval or withdrawal from the market. Well-advanced programs in our pipeline and those of our partners result in potential new approvals; on the other hand, missing targets in this area may have critical negative effects on the financial position and operating result, for example due to lower net sales or the non-occurrence of milestone payments from collaboration agreements. Overall, these risks are considered to be medium risks, with probabilities ranging from unlikely to possible.

RISKS AND OPPORTUNITIES RELATED TO THE QUALITY AND AVAILABILITY OF PRODUCTS

Risk of a temporary ban on products/production facilities or of non-registration of products due to non-compliance with quality standards

We are required to comply with the highest standards of quality in the manufacturing of pharmaceutical products (Good Manufacturing Practice or official pharmacopoeia). In this regard we are subject to the supervision of the regulatory authorities. Conditions imposed by national regulatory authorities could result in a temporary ban on products/production facilities, and possibly affect new registrations with the respective authority. We make the utmost effort to ensure compliance with regulations, regularly perform our own internal inspections and also carry out external audits. Thanks to these quality assurance processes, the occurrence of a risk with a critical negative impact is unlikely, however cannot be entirely ruled out. Depending on the product concerned and the severity of the objection, such a risk can have a moderate negative impact on the net assets, financial position and results of operations. Therefore, we rate this as a medium risk.

Risks of production availability

Further risks include operational failures due to fire or force majeure, for example natural disasters such as floods or earthquakes, which could lead to a substantial interruption or restriction of business activities. Insofar as it is possible and economically viable, the Group limits its damage risks with insurance coverage, the nature and extent of which is constantly adapted to current requirements. Likewise, we are exposed to risks of production outages and the related supply bottlenecks that can be triggered by technical problems in production facilities with very high capacity utilization. Furthermore, there are risks of supply bottlenecks due to a lack or disappearance of capacity. We are working to continuously mitigate the risks by making regular investments, setting up alternative sourcing options and maintaining inventory levels.

Although the occurrence of these risks is considered unlikely, an individual event could have a critical negative effect on the net assets, financial position and results of operations, and they are therefore classified as a medium risk.

Risks of dependency on suppliers
Quality controls along the entire value chain reduce the risks related to product quality and availability. This starts with the qualification of our suppliers. Quality controls also include comprehensive quality requirements for raw materials, purchased semi-finished products and plants. We are dependent on individual suppliers for a number of precursor products, packaging materials and finished goods. In the event that one of these suppliers curtails or discontinues production, or supply is disrupted, this could potentially have a critical impact on the business concerned. With long-term strategic alliances for precursor products critical to supply and price as well as alternative sourcing strategies, we reduce the probability of occurrence of these risks and rate them as unlikely. Overall, these are classified as medium risks.

Product liability risks
Companies in the chemical and pharmaceutical industries are exposed to product liability risks in particular. Product liability risks can lead to considerable claims for damages, loss of reputation and costs to avert damages. We have taken out the liability insurance that is standard in the industry for such risks. However, it could be that the insurance coverage available is insufficient for individual cases. Although the occurrence of product liability claims in excess of the existing insurance coverage is considered unlikely, individual cases could still have a critical negative effect on the net assets, financial position and results of operations. We therefore rate a potential product liability risk as a medium risk.

Risks due to product-related crime and espionage
Owing to our portfolio, we are exposed to a number of sector-specific crime risks. This relates primarily to products, including among other things, counterfeiting, illegal channeling, misuse as well as all types of property crime, including attempts at these crimes. Crime phenomena such as cybercrime and espionage could equally affect our innovations or innovation abilities as such.

To combat product-related crime, an internal coordination network covering all functions and businesses (“Anti-Counterfeiting Operational Network”) was set up several years ago. In addition, security measures are in use to protect products against counterfeiting. Innovative technical security solutions and defined preventive approaches are used to ward off dangers relating to cybercrime and espionage. Measures to prevent risks and to prosecute identified offenses are conducted in all the relevant crime areas in close and trustworthy cooperation with the responsible authorities. The impact of these risks on business operations depends on the respective individual case, product-specific factors, the value chain and regional aspects in particular. Our Corporate Security department is responsible for the overall coordination of all measures in this area. Overall, the threat resulting from crime in general is seen as being possible and is classified as a medium risk.

Opportunities due to an expanding local presence in high-growth markets
For numerous markets in Asia, the Middle East, Latin America and Africa, we expect that in the coming years all business sectors will continue to make above-average contributions to growth. In order to further expand this potential for our businesses, we have moved forward with several investment projects in recent years. For instance, in 2018 we invested around € 15 million in China to further expand the capacity of a pharmaceutical manufacturing facility and a further € 29 million in a manufacturing plant for our Life Science business sector. Moreover, we are continuing our engagement in Africa. The greater local presence and customer proximity could give us a key competitive edge and, in the medium to long term, offers the opportunity for significant growth in sales and EBITDA pre.

RISKS AND OPPORTUNITIES FROM THE USE OF SOCIAL MEDIA

Our company and its employees are active on numerous social media channels. The consistent and legally compliant use of the channels and their content is important in terms of increasing awareness of our brand, among other things. We take precautions and implement processes to ensure awareness of the proper handling of social media, controlling publication and actively managing communication.

Nevertheless, reputational risks could result, for instance through public dialogs in social media.

Overall, we rate this as a low risk.

Financial risks and opportunities

As a corporate group that operates internationally and due to our presence in the capital market, we are exposed to various financial risks and opportunities. Above all, these are liquidity and counterparty risks, financial market risks and opportunities, risks of fluctuations in the market values of operational tangible and intangible assets, as well as risks and opportunities from pension obligations.

RISK AND OPPORTUNITY MANAGEMENT IN RELATION TO THE USE OF FINANCIAL INSTRUMENTS

In the area of financial risks and opportunities, we use an active management strategy to reduce the effects of fluctuations in exchange and interest rates. The management of financial risks and opportunities by using derivatives in particular is regulated by extensive guidelines. Speculation is prohibited. Derivative transactions are subject to constant risk controls. A strict separation of functions between trading, settlement and control functions is ensured.

LIQUIDITY RISKS

In order to ensure its continued existence, a company must be able to fulfill its commitments from operating and financial activities at all times. Therefore, to reduce potential liquidity risks, we have a central Group-wide liquidity management system in place and a balanced maturity profile. The maturities of our financial liabilities are aligned with our planned free cash flow. Furthermore, we have a multicurrency revolving credit facility of € 2 billion with a term until 2023, which ensures continuing solvency if any liquidity bottlenecks occur. As our loan agreements do not contain any financial covenants, these agreed lines of credit can be accessed even if our credit rating should deteriorate. Additionally, we have a commercial paper program with a maximum volume of € 2 billion.

Overall, the liquidity risk is unlikely and rated as low.

COUNTERPARTY RISKS

Counterparty risks arise from the potential default by a partner in connection with financial investments, loans and financing commitments on the one hand and receivables in operating business on the other.

As for counterparty risks from financial transactions, we review all positions relating to trading partners and their credit ratings on a daily basis. We manage financial risks of default by diversifying our financial positions and through the related active management of our trading partners. Significant financial transactions involving credit risk are entered into with banks and industrial companies that have a good credit rating. Moreover, our large banking syndicate – the multi-currency revolving credit facility of € 2 billion was syndicated by 19 banks – reduces possible losses in the event of default.

The solvency and operational development of trading partners is regularly reviewed as part of the management of operational counterparty risks. Sovereign risks are also analyzed. The volume of receivables of each customer is capped in line with their credit ratings. Risk-mitigating measures, such as credit insurance, are utilized as appropriate. Nevertheless, defaults by isolated trading partners, even those with outstanding credit ratings, cannot be entirely ruled out, although rated as unlikely (further information can be found in "Credit risks" in Note (38) "Management of financial risks" in the Notes to the Consolidated Financial Statements).

Counterparty risk is classified as a medium risk overall owing to the unlikely probability of occurrence with a potential critical negative effect.

FINANCIAL MARKET OPPORTUNITIES AND RISKS

As a result of our international business activities and global corporate structure, we are exposed to risks and opportunities from fluctuations in exchange rates. These result from financial transactions, operating receivables and liabilities, as well as forecast future cash flows from sales and costs in foreign currency. We use derivatives to manage and reduce the aforementioned risks and opportunities (further information can be found in Note (38) "Management of financial risks" in the Notes to the Consolidated Financial Statements). Due to their possible occurrence with a potentially critical negative effect on the net assets, financial position and results of operations, foreign exchange rate risks are rated as medium risk.

Variable interest and current financial liabilities are exposed to the risks and opportunities of interest rate fluctuations. These are also managed and reduced using derivatives. Interest rate risks have a potentially moderate negative impact, are considered unlikely and pose low risks overall.

RISKS OF IMPAIRMENT OF BALANCE SHEET ITEMS

The carrying amounts of individual balance sheet items are subject to the risk of changing market and business conditions and thus to changes in fair values as well. Necessary impairments could have a significant negative non-cash impact on earnings and affect the accounting ratios. This applies in particular to the high level of intangible assets including goodwill, which mainly derive from the purchase price allocations made in connection with past acquisitions (further information can be found in Note (19) "Goodwill" and (20) "Other intangible assets" in the Notes to the Consolidated Financial Statements). All relevant risks were assessed during the preparation of the consolidated financial statements and taken into account accordingly. We rate risks beyond this as unlikely with a critical negative impact. Therefore, this is seen as a medium risk.

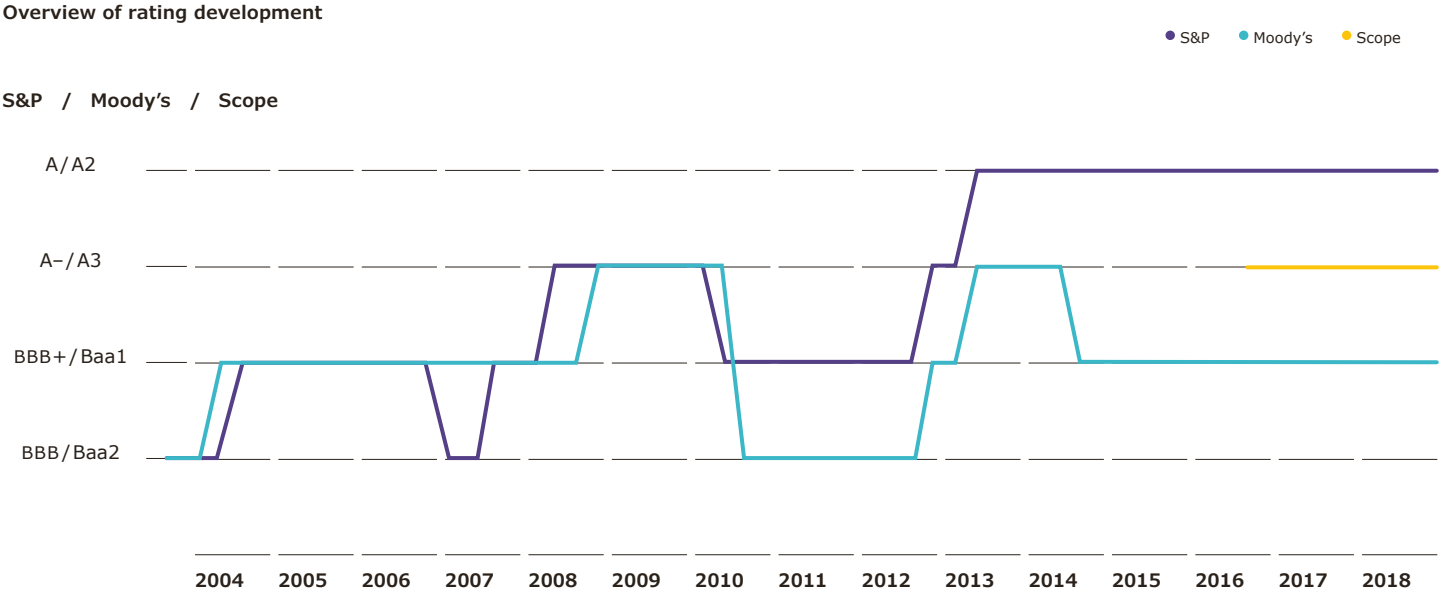
RISKS AND OPPORTUNITIES FROM PENSION OBLIGATIONS

We have commitments in connection with pension obligations. The present value of defined benefit obligations can be significantly increased or reduced by changes in the relevant valuation parameters, for example the interest rate or future salary increases. Pension obligations are regularly assessed as part of annual actuarial reports. The obligations are covered by the pension provisions reported in the balance sheet based on the assumptions as of the balance sheet date. Some of these obligations are funded by plan assets (further information can be found in Note (25) "Provisions for pensions and other post-employment benefits" in the Notes to the Consolidated Financial Statements). To the extent that pension obligations are covered by plan assets consisting of interest-bearing securities, shares, real estate and other financial assets, decreasing or negative returns on these assets can adversely affect the fair value of plan assets and thus result in further additions to pension provisions. By contrast, rising returns increase the value of plan assets, thereby resulting in excess cover of plan liabilities. We increase the opportunities of fluctuations in the market value of plan assets on the one hand and reduce the risks on the other by using a diversified investment strategy. The unlikely risk due to pension obligations could have moderate negative effects on the net assets, financial position and results of operations, and is classified as low.

ASSESSMENTS BY INDEPENDENT RATING AGENCIES

The capital market uses the assessments published by rating agencies to help lenders assess the risks of a financial instrument used by our company. We are currently rated by Standard & Poor's (S&P), Moody's and Scope. Standard & Poor's has issued a long-term credit rating of A with a stable outlook, Moody's a rating of Baa1 with a stable outlook and Scope a rating of A–, likewise with a stable outlook. In line with market procedures, our financing conditions are closely tied to our rating. The better a rating, the more favorably we can generally raise funds on the capital market or from banks.

Overview of rating development



Legal risks

Generally, we strive to minimize and control our legal risks. To this end, we have taken the necessary precautions to identify threats and defend our rights where necessary.

Nevertheless, we are still exposed to litigation risks or legal proceedings. In particular, these include risks in the areas of product liability, competition and antitrust law, pharmaceutical law, patent law, trademark law, data protection law, tax law and environmental protection. As a research-based company, we have a valuable portfolio of industrial property rights, patents and brands that could become the target of attacks and infringements. The outcome of future proceedings or those currently pending is difficult to foresee.

For instance, we are currently involved in litigation with Merck & Co. Inc., Kenilworth, NJ, USA (outside the United States and Canada: Merck Sharp & Dohme Corp. (MSD)), against whom we have filed lawsuits in various countries. This company has also sued us in the United States for trademark infringement, among other things.

Due to long statutes of limitations or in some cases the absence thereof, it is not possible to rule out that we will face third-party claims arising from the same issue despite the conclusion of legal proceedings. Court or official rulings or settlements can lead to expenses with a significant impact on our business and earnings.

Despite extensive precautionary measures, non-compliance with laws and regulations leading to related consequences can never be completely excluded.

Tax risks are reviewed regularly and systematically by Group Tax. Corresponding standards and guidelines are used in order to identify tax risks at an early stage as well as to review, evaluate and correspondingly minimize them. Risk reduction measures are coordinated by Group Tax together with the subsidiaries abroad.

In our opinion, the lawsuits described below constitute the most significant legal risks. This should not be seen as an exhaustive list of all legal disputes currently ongoing.

RISKS FROM PRODUCT-RELATED AND PATENT LAW DISPUTES

We are involved in a patent dispute with Biogen Inc., Massachusetts (United States), (Biogen) in the United States. Biogen claims that the sale of Rebif® in the United States infringes on a Biogen patent. The disputed patent was granted to Biogen in the United States in 2009. Subsequently, Biogen sued us and other pharmaceutical companies for infringement of this patent. Our company defended itself against all allegations and brought a countersuit claiming that the patent is invalid and not infringed on by our actions. In the first instance, a jury recognized the invalidity of the patent. This jury verdict was overturned by a first-instance federal judge. For the time being the patent is thus deemed to be legally valid and to have been infringed. We filed a complaint with the United States Court of Appeals of the Federal Circuit (CAFC – second instance) against the first-instance ruling in October 2018. We have taken appropriate accounting measures.

Nevertheless, potentially critical negative impacts of the litigation on the financial position cannot be ruled out.

In the Performance Materials business sector, we are involved in a legal dispute with JNC Corporation, Japan, (JNC). JNC claims that by manufacturing and marketing certain liquid crystals mixtures, our company has infringed JNC patents. We maintain that JNC's patent infringement assertion is invalid owing to relevant prior art and has filed the corresponding nullity actions, which in three cases were already successful in first-instance proceedings. JNC has filed complaints in each case. In a correction trial, a decision in favor of JNC was issued in the second instance. Both our company and the Korean Patent Office have filed complaints with the Korean Supreme Court. In parallel, JNC filed two patent infringement suits. In each of the cases, a first-instance and a second-instance decision was taken in our favor, against which JNC has appealed or is highly likely to appeal. We are prepared for this matter and the dispute, and have taken appropriate accounting measures. Nevertheless, a potentially critical negative impact of the litigation on the financial position cannot be ruled out.

In July 2017, BMS, E.R. Squibb & Sons L.L.C., Ono Pharmaceutical Co., Ltd., and Tasuku Honjo filed suit in the United States District Court of Delaware against our company and Pfizer Inc., based on the allegation that Bavencio® infringes a U.S. patent. The lawsuit was settled based on a settlement agreement signed between Pfizer and the claimants after the balance sheet date. For this reason, the last year's reported risk is obsolete.

RISKS DUE TO ANTITRUST AND OTHER GOVERNMENT PROCEEDINGS

Raptiva®: In December 2011, the federal state of São Paulo, Brazil, sued us for damages because of alleged collusion between various pharmaceutical companies and an association of patients suffering from psoriasis and vitiligo. This collusion is alleged to have been intended to increase sales of the medicines from the companies involved to the detriment of patients and state coffers. Moreover, patients are also suing for damages in connection with the product Raptiva®. We have taken appropriate accounting measures for these issues, which relate to various legal cases. Risks in excess of this with a substantial negative effect on the net assets, financial position and results of operations cannot be ruled out, but are considered unlikely. This is rated as a medium risk.

On July 6, 2017, we received notice from the European Commission (EU Commission) in connection with the antitrust review proceedings for the acquisition of Sigma-Aldrich, in which the EU Commission informed our company of its preliminary conclusion that our company and Sigma-Aldrich allegedly transmitted incorrect and/or misleading information within the scope of the acquisition of Sigma-Aldrich. The EU Commission received registration of the merger on April 21, 2015 and granted clearance on June 15, 2015 subject to the condition that our company and Sigma-Aldrich divest parts of the European solvents and inorganic chemicals businesses of Sigma-Aldrich in order to resolve antitrust concerns. According to the preliminary viewpoint of the EU Commission communicated in the letter dated July 6, 2017, our company and Sigma-Aldrich withheld in this connection important information about an innovation project. According to the EU Commission, the innovation project should have been included in the remedies package. At the present time, an EU Commission administrative procedure is still pending that could lead to a fine being imposed by the EU Commission. Our company is entitled to legal recourse should a fine be imposed. The ongoing investigations are limited to the examination of violations of EU merger control procedures and do not affect the validity of the EU Commission's decision to approve the merger. As the risk is considered to have a potential critical negative impact on the net assets and financial position, a provision has been set up.

RISKS OWING TO A SETTLEMENT AGREEMENT OF THE DIVESTED GENERICS GROUP

Paroxetine: In connection with the divested generics business, we are subject to antitrust investigations by the British Competition and Market Authority (CMA) in the United Kingdom. In March 2013, the authorities informed us of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd. and several subsidiaries of GlaxoSmithKline plc, United Kingdom in connection with the antidepressant drug paroxetine violates British and European competition law. Our company, the then-owner of Generics (UK) Ltd., was allegedly involved in the negotiations for the settlement agreement and is therefore liable. The investigations into Generics (UK) Ltd. started in 2011, without this being known to us. On February 11, 2016, the CMA imposed a fine in this matter. We have taken legal action against this fine. Appropriate accounting measures have been taken. As things stand at present, a decision and outflow of resources are not expected until 2019 because the Appeals Tribunal has since submitted the relevant legal questions to the European Court of Justice (CJEU) for a preliminary ruling. This is currently classified as a medium risk with a moderate negative impact on the financial position.

Human resources risks

Our future growth is highly dependent on our innovative strength. Therefore, the expertise and engagement of employees in all sectors in which we operate are crucial to the success of the company. The markets relevant to the company are characterized by intensive competition for qualified specialists and by the challenge of being perceived by the public as an attractive employer. Fluctuation risks specific to countries and industries have to be identified ahead of time and specifically addressed in order to keep the skills and expertise critical to success and business within the company.

Recruiting and retaining specialists and talent is therefore one of the key priorities for the company and is managed through the targeted use of, for instance, employer branding initiatives, global talent and succession management processes as well as competitive compensation packages. Nevertheless, employee-related risks that affect business activities are possible, even though their impact is difficult to assess. We rate this as a medium risk.

Information technology risks

We use a variety of IT systems and processes in order to optimally support our globalization. Trends in information technology offer various opportunities but also harbor risks.

RISKS DUE TO CYBERCRIME AND THE FAILURE OF BUSINESS-CRITICAL IT APPLICATIONS

Increasing international networking and the related possibility of IT system abuse are resulting in cybercrime risks for our company, such as the failure of central IT systems, the disclosure or loss of the data integrity of confidential data from research and business activities, the manipulation of IT systems in process control, or an increased burden or adverse impact on IT systems as a result of virus attacks.

The Group operates an information protection management system based on ISO 27001 comprising security guidelines as well as organizational and technical measures to prevent and address IT security incidents. Globally used IT applications form the basis for the contractual delivery of products and solutions. The failure of business-critical IT applications could therefore have a direct influence on our ability to deliver and the quality of our products. This also applies to the failure of a data center. To achieve the required service quality, we use a quality management system certified to 9001 that also applies to the provision of IT. In addition, to reduce the risk of failure, we operate several redundantly designed data centers. Furthermore, insurance solutions for cybercrime offenses are in place at Group level.

Likewise, complications with the changeover of IT systems could negatively impact the earnings situation. Close monitoring of critical IT projects serves to mitigate this risk.

Despite the mitigating measures taken and functional continuity plans, the effects of cybercrime or the failure of business-critical IT applications and their influence on the net assets, financial position and results of operations are considered high risks owing to likely and potentially critical negative impacts.

Environmental and safety risks

As a company with global production operations, we are exposed to risks of possible damage to people, goods and our reputation. Audits, consulting and training on environmental protection and occupational health and safety minimize these risks to people and the environment. In order to ensure the continuity of plant and equipment, we monitor these risks both at our own sites as well as at suppliers and contract manufacturers. By adhering to high technical standards, our rules of conduct and all legal requirements in environmental protection and occupational health and safety, we ensure the preservation of goods and assets. We have taken sufficient appropriate accounting measures for the environmental risks known to us. Nevertheless, we classify these as a high risk since a critical negative impact on the financial position cannot be ruled out.

Risks of the divestment, acquisition and integration of companies and businesses

Irrespective of the fact that acquisitions made in the past have been successfully completed, the risk of conducting the acquisition and integration exists for future transactions. This includes, among other things, the inability to meet sales volume targets and higher integration costs than expected, as well as the failure to meet synergy goals. The divestment of companies and businesses can lead to liability vis-à-vis the buyer or additional expenses, for instance through indemnity clauses and guarantee commitments or long-term supply contracts. Through strong due diligence processes and closely managed integration processes, we seek to reduce the probability of occurrence of this risk. Therefore, we classify this as a low risk with an unlikely probability of occurrence and potentially moderate negative effects on the net assets, financial position and results of operations.

Overall view of the risk and opportunity situation and management assessment

The most significant individual risks in the businesses have been named in the report above, with business-related risks being the most significant alongside legal risks.

With respect to high and medium risks, certain changes have occurred, as the assessment of the individual risks has of course shifted over the fiscal year due to changing external and internal conditions, while the overall risk profile remained stable. Thanks to the risk reduction measures taken – such as the consistent implementation of management action (organizational responsibility and process improvements), existing insurance coverage and accounting precautions – we take counteraction, in particular against significant individual risks.

The overall risk of the Group, which is derived from the probability-weighted aggregation of the identified risks, leads to the assessment that we are not exposed to risks of a nature to threaten the existence of the Group as a going concern or for which coverage and financing of the losses is questionable. We are confident that we will continue to successfully master the challenges arising from the above risks in the future as well. Our company also benefits from diversification through our different products and markets.

In our view, business-related opportunities offer the greatest potential. An important element here is the continuous expansion of our businesses in Asia, Latin America, Africa and the Middle East. With the successful focusing and continued intensification of our research and development activities, we want to be able to continue to offer our customers innovative products and help shape markets. Moreover, we also consolidate our expertise in numerous alliances with industrial partners as well as various universities and international organizations. We are making targeted investments in future-oriented companies and start-ups via our corporate venture capital Fund and our Accelerator programs. The topic of innovation is at the forefront of all our activities. Externally, this is becoming particularly apparent through our new Innovation Center at Group headquarters in Darmstadt, which is to develop into a nucleus of creativity at our company. The activities listed hold significant opportunities for us in the medium to long term, beyond the underlying forecast period.

We pursue the opportunities that arise and specify their expected effects in the forecast development of net sales, EBITDA pre and business free cash flow. Furthermore, we will actively seek new opportunities, examine their implementation and drive them forward where appropriate. If opportunities arise in addition to the forecast developments, or these occur more quickly than anticipated, this could have correspondingly positive effects on our net assets, financial position and results of operations.

Report on Expected Developments

The following report provides a forecast for fiscal 2019 of the development of Merck KGaA, Darmstadt, Germany, and its three business sectors: Healthcare, Life Science and Performance Materials.

The sale of the Consumer Health business to Procter & Gamble (P&G) was completed as of December 1, 2018. The 2018 figures already reflect this sale. For this reason, the sale has not been recorded as a portfolio effect in the comparison of the forecast with the figures for fiscal 2018.

We define organic earnings growth as currency-adjusted and portfolio-adjusted growth. Accordingly, the effects resulting from the first-time application of the new accounting standard for leases (IFRS 16) are reflected in organic earnings growth.

FORECAST FOR THE GROUP

€ million	Actual results 2018	Forecast for 2019	Key assumptions
Net sales	14,836	– Moderate organic growth – Slightly negative foreign exchange effect of –1% to –2%	– Growth driven by Life Science and Healthcare, which more than offsets the decline of Performance Materials – Foreign exchange effect primarily resulting from several emerging market currencies
EBITDA pre	3,800	– Pronounced organic percentage growth in the low teens range – Negative foreign exchange effect of between –3% and –4%	– Growth driven by Healthcare and Life Science, which more than offsets the decline of Performance Materials – First-time application of IFRS 16 with a positive contribution of around € 130 million – Foreign exchange effect primarily resulting from several emerging market currencies
Business free cash flow	2,508	– Moderate increase	– Higher EBITDA pre and positive effects in working capital offset higher investments in property, plant and equipment as well as digitalization initiatives

NET SALES

For the Group, in 2019 we expect moderate organic sales growth in comparison with the previous year. With regard to foreign currencies, we continue to expect a volatile environment due to political and macroeconomic developments. Our forecast for 2019 is based on an exchange rate of the euro against the U.S. dollar in the range of 1.15–1.20. This means that the foreign exchange effect from the development of the exchange rate between the euro and the U.S. dollar is likely to be neutral when compared with the prior year. All told, however, due to the unfavorable trend of exchange rates on several growth markets – Latin America, in particular – we expect a slightly negative foreign exchange effect of between –1% and –2% when compared with the previous year.

EBITDA PRE

EBITDA pre is our key financial indicator to steer operating business. On an organic basis, we forecast an increase in EBITDA pre in the low double-digit percentage range for the Group in 2019 compared with the prior year. This includes effects from the first-time application of the accounting standard IFRS 16, which contains new provisions on reporting for leases. Based on the current accounting provisions with respect to leases, EBITDA pre will increase by around € 130 million compared with the prior year. Most of the effects will probably be accounted for by the Life Science and Healthcare business sectors, while the impact on Performance Materials as well as Corporate and Other will be less pronounced.

The projected trend of exchange rates will likely reduce EBITDA pre for the Group by between –3% and –4% compared with the prior year and will thus have a disproportionate effect compared with sales, particularly in the Healthcare business sector. While we expect the development of the euro against the U.S. dollar to be neutral for the Groups' EBITDA pre, the negative trend of currencies on several growth markets will weigh on EBITDA pre. In the affected countries, the cost base is low relative to sales owing to our regional structures. In addition, due to high hedging costs, these emerging market currencies are not hedged. Therefore, a compensating effect from currency hedging cannot be expected.

BUSINESS FREE CASH FLOW

For business free cash flow of the Group, we expect a moderate rise in 2019 owing to higher EBITDA pre and positive effects from the management of working capital. Both effects combined will be able to more than offset the rising investments in property, plant and equipment as well as digitalization initiatives.

FORECAST FOR THE HEALTHCARE BUSINESS SECTOR

€ million	Actual results 2018	Forecast for 2019	Key assumptions
Net sales	6,246	– Moderate organic growth – Moderately negative foreign exchange effect	– At least stable sales development of the base business in organic terms – Substantial growth contribution of our newly approved products, particularly Mavenclad®; expected market approval in the United States has been taken into account – Negative foreign exchange effect due to trend of exchange rates on several growth markets
EBITDA pre	1,556	– Pronounced organic growth rate in the low-to-mid-twenties percentage range – Strongly negative foreign exchange effect	– Expected substantial earnings contributions from our new products, especially Mavenclad®, more than offset negative mix effects associated with the projected decline of Rebif® sales – Moderate increase in research and development expenses due to the development of our pipeline, but down in relation to sales – Earnings contributions from the strategic alliance with GlaxoSmithKline plc of approximately € 100 million and owing to license payments for Erbitux® that were lower than expected – Negative foreign exchange effect due to trend of exchange rates on several growth markets
Business free cash flow	1,025	– Increase in the low teens percentage range	– Rise in EBITDA pre – Positive net working capital effects (including positive effects from the sale of the Consumer Health business)

NET SALES

For the Healthcare business sector, we expect moderate organic sales growth in 2019. We project an at least stable sales trend for our base business. The persistently strong demand for our products in the General Medicine & Endocrinology business unit on the growth markets will make a major contribution to this trend, as will our business with products for the treatment of infertility. These positive effects should compensate for the expected decline in sales of Rebif® and the continuing price pressure on major markets in the Europe, Asia-Pacific, and Middle East and Africa regions. Moreover, we expect our new products, above all Mavenclad®, to make a significant contribution to growth. For 2019, we forecast Bavencio® sales totaling a euro figure in the high double-digit millions and Mavenclad® sales up to a figure in the mid-triple-digit millions. These forecasts include the expected market approval of Mavenclad® in the United States. In particular, the unfavorable currency trend on several growth markets should lead to a moderately negative foreign exchange effect on Healthcare sales.

EBITDA PRE

For 2019, we forecast organic EBITDA pre of the Healthcare business sector to record strong growth in the low-to-mid-twenties percentage range compared with the previous year. Foreign exchange effects are expected to weigh heavily on EBITDA pre.

The negative earnings effects resulting from the projected decline of Rebif® sales should be more than offset by expected, substantial earnings contributions from our new products, particularly Mavenclad®. The disappearance of one-time effects from fiscal 2018 totaling some € 180 million should be more than offset by expected earnings contributions from the active management of our pipeline assets and milestone payments. The conclusion of a global strategic alliance with GlaxoSmithKline plc (GSK) on February 5, 2019, for the joint development and marketing of M7824 (Bintrafusp alfa[1]) is an initial major contribution in this respect. For 2019, we expect an income effect from the upfront cash payment of around € 100 million in other operating income. License payments for Erbitux® that were lower than expected had the effect of enhancing earnings. Research and developments costs to develop our pipeline, especially in immunoncology, will continue to rise; based on current forecasts this trend is likely to weaken. This budgeted cost increase does, however, depend on the development of clinical data and on prioritization decisions. We also expect our marketing and selling costs to increase further, driven primarily by preparations for the launch of Mavenclad®, particularly in the United States. However, we expect research and development costs as well as marketing and selling costs to decline or at least remain stable in relation to sales.

[1] Bintrafusp alfa is the proposed International Nonproprietary Name (INN) for bifunctional immunotherapy M7824. Bintrafusp alfa is currently in clinical trials and not approved for any indication worldwide.

BUSINESS FREE CASH FLOW

In 2019, we expect business free cash flow of the Healthcare business sector to show an increase in the low twenties percentage range. The main drivers will be the expected rise in EBITDA pre and positive developments of net working capital (including positive effects from the sale of the Consumer Health business).

FORECAST FOR THE LIFE SCIENCE BUSINESS SECTOR

€ million	Actual results 2018	Forecast for 2019	Key assumptions
Net sales	6,185	– Organic growth slightly above medium-term market growth of 4% p.a. – Slightly negative foreign exchange effect	– Process Solutions is expected to remain the main driver of growth, followed by Applied Solutions – Research Solutions will also make a moderately positive contribution to the organic sales development – No material portfolio effect as a result of the sale of the flow cytometry business – Negative foreign exchange effect, particularly on account of the development of emerging market currencies
EBITDA pre	1,840	– Organic growth ranging from strong to a double-digit percentage rate – Moderately negative foreign exchange effect	– Organic income growth on account of the expected sales growth and slight margin expansion – In addition, positive contribution to organic income growth from the switch to IFRS 16 – Negative foreign exchange effect, particularly on account of the development of emerging market currencies
Business free cash flow	1,393	– Moderately below 2018 levels	– Improved EBITDA pre – Increase in investments in property, plant and equipment in strategic projects

NET SALES

For the Life Science business sector in 2019, we project organic growth in net sales over the previous year that is slightly above medium-term market growth, which we put at around 4% per year. We expect all business units to make a positive contribution to organic growth. In 2019, the Process Solutions business unit is again likely to remain the strongest driver of organic growth, followed by Applied Solutions. The Research Solutions business unit should also make a moderate contribution to the sales development, albeit to a lesser extent than the other two business units. We sold the flow cytometry business at the end of 2018. The divestment will not have a material portfolio effect. Due to the development of currencies on various growth markets, we project a slightly negative foreign exchange effect.

EBITDA PRE

In 2019, the Life Science business sector is expected to show a sharp increase in organic EBITDA pre totaling nearly double-digit growth rates compared with the previous year. The persistently dynamic demand trend, a further slight increase in the margin and the IFRS 16 effects will all contribute to the organic growth in income. Cost and sales synergies from the acquisition of Sigma-Aldrich were realized as planned in 2018. All told, these synergies came to € 280 million. No incremental synergies are expected for 2019.

In fiscal 2019, we forecast organic EBITDA pre growth of the Life Science business sector that will be reduced by a moderately negative foreign exchange effect, driven by the devaluation of several emerging market currencies.

BUSINESS FREE CASH FLOW

We expect business free cash flow of our Life Science business sector to be moderately below the prior-year level. Higher EBITDA pre will be more than offset by investments in strategic projects.

FORECAST FOR THE PERFORMANCE MATERIALS BUSINESS SECTOR

€ million	Actual results 2018	Forecast for 2019	Key assumptions
Net sales	2,406	– Organically moderate decline from the prior-year level – Foreign exchange effect roughly neutral	– Strong growth momentum in the Semiconductor Solutions business unit – Continuing price decline in Liquid Crystals business, which is mitigated by a temporary rise in volume due to capacity expansions of customers in China – Neutral foreign exchange effect due to the development of the exchange rate of the euro against the U.S. dollar
EBITDA pre	786	– Organic high single-digit to low double-digit percentage decline – Foreign exchange effect roughly neutral	– Drop in liquid crystal prices cannot be offset by growth in other businesses and active cost management – Neutral foreign exchange effect due to the development of the exchange rate of the euro against the U.S. dollar
Business free cash flow	588	– Decline in the low teens percentage range	– Decline in EBITDA pre

NET SALES

We forecast a moderate organic sales decline in the Performance Materials business sector in 2019 compared with the prior year. We also project a drop in sales and prices in the Liquid Crystals business in fiscal 2019. Despite selected capacity expansion projects by our customers, which benefited our Liquid Crystals business in recent months and which are expected to continue providing a benefit in the first half of 2019, we expect that the price pressure characteristic of this industry cannot be compensated for by corresponding volume growth in 2019 as a whole. This development can probably not be offset by good organic growth in other business areas either, for example our business with semiconductor materials or OLED. Due to the development of the euro against the U.S. dollar, we project a neutral foreign exchange effect for the Performance Materials business sector in 2019.

EBITDA PRE

Our Performance Materials business sector will probably not be able to absorb the expected decline in sales of the highly profitable Liquid Crystals business in 2019, despite a good expected development in other business areas and strict cost discipline. Consequently, we expect that organic EBITDA pre will decline in the high single-digit to low teens percentage range in comparison with 2018. Due to the development of the euro against the U.S. dollar, we expect a neutral foreign exchange effect for the Performance Materials business sector.

BUSINESS FREE CASH FLOW

For the Performance Materials business sector we forecast a decline of business free cash flow in the low teens range, essentially as a result of the expected negative development of EBITDA pre.

Corporate and Other

The expenses for Corporate and Other will, in our opinion, show an increase in the low-to-mid-teens range on an organic basis in 2019. This increase will be based on a further expansion of our innovation and digitalization initiatives. A greater focus on the costs of the administrative functions and substantially reduced strain from foreign exchange effects are likely to partly offset the increase.

Report in accordance with Section 315a (1) of the German Commercial Code (HGB)

The following information is provided in accordance with section 315a (1) of the German Commercial Code (HGB) and the explanatory report pursuant to section 176 (1) sentence 1 of the German Stock Corporation Act (AktG).

As of the balance sheet date, the company's subscribed capital is divided into 129,242,251 no-par value bearer shares plus one registered share. Each share therefore corresponds to € 1.30 of the share capital. The holder of the registered share is E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of Merck KGaA, Darmstadt, Germany. It is entitled and obliged to appoint one-third of the members of the Supervisory Board representing the limited liability shareholders. If the holder of the registered share is a general partner, he or she has no such right of appointment. The transfer of the registered share requires the company's approval. The approval is granted at the sole discretion of the personally liable general partner with an equity interest, namely E. Merck KG, Darmstadt, Germany.

Pursuant to the information on voting rights submitted to us in accordance with the German Securities Trading Act (WpHG), on December 31, 2018, no shareholders owned direct or indirect investments exceeding 10% of the voting rights.

According to the Articles of Association of Merck KGaA, Darmstadt, Germany, the general partners not holding an equity interest who form the Executive Board are admitted by E. Merck KG, Darmstadt, Germany, with the consent of a simple majority of the other general partners. A person may be a general partner not holding an equity interest only if he or she is also a general partner of E. Merck KG, Darmstadt, Germany. In addition, at the proposal of E. Merck KG, Darmstadt, Germany, and with the approval of all general partners not holding an equity interest, further persons who are not general partners not holding an equity interest may be appointed to the Executive Board.

The Articles of Association can be amended by a resolution by the Annual Meeting that requires the approval of the general partners. Notwithstanding any statutory provisions to the contrary, the resolutions of the General Meeting are adopted by a simple majority of the votes cast. Where the law requires a capital majority in addition to the voting majority, resolutions are adopted by a simple majority of the share capital represented in the vote. The Articles of Association of the company encompass authorized and contingent capital.

The Executive Board is authorized to increase the company's share capital with the approval of the Supervisory Board and of E. Merck KG, Darmstadt, Germany, once or repeatedly up to and including April 27, 2022 by up to a total of € 56,521,124.19 by issuing new no-par value bearer shares against cash and/or non-cash contributions ("Authorized Capital 2017"). Limited liability shareholders shall be generally granted the statutory right to subscribe to the new shares. However, the Executive Board is authorized, with the approval of the Supervisory Board, to exclude the limited liability shareholders' subscription right in full or in part in case of a capital increase against cash contributions pursuant to or by analogous application of section 186 (3) sentence 4 AktG if the issue price of the new shares is not substantially lower than the stock exchange price of the company's shares already listed and if the new shares which are issued under exclusion of the subscription right do not exceed a proportional amount of 10% of the share capital either at the time of the Authorized Capital 2017 taking effect or at the time of the Authorized Capital 2017 being utilized. This restriction to 10% of the share capital shall include the proportional amount of the share capital that is attributable to shares which are issued under exclusion of the subscription right or sold during the term of the Authorized Capital 2017 based on an authorization to issue new shares or sell own shares by direct or analogous application of section 186 (3) sentence 4 AktG. Further, this restriction shall also include the proportional amount of the share capital that is attributable to shares which may or must be issued in order to service bonds carrying a conversion or option right or a conversion or option obligation, if the bonds are issued during the term of the Authorized Capital 2017 under exclusion of the limited liability shareholders' subscription right by analogous application of section 186 (3) sentence 4 AktG. It is likewise possible to exclude the subscription right of the limited liability shareholders with the approval of the Supervisory Board in the case of capital increases through non-cash contributions, particularly for the purpose of acquiring enterprises, parts of enterprises or interests in enterprises. In addition, with the approval of the Supervisory Board, the limited liability shareholders' subscription rights can be excluded in order to enable E. Merck KG, Darmstadt, Germany, to exercise its

right pursuant to Article 32 (3) of the Articles of Association of the company to participate in a capital increase by issuing shares or freely transferable share subscription rights.

It is likewise possible to exclude, with the approval of the Supervisory Board, the subscription right of the limited liability shareholders in order to enable E. Merck KG, Darmstadt, Germany, to exercise its right pursuant to Article 33 of the Articles of Association to convert, in full or in part, its equity interest into share capital.

Moreover, with the approval of the Supervisory Board, the subscription right of the limited liability shareholders can be excluded if and to the extent this is necessary to grant the holders or creditors of conversion or option rights and/or the holders or creditors of financing instruments carrying conversion or option obligations, which were or are issued by the company or by a domestic or foreign company in which the company directly or indirectly holds the majority of the votes and capital, a subscription right to the extent to which they would be entitled after the exercise of the conversion or option rights or after the performance of a conversion or option obligation.

Lastly, with the approval of the Supervisory Board, the subscription right of the limited liability shareholders can be excluded in order to exclude fractional amounts from the subscription right.

The sum of shares issued on the basis of the Authorized Capital 2017 under exclusion of the limited liability shareholders' subscription right must not exceed a proportional amount of 20% of the share capital, by taking into account other shares of the company which, during the term of the Authorized Capital 2017, are sold or issued under exclusion of the subscription right or are to be issued under bonds issued after April 28, 2017 under exclusion of the subscription right; this limitation shall apply both at the time of this authorization taking effect and at the time of this authorization being exercised.

To the extent that the subscription right is not excluded under the above provisions, it may also be granted to the limited liability shareholders by way of an indirect subscription right pursuant to section 186 (5) AktG or, in part, by way of a direct subscription right, and otherwise by way of an indirect subscription right pursuant to section 186 (5) AktG.

Furthermore, the Executive Board is authorized, with the approval of the Supervisory Board, to determine the additional details of the capital increase and its implementation, including the content of rights attached to the shares as well as the terms and conditions of the share issue.

The Articles of Association also encompass contingent capital. The share capital is contingently increased by up to € 66,406,298.40 divided into 51,081,768 shares (Contingent Capital I). The contingent capital increase serves to grant exchange rights to E. Merck KG, Darmstadt, Germany, in accordance with Article 33 of the Articles of Association to enable the conversion of its equity interest. The shares carry dividend rights from the beginning of the fiscal year following the year in which the conversion option is exercised.

Moreover, the share capital is contingently increased by up to € 16,801,491.20 composed of up to 12,924,224 no par value bearer shares (Contingent Capital II). This increase in contingent capital is only to be implemented insofar as the bearers or creditors of option or conversion rights or with an obligation to convert or exercise options on warrant bonds, option participation certificates, option participation bonds, convertible bonds, convertible participation certificates or convertible participation bonds issued against contributions that are issued or guaranteed by the company or a subordinate Group company on the basis of the authorization resolution of the Annual General Meeting of April 27, 2018 to April 26, 2023, utilize their option or conversion rights or, to fulfill their conversion obligation or obligation to exercise options insofar as they are obliged to fulfill their conversion or option exercise obligation, or insofar as the company exercises an option, wholly or in part, of granting shares in the company instead of paying the sum of money due and to the extent that in each case a cash settlement is not granted, or own shares or other forms of fulfillment are used. Each issue of new shares shall take place at the determined option or conversion price, pursuant to the aforementioned authorization resolution. The new shares participate in the profit from the beginning of the fiscal year in which they are created; insofar as this is legally permissible, the Executive Board may, with the approval of the Supervisory Board, and in deviation from section 60 (2) AktG, stipulate that the new shares also participate in the profit for a past fiscal year. The Executive Board is authorized, with the approval of the Supervisory Board and of E. Merck KG, Darmstadt, Germany, to stipulate the further details of the implementation of the increase in contingent capital.

The company is not authorized to acquire its own shares.

The company has not entered into any material agreements subject to a change of control pursuant to a takeover offer nor has it entered into any compensation agreements with the members of the Executive Board or employees in the event of a takeover offer.

Additional Information in accordance with the German Commercial Code (HGB)

The management report of Merck KGaA, Darmstadt, Germany, has been combined with the Group management report. The annual financial statements and the combined management report of the Group and Merck KGaA, Darmstadt, Germany, for 2018 are being filed with the electronic German Federal Gazette (elektronischer Bundesanzeiger) and are available on the website of the German company register.

Merck KGaA, Darmstadt, Germany, headquartered in Darmstadt, is the parent company of the Group. In addition to its function of a holding company, Merck KGaA, Darmstadt, Germany, generated sales in the Healthcare, Life Science and Performance Materials business sectors. Merck KGaA, Darmstadt, Germany, bears a significant portion of the Group-wide research and development costs, and employs the majority of the 11,000-plus workforce in Darmstadt.

The financial statements of Merck KGaA, Darmstadt, Germany, have been prepared in accordance with the provisions of the German Commercial Code (HGB), as amended by the German Accounting Directive Implementation Act (BilRUG), and the German Stock Corporation Act (AktG). The full version of the annual financial statements together with the unqualified auditor's opinion has been submitted to the operator of the electronic Federal Gazette (elektronischer Bundesanzeiger), where they are published and forwarded to the Company Register.

Statement on Corporate Governance

The Statement of Corporate Governance according to section 289a of the German Commercial Code (HGB) is contained in the "Corporate Governance" section of the Annual Group Report.

Effects of material company agreements on the net assets, financial position and results of operations

SPIN-OFF OF OPERATING BUSINESS ACTIVITIES OF THE BUSINESS SECTORS AND TEMPORARY LEASEBACK OF THE SPUN-OFF BUSINESS ACTIVITIES

As part of the strategic development of Merck KGaA, Darmstadt, Germany, the existing operating activities of the Healthcare, Life Science and Performance Materials business sectors within Merck KGaA, Darmstadt, Germany, together with the relevant assets and liabilities (hereinafter: "operating sectors") were spun off at their carrying values into three separate companies (hereinafter: "OpCo" or plural "OpCos") with the legal form of a GmbH or German limited liability corporation (operating spin-off). This operating spin-off is based on the spin-off and takeover agreement concluded between Merck KGaA, Darmstadt, Germany, and the OpCos in notarized form on March 2, 2018. Following approval by the 2018 Annual General Meeting, the operating spin-off took place with economic effect as of 0:00 hours on January 1, 2018.

Immediately after the spin-off took effect, all shares held by Merck KGaA, Darmstadt, Germany, in the respective OpCos were transfered to holding companies via a further spin-off (holding company spin-off), as a result of which the OpCos are each indirectly held by Merck KGaA, Darmstadt, Germany, via an intermediate holding company. The acquiring legal entities within the scope of the holding company spin-off were Merck Healthcare Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, for the business shares of Healthcare OpCo, Merck Life Science Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, for the business shares of Life Science OpCo and Merck Performance Materials Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, for the business shares of Performance Materials OpCo (referred to individually as "HoldCo", independently of the sector, and jointly as "HoldCos"). To this end, Merck KGaA, Darmstadt, Germany, and the HoldCos signed a notarized spin-off and takeover agreement on March 2, 2018. The holding company spin-off took place with economic effect as of 0:00 hours on January 1, 2018.

Since the technical system requirements for the introduction of the sector-specific ERP systems as regards the OpCos were not in place at the time of the spin-off, the business activities spun off to the OpCos have been temporarily leased back by the relevant OpCos to Merck KGaA, Darmstadt, Germany, until the introduction of the sector-specific ERP systems. For this purpose, also on March 2, 2018, Merck KGaA, Darmstadt, Germany, entered into a business leasing contract with the respective OpCo with economic effect as of 0:00 hours on January 1, 2018, to lease back all the operating business previously spun off to the OpCo. Under the terms of the respective business leasing contract, Merck KGaA, Darmstadt, Germany, leases the entire operation from the respective OpCo, as well as all fixed assets in this context; it acquires the current assets as well as certain liabilities and provisions at their carrying amounts under German commercial law. The business lease allowed the spin-off measures to be implemented for all OpCos with economic effect at a uniform time, 0:00 hours on January 1, 2018, while retaining the flexibility of transitioning the management of the relevant operating business in accordance with the sector-specific ERP introduction at an individual time to the OpCo in question in a targeted manner. On the basis of the operating lease contract, Merck KGaA, Darmstadt, Germany, will

temporarily continue to operate the spun-off business as a leaseholder in its own name and for its own account. Once the relevant ERP systems have been introduced for the respective OpCo, the business lease with this OpCo will be terminated and the business previously leased out will pass to the OpCo.

The aforementioned spin-off and business leasing contracts form part of an overall entrepreneurial concept. They were submitted to the General Meeting of Merck KGaA, Darmstadt, Germany, for approval on April 27, 2018 (2018 Annual General Meeting) as a coherent restructuring measure and approved by it. The gradual implementation of the measures is due to be completed in 2020. In 2018, the Healthcare OpCo changed its legal form to that of a German corporation with general partners ("Kommanditgesellschaft auf Aktien") and has since been trading under the name of Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

The table below shows the balance sheet of Merck KGaA, Darmstadt, Germany, after the operating spin-off, holding company spin-off and temporary leaseback as of 0:00 hours on January 1, 2018. The impact in fiscal 2018 of the spin-offs was mainly lower depreciation, amortization and write-downs of fixed assets and lower pension expenses. On the other hand, business lease expenses and the passing-on of costs for personnel-related provisions led to an increase in other operating expenses.

€ million	Merck KGaA, Darmstadt, Germany Dec. 31, 2017	Merck KGaA, Darmstadt, Germany Jan. 1, 2018[1]
ASSETS		
A. Fixed assets		
Intangible assets	489.7	191.8
Tangible assets	1,173.0	821.6
Financial assets	16,485.7	17,510.7
	18,148.4	**18,524.2**
B. Current assets		
Inventories	688.3	688.3
Trade accounts receivable	181.3	181.3
Other receivables and other assets	891.6	591.6
Cash and cash equivalents	1.4	1.4
	1,762.6	**1,462.6**
C. Prepaid expenses	28.5	28.5
Total ASSETS	**19,939.5**	**20,015.3**
EQUITY AND LIABILITIES		
A. Net equity		
Subscribed capital	168.0	168.0
General partner's equity	397.2	397.2
Capital reserves	3,813.7	3,813.7
Retained earnings	701.6	701.6
Profit carried forward E. Merck KG, Darmstadt, Germany	60.3	60.3
Net retained profit: shareholders	187.1	187.1
	5,327.9	**5,327.9**
B. Provisions		
Provisions for pensions and other post-employment benefits	200.4	110.7
Other provisions	1,112.1	946.1
	1,312.5	**1,056.8**
C. Liabilities		
Financial liabilities	1,500.0	1,500.0
Trade accounts payable	292.1	292.1
Other liabilities	11,489.1	11,820.7
	13,281.3	**13,612.8**
D. Deferred income	17.9	17.9
Total LIABILITIES	**19,939.5**	**20,015.3**

[1] After operating spin-off, holding company spin-off and temporary leaseback.

Business development

Net sales of Merck KGaA, Darmstadt, Germany, decreased slightly in 2018. The decline of € 22 million resulted primarily from the Healthcare and Performance Materials business sectors, offset mainly by an increase in other sales.

			Change	
€ million	**2018**	2017	€ million	in %
Healthcare	2,310	2,404	–94	–3.9%
Life Science	780	777	3	0.4%
Performance Materials	1,386	1,399	–13	–0.9%
Other sales	309	228	82	35.8%
Total	**4,785**	**4,807**	**–22**	**–0.5%**

Other sales mainly included intragroup cross-charging for IT services, rent and other administrative services.

The share of sales with other Group companies (Group sales) amounted to 93.6% in 2018 (2017: 93.6%).

			Change	
€ million	**2018**	2017	€ million	in %
Group sales	4,477	4,500	–23	–0.5%
Sales to third parties	308	307	1	0.3%
Total	**4,785**	**4,807**	**–22**	**–0.5%**

At 86.7% (2017: 90.3%), the share of exports in 2018 was below the previous year's level.

			Change	
€ million	**2018**	2017	€ million	in %
Outside Germany	4,148	4,341	–193	–4.4%
Germany	637	467	170	36.5%
Total	**4,785**	**4,807**	**–22**	**–0.5%**

The decline in net sales of the Healthcare business sector was attributable to a one-time payment for future license payments in the previous year, which had increased sales. By contrast, net sales of products rose slightly in 2018. Business with cardiovascular medications (+5.1%), the oncology drug Erbitux® (+1.0%) and with thyroid medications (+3.8%) showed a moderate increase. All told, the business sector recorded declining sales in particular in the Middle East and Africa region, while sales rose especially in the Asia-Pacific region.

In the Performance Materials business sector, the previous year's sales level was not reached by the Display Solutions business unit (–0.8%). In addition, the Surface Solutions business unit recorded a slight drop in sales (–2.0%) mainly affecting sales in the Middle East and Africa region. From a regional perspective, sales in Asia-Pacific were flat, while Europe recorded moderate losses and North America generated sales growth.

Net sales of the Life Science business sector were slightly above the previous year's figure. The Research Solutions (–3.0%) and Applied Solutions (–5.0%) business units showed a slight decline in sales, which was offset by the increase in net sales in the Process Solutions business unit (+4.4%). Sales growth was generated in the North America and Asia-Pacific regions. By contrast, a slight fall was recorded in particular in the Europe and Middle East and Africa regions.

RESULTS OF OPERATIONS

			Change	
€ million	**2018**	2017	€ million	in %
Sales	4,785	4,807	–22	–0.5%
Other income	172	212	–40	–18.9%
Cost of materials	–1,776	–1,505	–271	18.0%
Personnel expenses	–1,305	–1,258	–47	3.7%
Depreciation, amortization and write-downs	–112	–183	71	–38.8%
Other operating expenses	–2,152	–1,801	–351	19.5%
Investment income/Write-downs of financial assets	1,234	847	387	45.7%
Financial result	–262	–201	–61	30.3%
Profit before profit transfers and taxes	**584**	**917**	**–334**	**–36.4%**
Profit transfers	–454	–553	99	–17.9%
Taxes	32	–193	225	–116.3%
Profit after profit transfers and taxes	**162**	**171**	**–9**	**–5.3%**

The decline in **other income** was mainly the result of lower gains from the release of provisions.

The increase in **cost of materials** was due to a higher amount of intragroup cross-charging and increased sales volume with declining prices in some cases; the cost of materials in relation to sales amounted to 37.1% (2017: 31.3%).

The rise in **personnel expenses** was due to higher wages and salaries as a result of the collectively agreed pay increase and the higher number of employees.

Depreciation, amortization and write-downs fell by 38.8% as a result of the decline in fixed assets following the spin-off.

The increase in **other operating expenses** was due to increased consulting costs and higher expenses in connection with the business lease as well as an increase in the passing-on of costs for personnel-related provisions; see section "Effects of material company agreements on the net assets, financial position and results of operations".

Investment income rose essentially on account of higher profit transfers by OpCo companies; see section "Effects of material company agreements on the net assets, financial position and results of operations". However, the reduced dividend payment by the Merck Holding GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, had an offsetting effect.

The **Financial result** deteriorated due to lower fair values of plan assets.

ASSETS

			Change	
€ million	**Dec. 31, 2018**	Dec. 31, 2017	€ million	in %
Fixed assets	**18,670**	**18,148**	**522**	**2.9%**
Intangible assets	239	490	–251	–51.2%
Tangible assets	899	1,173	–274	–23.4%
Financial assets	17,532	16,486	1,046	6.3%
Current assets	**2,336**	**1,763**	**573**	**32.5%**
Inventories	725	688	37	5.3%
Trade accounts receivable	315	181	134	73.7%
Other receivables and other assets	1,293	892	401	45.0%
Cash and cash equivalents	3	1	2	142.9%
Prepaid expenses	**34**	**28**	6	**21.1%**
	21,040	**19,940**	**1,100**	**5.5%**

EQUITY AND LIABILITIES

€ million	Dec. 31, 2018	Dec. 31, 2017	Change € million	Change in %
Net equity	**5,329**	**5,328**	**1**	**0.0%**
Provisions	**1,119**	**1,312**	**–193**	**–14.7%**
Provisions for pensions and other post-employment benefits	288	200	87	43.2%
Other provisions	832	1,112	–280	–25.2%
Liabilities	**14,575**	**13,281**	**1,295**	**9.8%**
Financial liabilities	1,500	1,500	–	–
Trade accounts payable	446	292	154	52.7%
Other liabilities	12,629	11,489	1,141	9.9%
Deferred income	**17**	**18**	**–1**	**–6.1%**
	21,040	**19,940**	**1,100**	**5.5%**

The net assets and financial position of Merck KGaA, Darmstadt, Germany, changed only slightly in comparison with the previous year. With a 5.5% increase in total assets, the equity ratio amounted to 25.3% (2017: 26.7%).

The operating spin-off led to a decline in intangible and tangible assets, while financial assets increased; see section "Effects of material company agreements on the net assets, financial position and results of operations".

The increase in current assets (€ +573 million) was mainly attributable to higher receivables from affiliates for profit transfers and other group cross-charging.

The drop in other provisions (€ –280 million) resulted primarily from the operating spin-off; see section "Effects of material company agreements on the net assets, financial position and results of operations".

The rise in other liabilities resulted primarily from the clearing account with the Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Research and development

In 2018, research and development spending on projects of Merck KGaA, Darmstadt, Germany, and other Group companies totaled € 923 million (2017: € 685 million). A large portion was also incurred by companies outside the Group. In Darmstadt, Healthcare mainly focuses on research in the areas of oncology as well as autoimmune and inflammatory diseases. The rise of € 196 million in R&D spending by the Healthcare business sector was reflected in the increase of € 238 million in overall R&D spending (34.7%). At the same time, the Healthcare business sector accounted for 65.4% (2017: 59.6%) and thus the largest share of research and development spending. The Performance Materials business sector focuses its research activities on developing new and improved basic materials and mixtures for LC displays, for innovative OLED applications and for materials for the production of integrated circuits. To strengthen the Pigments business, new effect pigments for the automotive, cosmetics and printing ink sectors have been developed. In the Life Science business sector, research activities focused in particular on technologies for laboratory and life science applications, and the promotion of new developments. Improved test kits, chromatography methods, substrates for separating active substances, and innovations continue to be in the focus in the fields of microbiology and hygiene monitoring.

RESEARCH AND DEVELOPMENT COSTS

€ million	2018	2017	Change € million	Change in %
Healthcare	604	408	196	48.0%
Life Science	46	35	11	31.4%
Performance Materials	260	220	40	18.2%
Other R&D spending that cannot be allocated to the individual business sectors	13	22	–9	–40.9%
Total	**923**	**685**	**238**	**34.7%**

The ratio of research and development spending to sales was 19.3% (2017: 14.3%). Overall, the average number of employees working in research and development was 2,674. Merck KGaA, Darmstadt, Germany, is one of the main research sites of the Group, accounting for a share of 41.6% (2017: 32.0%) of total Group research and development spending.

Dividend

For 2018, we are proposing to the General Meeting the payment of a dividend of € 1.25 per share.

Personnel

As of December 31, 2018, Merck KGaA, Darmstadt, Germany, had 11,133 employees, representing an increase over the previous year (2017: 10,677).

Average number of employees by functional area:

PERSONNEL

Average number of employees during the year	**2018**	2017
Production	3,756	3,536
Administration	3,213	3,072
Research	2,674	2,515
Logistics	671	648
Sales and marketing	590	574
Other	79	128
Total	**10,983**	**10,473**

Risks and opportunities

Merck KGaA, Darmstadt, Germany, is largely subject to the same opportunities and risks as the Group. More information can be found in the Report on Risks and Opportunities.

Forecast for Merck KGaA, Darmstadt, Germany

DEVIATIONS OF ACTUAL BUSINESS DEVELOPMENT IN 2018 FROM THE PREVIOUSLY REPORTED GUIDANCE:

In the 2017 combined management report, net sales were forecast to increase slightly in the Life Science and Healthcare business sectors in fiscal 2018. A slight drop in net sales was forecast for the Performance Materials business sector.

The sales decline in the Healthcare business sector (– 3.9%) resulted primarily from lower license income. Sales of products were slightly above the previous year's level. Sales growth was generated in the Oncology (+ 2.1%) and Fertility (+11.9%) business units. This sales growth was offset by declining sales in the other business units (Neurology & Immunology).

In 2018, sales in the Life Science business sector were flat overall. Declining sales in the Research Solutions (– 3.0%) and Applied Solutions (– 5.0%) business units were offset by rising sales in Process Solutions (+ 4.4%).

Continued high competitive pressure in the Display Solutions business unit (– 0.8%) led to a slight fall in Performance Materials net sales (– 0.9%). The Surface Solutions business unit additionally recorded a slight drop in sales (– 2.0%).

Net income was down compared to the previous year (– 5.3%). Higher other operating expenses (19.5%) contrast, in particular, with improved investment income (45.7%) and a reduction in tax expenses. Investment income rose primarily due to profit transfers of the newly established OpCo companies. However, the reduced dividend payment by the Merck Holding GmbH, Gernsheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, had an offsetting effect.

Forecast 2019

For fiscal 2019, a decline in net sales is expected overall due to the planned termination of the business leasing contract with Merck Healthcare KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany, and the resulting transfer of the Healthcare business sector's operating business.

A slight decline in net sales is forecast for the Performance Materials business sector. In the Life Science business sector, we expect a slight increase in net sales for fiscal 2019.

As in 2017, the financing costs of the Sigma-Aldrich acquisition continue to adversely affect net income. Nevertheless, positive investment income and dividend payments from subsidiaries will lead again to a slight increase in net income.

The Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, will provide the company with sufficient financial resources and thus ensure liquidity.

Currently no risks can be identified that may jeopardize the continued existence of the company.

CORPORATE GOVERNANCE

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CORPORATE GOVERNANCE

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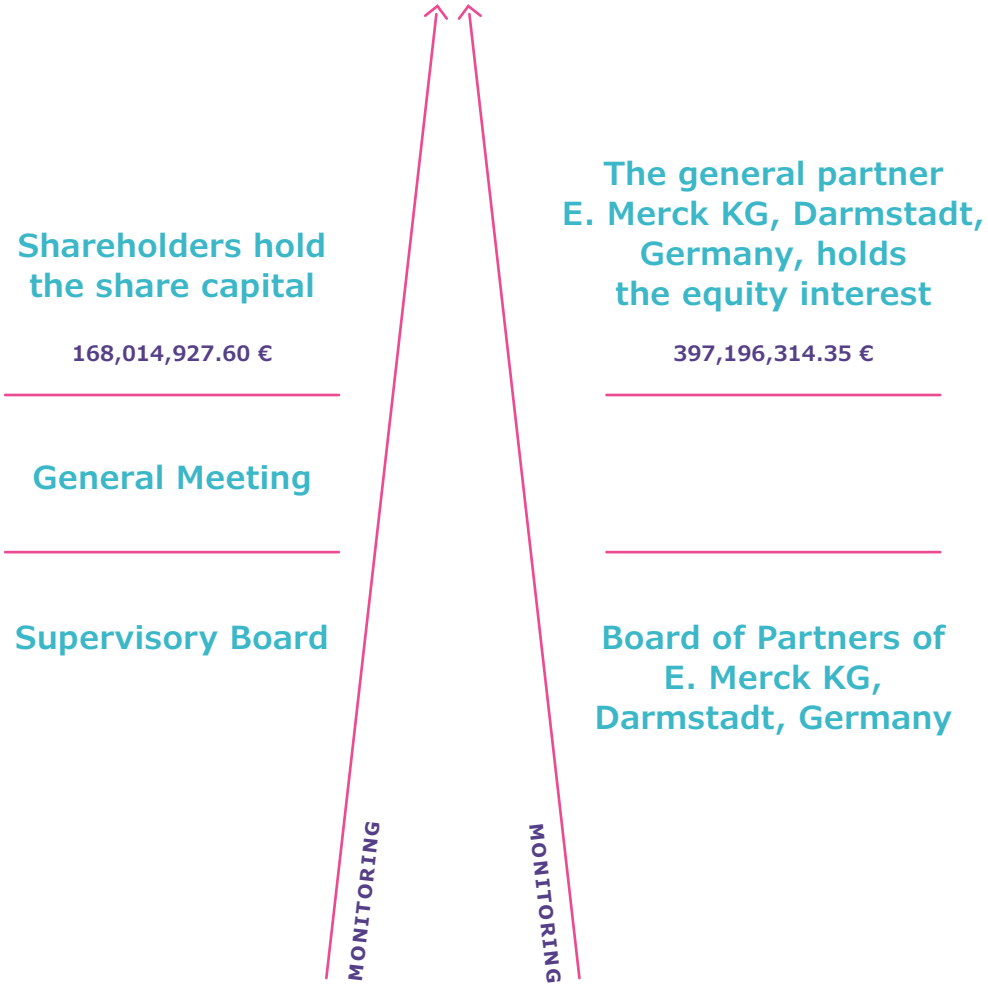
Capital Structure and Corporate Bodies of Merck KGaA, Darmstadt, Germany

Total capital of Merck KGaA, Darmstadt, Germany

565,211,241.95 €

Executive Board of Merck KGaA, Darmstadt, Germany

General partners with no equity interest



Further information can be found under “Merck KGaA, Darmstadt, Germany” on page 166.

Statement on Corporate Governance

The Statement on Corporate Governance contains the Declaration of Conformity, relevant information on practices within the company, a description of the procedures of the corporate bodies, as well as targets for the percentage of positions held by women as well as the diversity policy.

Joint report of the Executive Board and the Supervisory Board according to section 3.10 of the German Corporate Governance Code including the Declaration of Conformity

The German Corporate Governance Code is geared toward the conditions found in a German stock corporation ("Aktiengesellschaft" or "AG") and does not take into consideration the special characteristics of a corporation with general partners ("Kommanditgesellschaft auf Aktien" or "KGaA") such as Merck KGaA, Darmstadt, Germany. Given the structural differences between an AG and a KGaA, several recommendations of the German Corporate Governance Code are to be applied to a KGaA only in a modified form. Major differences between the two legal forms exist in terms of liability and management. While, in the case of an AG, only the AG is liable as a legal entity, the general partners of a KGaA also have unlimited personal liability for the company's obligations (section 278 (1) of the German Stock Corporation Act – "AktG"). At Merck KGaA, Darmstadt, Germany, this pertains to both E. Merck KG, Darmstadt, Germany – which pursuant to Article 8 (5) of the Articles of Association is excluded from management and representation – as well as to the managing general partners, who together make up the Executive Board of Merck KGaA, Darmstadt, Germany. The members of the Executive Board of Merck KGaA, Darmstadt, Germany, are therefore subject to unlimited personal liability. Unlike an AG, their executive authority is not conferred by the Supervisory Board, but rather by their status as general partners. Consequently, in addition to other responsibilities typical of the supervisory board of an AG (see description of the procedures of the Supervisory Board on pages 186 et seq.), the supervisory board of a KGaA does not have the authority to appoint the management board, draw up management board contracts or specify compensation of the management board. This legal form also involves special features with regard to the General Meeting. For example, in a KGaA, many of the resolutions made require the consent of the general partners (section 285 (2) AktG), including in particular the adoption of the annual financial statements (section 286 (1) AktG).

Merck KGaA, Darmstadt, Germany, applies the German Corporate Governance Code analogously where these regulations are compatible with the legal form of a KGaA. In order to enable shareholders to compare the situation at other companies more easily, to a broad extent we base corporate governance on the conduct recommendations made by the Government Commission of the German Corporate Governance Code and forego having our own, equally permissible, code. The recommendations of the Code in the version dated February 7, 2017, the intent and meaning of which are applied, were complied with in the period between the last Declaration of Conformity issued on February 28, 2018 with one exception.

For a clearer understanding, the following gives a general explanation of the application of German company law at Merck KGaA, Darmstadt, Germany, with additional references to the General Meeting and shareholder rights.

MERCK KGAA, DARMSTADT, GERMANY

The general partner E. Merck KG, Darmstadt, Germany, holds around 70% of the total capital of Merck KGaA, Darmstadt, Germany (equity interest); the shareholders hold the remainder, which is divided into shares (share capital). E. Merck KG, Darmstadt, Germany, is excluded from the management of business activities. The general partners with no equity interest (Executive Board) manage the business activities. Nevertheless, due to its substantial capital investment and unlimited personal liability, E. Merck KG, Darmstadt, Germany, has a strong interest in the businesses of Merck KGaA, Darmstadt, Germany, operating efficiently in compliance with procedures. The participation of Merck KGaA, Darmstadt, Germany, in the profit/loss of E. Merck KG, Darmstadt, Germany, in accordance with Articles 26 et seq. of the Articles of Association further harmonizes the interests of the shareholders and of E. Merck KG, Darmstadt, Germany. E. Merck KG, Darmstadt, Germany, appoints and dismisses the Executive Board. In addition, E. Merck KG, Darmstadt, Germany, has created bodies – complementing the expertise and activities of the Supervisory Board – to monitor and advise the Executive Board. This task applies primarily to the Board of Partners of E. Merck KG, Darmstadt, Germany.

Based on the provisions of the German Stock Corporation Act, the Articles of Association of Merck KGaA, Darmstadt, Germany, and the rules of procedure of the various committees, Merck KGaA, Darmstadt, Germany, has a set of rules for the Executive Board and its supervision that meet the requirements of the German Corporate Governance Code. The investors, who bear the entrepreneurial risk, are protected as provided for by the German Corporate Governance Code.

THE GENERAL MEETING OF MERCK KGAA, DARMSTADT, GERMANY

The twenty-third General Meeting of Merck KGaA, Darmstadt, Germany, was held on April 27, 2018 in Frankfurt am Main, Germany. At 59.25%, the proportion of share capital represented at the meeting was slightly lower than in the previous year. In 2017, the proportion of share capital represented was 64.03%.

In particular, the Annual General Meeting passes resolutions concerning the approval of the annual financial statements, the appropriation of net retained profit, the approval of the actions of the Executive Board members and the Supervisory Board members, as well as the election of the auditor. Changes to the Articles of Association likewise require the adoption of a resolution by the General Meeting. The shareholders of Merck KGaA, Darmstadt, Germany, exercise their rights at the General Meeting. They may exercise their voting rights personally, through an authorized representative or through a proxy appointed by the company. The proxy is in attendance throughout the duration of the General Meeting. All the documents and information concerning upcoming General Meetings (including a summary explanation of shareholder rights) are also posted on our website. Moreover, the General Meeting is webcast live on the Internet from its commencement until the end of the speech by the Chairman of the Executive Board. The introductory speeches by the Chairman of the Executive Board and the Chairman of the Supervisory Board are recorded in order to make them available to interested members of the public at any time after the meeting. In this way, we are satisfying the high transparency requirements of the Group.

DECLARATION OF CONFORMITY

In accordance with section 161 AktG, applying the provisions of the German Corporate Governance Code correspondingly, the Executive Board and the Supervisory Board issued the following Declaration of Conformity with the recommendations of the Government Commission of the German Corporate Governance Code:

"Declaration of the Executive Board and the Supervisory Board of Merck KGaA, Darmstadt, Germany, on the recommendations of the Government Commission of the German Corporate Governance Code pursuant to section 161 AktG. Since the last Declaration of Conformity on February 28, 2018, we have complied with the recommendations of the Government Commission of the German Corporate Governance Code in the version dated February 7, 2017 published in the official section of the German Federal Gazette with the following exception: Contrary to section 5.3.2 of the German Corporate Governance Code, the Supervisory Board has not established an audit committee. However, an audit committee does exist in the form of the Finance Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany, which to a large extent exercises the duties described in section 5.3.2 of the Code. Due to the relatively limited authority of the supervisory board of a KGaA in comparison with that of an AG, this therefore satisfies the requirements of the German Corporate Governance Code.

In view of future compliance with the current recommendations of the Government Commission of the German Corporate Governance Code, the Executive Board and the Supervisory Board declare the following: With the exception of the aforementioned deviation from section 5.3.2 (audit committee), the company will comply with the recommendations of the Code in the version dated February 7, 2017."

Darmstadt, February 26, 2019

For the Executive Board — For the Supervisory Board

s. Stefan Oschmann — **s. Wolfgang Büchele**

Compensation report

(The compensation report is part of the notes to the audited consolidated financial statements).

COMPENSATION PHILOSOPHY

As the world's oldest pharmaceutical and chemical company, we attach great importance to responsible governance and entrepreneurship. This is also reflected by the compensation of the members of the Executive Board of Merck KGaA, Darmstadt, Germany. Unlike management board members of stock corporations, they are not merely employed members of a corporate board. Rather, they are personally liable general partners of both Merck KGaA, Darmstadt, Germany, and the general partner E. Merck KG, Darmstadt, Germany, and in this capacity they receive profit sharing from E. Merck KG, Darmstadt, Germany. Owing to the legal form as a KGaA (corporation with general partners), the stipulations of the German Corporate Governance Code concerning the compensation of management board members of publicly listed German stock corporations as well as the individual disclosure thereof do not apply to the Executive Board members of Merck KGaA, Darmstadt, Germany. Nevertheless, we have decided to comply with the requirements of the German Corporate Governance Code.

The compensation paid to the members of the Executive Board takes into account the responsibilities and duties of the individual Executive Board members, their status as personally liable partners, their individual performance, the economic situation, as well as the performance and future prospects of the company.

Furthermore, Executive Board compensation orients towards the external peer environment of Merck KGaA, Darmstadt, Germany, meaning in a comparison with other German blue-chip companies as well as international competitors. The relationship between Executive Board compensation and the compensation of top management and the workforce as a whole continues to be taken into account, also in a multi-year assessment. The Personnel Committee regularly commissions an independent compensation consultant to review the appropriateness of the compensation.

The following principles are followed or taken into account when it comes to the specific structure of the compensation, the setting of individual compensation, the selection of the key performance indicators and the structure of payout and allocation terms:

REGULATORY REQUIREMENTS AND PRINCIPLES OF GOOD CORPORATE GOVERNANCE

The structure of the compensation system and the assessment of individual compensation are guided by the German Stock Corporation Act (AktG) and the German Corporate Governance Code. Within the regulatory framework conditions, the objective is to offer the Executive Board members a competitive compensation package in line with market practice.

LONG-TERM GROUP STRATEGY

The execution of the long-term Group strategy is promoted through the selection of appropriate, ambitious key performance indicators for performance-related compensation. Against this background, our performance-related compensation components (profit sharing and the Long-Term Incentive Plan) orient towards the key performance indicators of the Group.

LONG-TERM INTERESTS OF OUR SHAREHOLDERS

The long-term interests of our shareholders are taken into account through a significantly high amount of variable, performance-related compensation as a proportion of total compensation as well as the compensation system's strong focus on the share price. The performance of the Executive Board members should be properly recognized, with the failure to meet targets leading to a noticeable reduction in performance-related compensation.

In our company, unlike publicly listed German stock corporations, it is not the Supervisory Board, but the Board of Partners of E. Merck KG, Darmstadt, Germany, that decides on the amount and composition of compensation received by our Executive Board members. The Board of Partners has assigned this task to its Personnel Committee. The Personnel Committee is thus primarily responsible for the followings topics as they relate to our Executive Board and the compensation thereof:

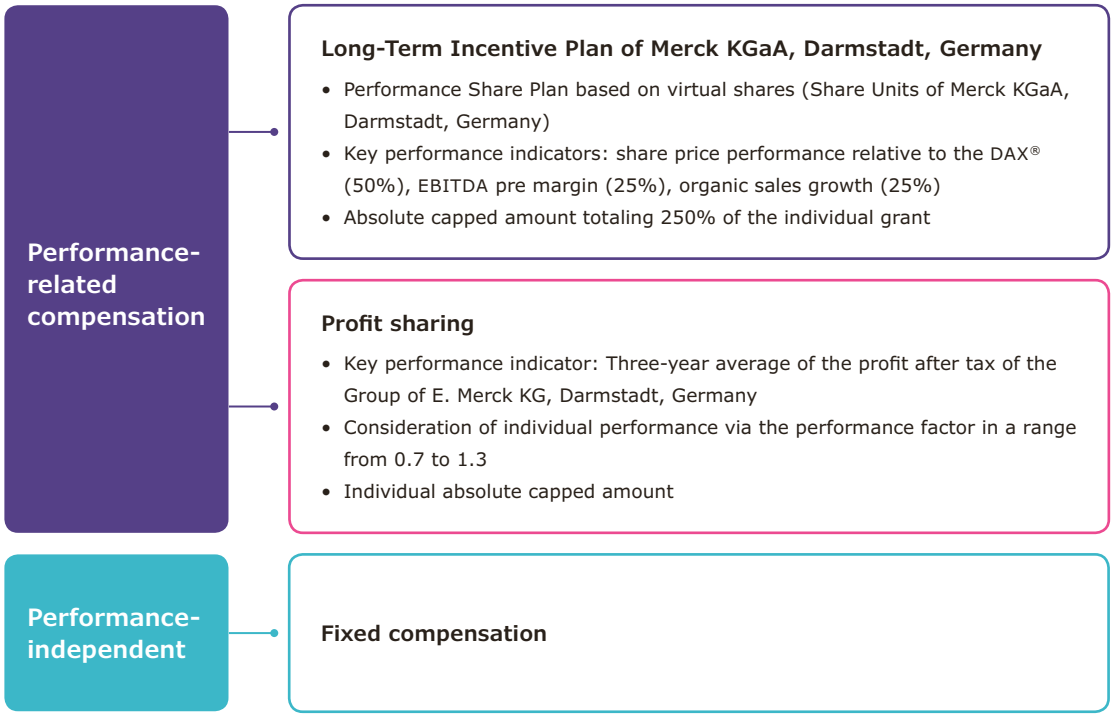
- Structure and examination of the performance-independent and performance-related compensation elements
- Contract terms of members of the Executive Board
- Assumption of honorary offices, board positions or other sideline activities
- Distribution of responsibilities among Executive Board members
- Granting of loans and salary advances

Taking the suggestions of our shareholders into account, the compensation system was further revised with the help of an independent compensation consultant with effect from fiscal 2018, while taking account of the regulatory requirements and the internal corporate strategy. In April 2018, the compensation system was submitted to the General Meeting for approval and accepted by 98.9% of the votes cast.

OVERVIEW OF THE STRUCTURE AND THE COMPONENTS OF THE COMPENSATION SYSTEM

The compensation system for the Executive Board basically comprises the three main components fixed compensation, profit sharing and the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany. It is complemented by contributions to the company pension plan as well as additional benefits. The components of the compensation system are as follows:

COMPENSATION ELEMENTS AND COMPENSATION STRUCTURE[1]



[1] Excluding additional benefits and company pension.

PERFORMANCE-INDEPENDENT COMPENSATION AND ADDITIONAL BENEFITS

Fixed compensation
The fixed compensation received by the members of the Executive Board comprises fixed and non-performance related amounts that are paid in the form of 12 equivalent monthly installments.

Additional benefits
In addition, the members of the Executive Board receive non-performance related additional benefits. These consist mainly of contributions to insurance policies, personal security expenses and a company car, which they may use privately.

PERFORMANCE-RELATED COMPENSATION

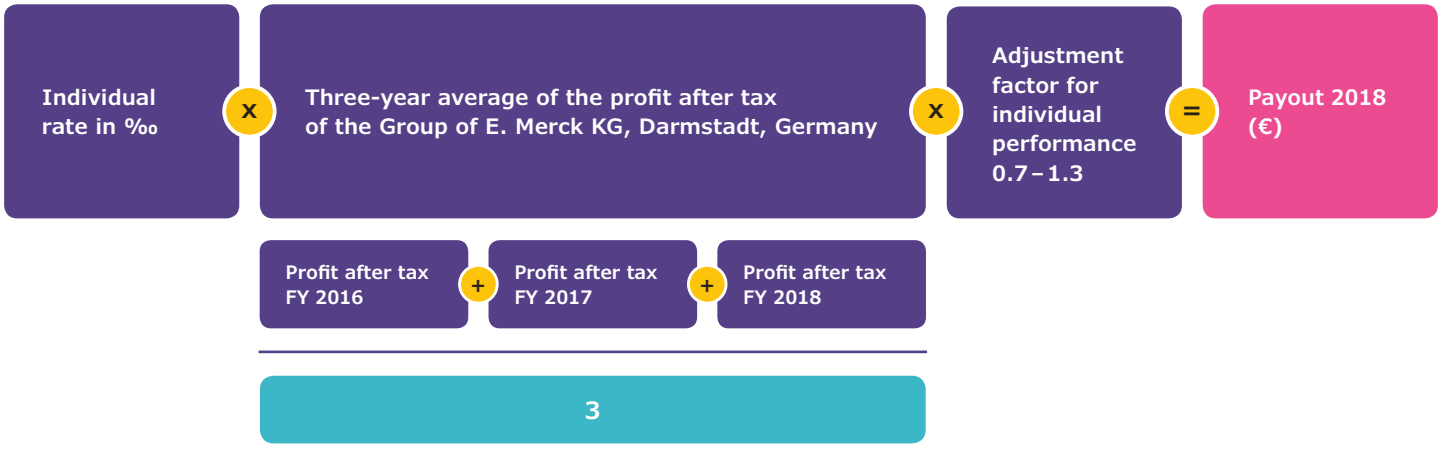
Performance-related compensation comprises profit sharing as well as the Long-Term Incentive Plan. Both performance-related compensation components are based on multi-year steering parameters. The regulatory requirements of the German Stock Corporation Act and the German Corporate Governance Code are taken into account, and particular recognition is given for sustainable corporate development.

Profit sharing

PROFIT SHARING

Key performance indicator	Three-year average of the profit after tax of the Group of E. Merck KG, Darmstadt, Germany
Period	Three years
Limit	Individual absolute capped amount

As part of profit sharing, at the end of a fiscal year the members of the Executive Board receive an individual per mille rate of the three-year average of profit after tax of the Group of E. Merck KG, Darmstadt, Germany. The current and the two preceding years are included in the calculation. The use of profit after tax as the key performance indicator, which also serves as the basis for dividend payments, ensures very close alignment with the shareholder interests. The amount of the individual per mille rate is staggered at intervals. Through staggering, the achievement of an average profit after tax of more than € 1 billion is more strongly incentivized than amounts below € 1 billion. However, insofar as the average profit after tax is more than € 1.5 billion, the amount greater than € 1.5 billion is not taken into account when determining the profit-sharing payment. To appropriately take into account the individual performance of the Executive Board members, since fiscal 2017 the Personnel Committee has been able to adjust the payment by applying a factor ranging from 0.7 to 1.3. The performance factor makes it possible to recognize superb performance of a member of the Executive Board by multiplying profit sharing by a value greater than 1.0 up to 1.3. Similarly, multiplying by a value less than 1 down to 0.7 can lower profit sharing if the case calls for it. The maximum profit-sharing payment is capped individually.



Effective fiscal year 2018, the Personnel Committee abolished one-time payments to members of the Executive Board as part of performance-related compensation. This adjustment measure serves primarily to take our international shareholder structure into account.

Moreover, the Personnel Committee resolved to define criteria applicable to the adjustment of profit sharing by applying the factor in a range of between 0.7 and 1.3. Insofar as the adjustment increases or decreases the profit sharing of a member of the Executive Board, this is to be published in the Compensation Report.

Adjustment criteria for increasing profit sharing could include the following:

- Extraordinary success in connection with M&A activities of the Group;
- Extraordinary success in the sustainable strategic, technical, product-related or structural further development or reorganization of the Group;
- Extraordinary performance in the execution of especially important projects or the achievement of other exceptionally important objectives in the area of responsibility;
- Extraordinary performance leading to a clear overachievement of targets for relevant key performance indicators in the area of responsibility;

- Extraordinary contributions to the aspirations and targets of our stakeholders (for example, employee satisfaction, customer satisfaction, Corporate Social Responsibility, implementation of diversity requirements).

Adjustment criteria for lowering profit sharing could include the following:

- Violations of internal rules and guidelines (for example, our Code of Conduct), legislation or other binding external requirements in the area of responsibility;
- Significant breaches of duty of care within the meaning of section 93 AktG or other grossly non-compliant or unethical behavior;
- Behaviors or actions that are contradictory to our company values;
- Failure to implement particularly important projects or to reach other exceptionally important targets in the area of responsibility;
- Clear failure to achieve targets for relevant key performance indicators in the area of responsibility.

Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany

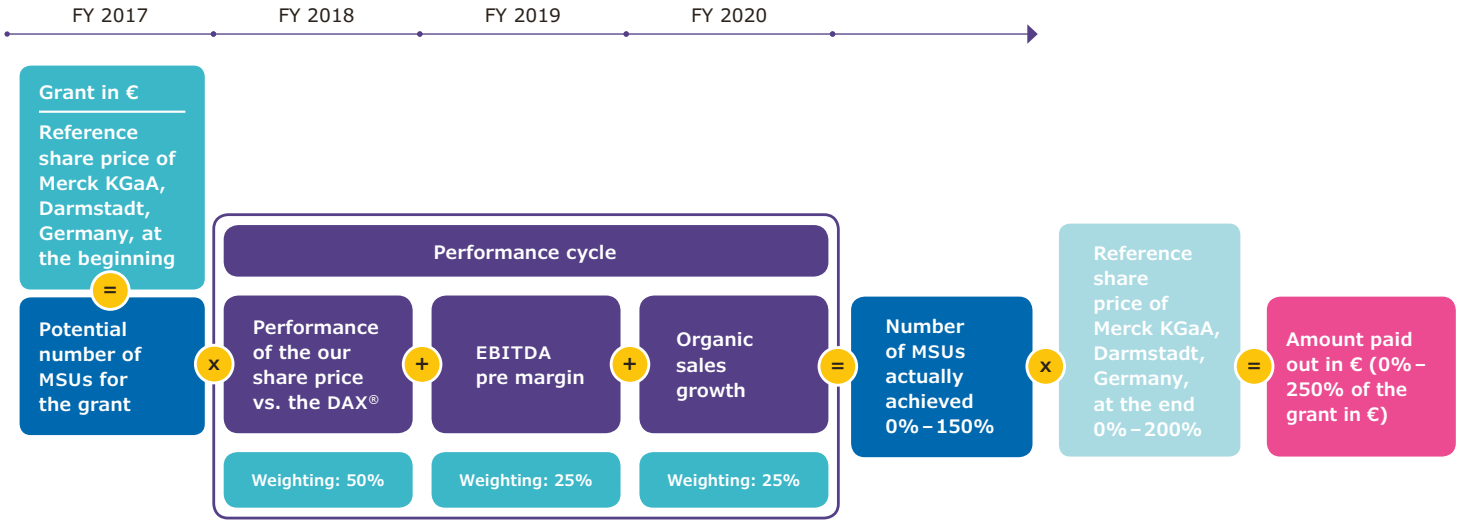
LONG-TERM INCENTIVE PLAN OF MERCK KGAA, DARMSTADT, GERMANY (LTIP)

Key performance indicators	• Share price performance relative to the DAX® (50% weighting) • EBITDA pre margin (25% weighting) • Organic sales growth (25% weighting)
Cycle	Three years
Limit	Absolute capped amount totaling 250% of the individual grant
Reference price (share price for conversion into numbers or for payment)	Average closing price of shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to the beginning or the end of the performance cycle

The Long-Term Incentive Plan is based on a three-year performance, future-oriented performance cycle. As part of the Long-Term Incentive Plan, the members of the Executive Board are eligible to receive a certain number of virtual shares – Share Units of Merck KGaA, Darmstadt, Germany (MSUs). The number of MSUs is calculated as follows:

At the beginning of the performance cycle, for each Executive Board member the Personnel Committee sets an individual grant in euros. This grant is then divided by the definitive reference share price at the beginning of the performance cycle, resulting in the number of MSUs they could be eligible to receive. The final number of MSUs that are actually allocated to the Executive Board members after the performance cycle has expired depends on the development of three weighted key performance indicators over the three-year performance cycle:

a) the performance of the share price of Merck KGaA, Darmstadt, Germany, compared with the performance of the DAX® with a weighting of 50%,
b) EBITDA pre margin, as a proportion of a defined target value with a weighting of 25%, and
c) the organic sales growth of the Group as a proportion of a defined target value with a weighting of 25%.



The Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, thus links two key performance indicators derived from the strategy with an external, relative key performance indicator. On the one hand, this creates an incentive to achieve strategic objectives. On the other hand, the strong share price orientation takes into account the company's long-term development prospects and the expectations of our shareholders. To prevent distortions as a result of exceptional factors as well as to directly reflect the performance of the Executive Board members, the EBITDA pre margin is used.

Depending on the performance of the key performance indicators, after the three-year performance cycle between 0% and 150% of the provisionally promised MSUs are finally allocated. The value of these MSUs is paid out to the Executive Board in the year after the three-year performance cycle has ended. For this, the final allocated number of MSUs is multiplied by the definitive reference share price at the end of the performance cycle. The maximum increase in the share price is limited to 200% of the reference price at the beginning of the performance cycle, thus limiting participation in external effects that contribute to share price increases. Apart from setting a limit on the final number of allocated MSUs and on the applicable share price increase, the overall Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, payment is limited to 250% of the individual grant. If targets are clearly missed, it is also possible that absolutely no payment is made from the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (0%).

Clawback provision

Through their status as personally liable general partners of Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany, the Executive Board members bear a very unique entrepreneurial responsibility. This is also reflected by the penalty criteria set forth in profit sharing and by the German statutory regulations on liability for damages stipulated in section 93 of the German Stock Corporation Act.

In order to take even greater account of the prominent position of entrepreneurial responsibility in compensation, a clawback provision was included in the Long-Term Incentive Plan, effective January 1, 2018, allowing amounts allocated from the Long-Term Incentive Plan but not yet paid out to be retained. Cases in which the clawback provision may be applied include violations of internal rules and regulations (our Code of Conduct), legislation, other binding external requirements in the area of responsibility, significant breaches of duty of care within the meaning of section 93 AktG, other grossly non-compliant or unethical behavior or actions that are contradictory to our company values.

To further increase the transparency of the Executive Board compensation system, the performance corridor for the key performance indicators used in the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, will be subsequently disclosed. However, the company will continue to refrain from publishing this performance corridor in advance as this could permit market-related and competitively relevant conclusions to be drawn about strategic objectives.

Share Ownership Guideline

A Share Ownership Guideline was introduced in 2017. This obligates the Executive Board members, for the duration of their employment relationship, to permanently hold shares of Merck KGaA, Darmstadt, Germany, in an amount equal to 100% of their annual gross fixed compensation. Owing to his position as Chairman of the Executive Board, Stefan Oschmann is obligated to hold a higher amount, or at least 200% of his annual gross fixed compensation, in shares of Merck KGaA, Darmstadt, Germany. The duty to provide evidence of the complete number of shares must be met no later than on expiration of four years after having joined the Executive Board or after the introduction of the rule. The Share Ownership Guideline promotes even stronger alignment between the interests of the Executive Board members and those of our shareholders and it additionally raises the entrepreneurial responsibility of the Executive Board members. Moreover, the introduction of the Share Ownership Guideline takes into account the widespread practice of share ownership among management and executive board members in international peer coparisons.

OVERALL COMPENSATION LIMIT

Compensation is capped with respect to its performance-related compensation elements of profit sharing and Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, as well as having an overall cap.

Compared with the previous year, one-time payments were abolished as part of the implementation of the revised compensation system and the maximum cap of the profit sharing was adjusted by the multiplication factor for individual benefits. The maximum limits are presented in the following table.

€ thousand	Fixed compensation	Maximum profit sharing limit	Maximum limit Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany	Maximum limit overall compensation
Member of the Executive Board				
Stefan Oschmann	1,300	4,810	5,638	**9,800**
Udit Batra	1,000	3,640	4,263	**8,000**
Kai Beckmann	1,000	3,120	3,575	**8,000**
Walter Galinat (left on: September 30, 2018)	800	2,860	3,300	**8,000**
Belén Garijo	1,100	3,900	4,675	**8,000**
Marcus Kuhnert	900	2,860	3,300	**8,000**

PENSION ENTITLEMENTS

Effective January 1, 2017, for the Executive Board members Kai Beckmann, Belén Garijo and Marcus Kuhnert, the individual contractual pension agreements were changed from defined-benefit to defined-contribution pension obligations, maintaining the direct commitment modality[1]. A defined-contribution pension agreement is also in place with Udit Batra. Within the scope of these defined-contribution pension obligations, every year an amount of €400,000 is paid into a benefit account and interest is paid on this at standard market interest rates. Once the respective Executive Board members reach the contractually agreed age limit and are no longer employed by E. Merck KG, Darmstadt, Germany, the amount in the benefit account is paid out either in ten annual installments or as a one-time payment. The balance in the benefit account is disbursed as a one-time payment, possibly topped up by additional contributions (maximally ten contributions, up to the age of 60) in the event of permanent disability, or in the event of death to surviving dependents. The vested amount from the former defined-benefit pension agreement was credited to the benefit account when the changeover took place.

Walter Galinat received a performance-related pension entitlement until his departure on September 30, 2018. Stefan Oschmann continues to receive such a pension provision. The old-age pension is determined in accordance with a certain percentage of pensionable compensation. The percentages can be found in the table below. The individual contractual pension obligations grant Stefan Oschmann and Walter Galinat entitlement to a lifelong old-age pension or surviving dependents' pension in the event of reaching the individual contractually agreed age limit, permanent disability, or death. As an alternative to an old-age pension, the promised pension may be paid out as a one-time amount calculated on the basis of actuarial

[1] For accounting purposes, this corresponds to a defined-benefit obligation within the meaning of IAS 19.8.

principles once the age limit stipulated in the relevant contract has been reached.

Moreover, surviving dependents of the two Executive Board members receive a surviving dependents' pension. For spouses, this amounts to 60% of the pension entitlement. Dependent children are entitled to either a half-orphan's or an orphan's pension maximally until the age of 25.

The contribution amounts or pensionable compensation and the percentage obligation as well as the pension provisions and service costs are listed in the following tables:

Defined-contribution obligation

		IFRS			
	Contribution level	Service cost of pension obligations earned in the current year		Present value of the defined-contribution pension obligation as of Dec. 31	
€ thousand		2017	**2018**	2017	**2018**
Member of the Executive Board					
Udit Batra	400	379	400	633	990
Kai Beckmann[1]	400	396	395	3,977	4,402
Belén Garijo[2]	400	398	394	4,162	4,637
Marcus Kuhnert[3]	400	426	421	2,512	2,958
Total	**1,600**	**1,599**	**1,610**	**11,284**	**12,987**

[1] For 2017, in addition to the current service cost of € 396 thousand for Kai Beckmann occurred a past service revenue of € 2,424 thousand (total service revenue: € 2,028 thousand).
[2] For 2017, in addition to the current service cost of € 398 thousand for Belén Garijo occurred a past service cost of € 2,184 thousand (total service cost: € 2,582 thousand).
[3] For 2017, in addition to the current service cost of € 426 thousand for Marcus Kuhnert occurred a past service cost of € 1,178 thousand (total service cost: € 1,604 thousand).

Defined-benefit obligations

			IFRS			
	Pensionable compensation	Percentage entitlement	Service cost of pension obligations earned in the current year		Present value of the defined-benefit pension obligation as of Dec. 31	
€ thousand			2017	**2018**	2017	**2018**
Member of the Executive Board						
Stefan Oschmann[1]	750	64	1,401	1,369	9,802	10,955
Walter Galinat (left on: September 30, 2018)	490	65	168	166	6,958	7,025
Total	**1,240**		**1,569**	**1,535**	**16,760**	**17,980**

[1] The percentage entitlement increases until retirement by two percentage points per year of service up to 70%.

BENEFITS IN THE EVENT OF TERMINATION OF DUTIES AS AN EXECUTIVE BOARD MEMBER

In the event of the early termination of the employment relationship, without notice for good cause, the employment contracts of the Executive Board members stipulate a cap on severance pay in accordance with the recommendations of the German Corporate Governance Code. Pursuant to this, payments in connection with the termination of an Executive Board member's duties shall not exceed twice the annual total compensation or constitute compensation for more than the remaining term of the employment contract (severance cap). If an Executive Board member's duties prematurely end due to the termination of the employment contract either by the company or the Executive Board member before the performance cycle of an open tranche in the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, expires, the obligations resulting from the plan are no longer applicable.

The employment contracts of Stefan Oschmann, Kai Beckmann and Udit Batra each contain a post-contractual non-competition clause. During a two-year period, an amount totaling 50% of the contractual average benefits received by the Executive Board member in question within the last twelve months prior to their departure is provided as compensation for each year of the period of the non-competition clause. During the period of the non-competition clause, other employment income and pension payments will be credited against this compensation. Within certain time limits, E. Merck KG, Darmstadt, Germany, has the possibility to dispense with adherence to the non-competition clause with the consequence that the obligation to make the compensation payments shall no longer exist. The contracts of the Executive Board members further provide for the continued payment of fixed compensation to surviving dependents for a limited period of time in the event of death. Above and beyond existing pension obligations, no further obligations exist in the event of the termination of the contractual relationships of the Executive Board members.

LOANS AND ADVANCES

The members of the Executive Board did not receive any advances or loans in fiscal 2018.

PAYMENTS TO FORMER EXECUTIVE BOARD MEMBERS AND THEIR SURVIVING DEPENDENTS

Payments to former members of the Executive Board or their surviving dependents are made for a limited period of time and represent continued payment of fixed compensation in the event of death as well as pension payments. In fiscal 2018, these amounted to € 13,763 thousand (2017: € 12,786 thousand). Pension provisions for 2018 come to € 155,950 thousand (2017: € 152,973 thousand).

MISCELLANEOUS

The total compensation of the Executive Board of Merck KGaA, Darmstadt, Germany, includes both the compensation received from E. Merck KG, Darmstadt, Germany, as well as possibly also from subsidiaries consolidated in the Group financial statements. Should members of the Executive Board be held liable for financial losses while executing their duties, under certain circumstances this liability risk is covered by a D&O insurance policy from Merck KGaA, Darmstadt, Germany. The D&O insurance policy has a deductible in accordance with the legal requirements and the recommendations of the German Corporate Governance Code.

PERFORMANCE-RELATED COMPENSATION IN 2018

The compensation system for our Executive Board is geared to suitably rewarding the performance of Executive Board members in terms of sustainable corporate development and the creation of shareholder value, whereas the failure to meet targets leads to a noticeable decrease in performance-related compensation. In response to the suggestions from our shareholders and to further increase the transparency of the Executive Board compensation system, the following tables present the average individual profit-sharing rates and the performance corridors for the key performance indicators used in the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany.

Profit sharing

As part of profit sharing, at the end of a fiscal year the members of the Executive Board receive an individual per mille rate of the three-year average of profit after tax of the Group of E. Merck KG, Darmstadt, Germany. The current and the two preceding years are relevant here.

Key performance indicator (€ million)	2015	2016	2017	**2018**
Profit after tax of the Group of E. Merck KG, Darmstadt, Germany	1,066	1,559	2,549	3,324
Three-year average profit after tax of the Group of E. Merck KG, Darmstadt, Germany (2015 – 2017)		1,724		–
Three-year average profit after tax of the Group of E. Merck KG, Darmstadt, Germany (2016 – 2018)	–		2,477	

The amount of the individual per mille profit-sharing rates is staggered at intervals. This staggering incentivizes the achievement of an average profit after tax of more than € 1 billion more strongly than amounts below € 1 billion. However, insofar as the average profit after tax is more than € 1.5 billion, the amount greater than € 1.5 billion is not taken into account when determining the profit-sharing payment. The average profit-sharing rates in per mille for the members of the Executive Board in 2018 were as follows:

Member of the Executive Board	**Average profit-sharing rate in per mille in 2018**	**Performance factor for individual performance 2018**
Stefan Oschmann	1.49	1
Udit Batra	1.13	1
Kai Beckmann	0.97	1
Walter Galinat (left on: September 30, 2018)	0.89	1
Belén Garijo	1.57	1.3
Marcus Kuhnert	0.89	1

The amount of profit-sharing for Belén Garijo was increased by a factor of 1.3. The following positive criterion was used to justify the increase in profit participation:

Extraordinary performance in the execution of especially important projects or the achievement of other exceptionally important objectives in the area of responsibility; Belén Garijo fulfilled this positive criterion in 2018 due to the following achievements.

- Success with the multi-year repositioning of the R&D area and significant productivity increases in pharmaceutical research.
- Many important gains in the pharmaceutical pipeline (Bavencio®, Evobrutinib, TGF-β trap).
- Approval and market introduction of Cladribin/Mavenclad® in the European Union.
- Today the pipeline of our company is seen by external experts as having a very high value, and this also significantly eases the task of winning top-level talent for company.

Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany
Until the beginning of fiscal 2017, payment from the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, was based on the achievement of specific targets with respect to the development of the share price of Merck KGaA, Darmstadt, Germany, compared with the DAX® as well as the development of the EBITDA pre margin during the three-year performance cycle. Since fiscal year 2017, organic sales growth of the Group has been included as an additional key performance indicator. The tables below show the target values that lead to 100% target achievement relative to the respective key performance indicator. Below the lower target corridor limit, target achievement for the respective key performance indicator is 0%. Above the upper target corridor limit, target achievement no longer increases.

Key performance indicator[1]	Lower target corridor limit	Target	Upper target corridor limit	Actually achieved value LTIP of Merck KGaA, Darmstadt, Germany, tranche 2014	Target achievement LTIP of Merck KGaA, Darmstadt, Germany, tranche 2014
Share price development relative to the DAX® (external key performance indicator)	–20%	0%	50%	36.3%	136.3%
EBITDA pre margin (internal key performance indicator)	25%	28%	31%	29.6%	126.7%

[1] The key performance indicator organic sales growth became a component of the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, in 2017 and is therefore not relevant for target achievement of the tranche in fiscal 2014.

Key performance indicator[1]	Lower target corridor limit	Target	Upper target corridor limit	Actually achieved value LTIP of Merck KGaA, Darmstadt, Germany, tranche 2015	Target achievement LTIP of Merck KGaA, Darmstadt, Germany, tranche 2015
Share price performance relative to the DAX® (external key performance indicator)	–20%	0%	50%	–16.1%	19.5%
EBITDA pre margin (internal key performance indicator)	25%	28%	31%	29%	116.7%

[1] The key performance indicator organic sales growth became a component of the Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany, in 2017 and is therefore not relevant for target achievement of the tranche in fiscal 2015.

TOTAL COMPENSATION

According to the German Commercial Code (HGB), the total compensation of the members of the Executive Board of Merck KGaA, Darmstadt, Germany, broken down by performance-related and performance-independent compensation components, is as follows.

		Performance-independent components		Performance-related components				Total	Expense (+)/income (–) recorded in the period for share-based compensation[3]
		Fixed compensation	Additional benefits	Profit sharing (without a long-term incentive effect)	Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (with a long-term incentive effect)				
					Grant value	Number of MSUs[1]	Time value[2]		
		(€ thousand)	(€ thousand)	(€ thousand)	(€ thousand)		(€ thousand)	(€ thousand)	(€ thousand)
Member of the Executive Board									
Stefan Oschmann	2018	1,300	186	3,700	2,255	24,584	1,426	6,612	3,536
	2017	1,300	164	3,700	2,255	23,581	2,146	7,310	–375
Udit Batra	2018	1,000	38	2,800	1,705	18,588	1,078	4,916	2,791
	2017	1,000	12	2,800	1,705	17,830	1,623	5,435	–335
Kai Beckmann	2018	1,000	81	2,400	1,430	15,590	904	4,385	2,387
	2017	1,000	36	2,400	1,430	14,954	1,361	4,797	–388
Walter Galinat (left on: September 30, 2018)	2018	600	26	2,200	1,320	14,391	835	3,661	2,051
	2017	800	32	2,200	1,320	13,804	1,256	4,288	91
Belén Garijo	2018	1,100	66	3,900	1,870	20,386	1,183	6,249	2,969
	2017	1,100	49	3,000	1,870	19,555	1,779	5,928	–376
Marcus Kuhnert	2018	900	26	2,200	1,320	14,391	835	3,961	2,203
	2017	800	21	2,200	1,320	13,804	1,256	4,277	–385
Total	**2018**	**5,900**	**423**	**17,200**	**9,900**	**107,930**	**6,261**	**29,784**	**15,937**
	2017	**6,000**	**314**	**16,300**	**9,900**	**103,528**	**9,421**	**32,035**	**–1,768**

[1] Number of potential MSUs subject to target achievement. For details see pages 171 and 172. The actual number of MSUs to be granted after the expiration of the three-year performance cycle may deviate from this.

[2] Time value on the date of the grant (date of the legally binding entitlement). The amount of a payment is thus not predefined. Payment is subject to target achievement and is made on a specified date after the expiration of the three-year performance cycle. The time value of the obligations was calculated using a Monte Carlo simulation based on the previously described KPIs. The expected volatilities are based on the implicit volatility of shares of Merck KGaA, Darmstadt, Germany, and the DAX® in accordance with the remaining term of the LTIP tranche. The dividend payments incorporated into the valuation model orient towards medium-term dividend expectations.

[3] In accordance with IFRS, the expense recorded for 2018 includes the values for the 2016, 2017 and 2018 LTIP tranches. In accordance with IFRS, the expense recorded for 2017 includes the values for the 2015, 2016 and 2017 LTIP tranches.

INFORMATION IN ACCORDANCE WITH THE REQUIREMENTS OF THE GERMAN CORPORATE GOVERNANCE CODE

In accordance with the requirements of the German Corporate Governance Code, the following tables present the compensation granted for 2018, including additional benefits, contributions to the company pension plan and the achievable minimum and maximum values of the variable compensation components, as well as the allocation of the respective compensation components for the fiscal year.

BENEFITS GRANTED FOR THE FISCAL YEAR

	Stefan Oschmann				Udit Batra			
	Chairman of the Executive Board				Member of the Executive Board			
Benefits granted (€ thousand)	2017	**2018**	**2018 (min.)**	**2018 (max.)**	2017	**2018**	**2018 (min.)**	**2018 (max.)**
Fixed compensation	1,300	1,300	1,300	1,300	1,000	1,000	1,000	1,000
Additional benefits	164	186	186	186	12	38	38	38
Total	**1,464**	**1,486**	**1,486**	**1,486**	**1,012**	**1,038**	**1,038**	**1,038**
Profit sharing	3,700	3,700	–	4,810	2,800	2,800	–	3,640
Multi-year variable compensation								
LTI 2017 (2017 to 2019)	2,146	–	–	–	1,623		–	–
LTI 2018 (2018 to 2020)	–	1,426	–	5,638	–	1,078	–	4,263
Total	**7,310**	**6,612**	**1,486**	**11,934**	**5,435**	**4,916**	**1,038**	**8,941**
Service cost	1,401	1,369	1,369	1,369	379	400	400	400
Total compensation	**8,711**	**7,981**	**2,855**	**13,303**	**5,814**	**5,316**	**1,438**	**9,341**

	Kai Beckmann				Walter Galinat			
	Member of the Executive Board				Member of the Executive Board (left on: September 30, 2018)			
Benefits granted (€ thousand)	2017	**2018**	**2018 (min.)**	**2018 (max.)**	2017	**2018**	**2018 (min.)**	**2018 (max.)**
Fixed compensation	1,000	1,000	1,000	1,000	800	600	600	600
Additional benefits	36	81	81	81	32	26	26	26
Total	**1,036**	**1,081**	**1,081**	**1,081**	**832**	**626**	**626**	**626**
Profit sharing	2,400	2,400	–	3,120	2,200	2,200	–	2,860
Multi-year variable compensation								
LTI 2017 (2017 to 2019)	1,361	–	–	–	1,256	–	–	–
LTI 2018 (2018 to 2020)	–	904	–	3,575	–	835	–	3,300
Total	**4,797**	**4,385**	**1,081**	**7,776**	**4,288**	**3,661**	**626**	**6,786**
Service cost	–2,028	395	395	395	168	166	166	166
Total compensation[1]	**2,769**	**4,780**	**1,476**	**8,171**	**4,456**	**3,827**	**792**	**6,952**

	Belén Garijo				Marcus Kuhnert			
	Member of the Executive Board				Member of the Executive Board			
Benefits granted (€ thousand)	2017	**2018**	**2018 (min.)**	**2018 (max.)**	2017	**2018**	**2018 (min.)**	**2018 (max.)**
Fixed compensation	1,100	1,100	1,100	1,100	800	900	900	900
Additional benefits	49	66	66	66	21	26	26	26
Total	**1,149**	**1,166**	**1,166**	**1,166**	**821**	**926**	**926**	**926**
Profit sharing	3,000	3,900	–	3,900	2,200	2,200	–	2,860
Multi-year variable compensation								
LTI 2017 (2017 to 2019)	1,779	–	–	–	1,256	–	–	–
LTI 2018 (2018 to 2020)	–	1,183	–	4,675	–	835	–	3,300
Total	**5,928**	**6,249**	**1,166**	**9,741**	**4,277**	**3,961**	**926**	**7,086**
Service cost	2,582	394	394	394	1,604	421	421	421
Total compensation[2,3]	**8,510**	**6,643**	**1,560**	**10,135**	**5,881**	**4,382**	**1,347**	**7,507**

[1] Kai Beckmann's total compensation in 2017 comprised current service costs of € 396 thousand and past service revenues of € 2,424 thousand (total: € 2,028 thousand).
[2] Belén Garijo's total compensation in 2017 comprised current service costs of € 398 thousand and past service costs of € 2,184 thousand (total: € 2,582 thousand).
[3] Marcus Kuhnert's total compensation in 2017 comprised current service costs of € 426 thousand and past service costs of € 1,178 thousand (total: € 1,604 thousand).

ALLOCATION FOR THE FISCAL YEAR

	Stefan Oschmann		Udit Batra		Kai Beckmann	
	Chairman of the Executive Board		Member of the Executive Board		Member of the Executive Board	
Allocation (€ thousand)	2017	**2018**	2017	**2018**	2017	**2018**
Fixed compensation	1,300	1,300	1,000	1,000	1,000	1,000
Additional benefits	164	186	12	38	36	81
Total	**1,464**	**1,486**	**1,012**	**1,038**	**1,036**	**1,081**
Profit sharing	3,700	3,700	2,800	2,800	2,400	2,400
Multi-year variable compensation						
LTI 2014 (2014 to 2016)	2,077	–	402	–	2,077	–
LTI 2015 (2015 to 2017)	–	599	–	326	–	599
Total	**7,241**	**5,785**	**4,214**	**4,164**	**5,513**	**4,080**
Service cost	1,401	1,369	379	400	–2,028	395
Total compensation[1]	**8,642**	**7,154**	**4,593**	**4,564**	**3,485**	**4,475**

	Walter Galinat		Belén Garijo		Marcus Kuhnert	
	Member of the Executive Board (left on: September 30, 2018)		Member of the Executive Board		Member of the Executive Board	
Allocation (€ thousand)	2017	**2018**	2017	**2018**	2017	**2018**
Fixed compensation	800	600	1,100	1,100	800	900
Additional benefits	32	26	49	66	21	26
Total	**832**	**626**	**1,149**	**1,166**	**821**	**926**
Profit sharing	2,200	2,200	3,000	3,900	2,200	2,200
Multi-year variable compensation						
LTI 2014 (2014 to 2016)	140	–	1,194	–	866	–
LTI 2015 (2015 to 2017)	–	105	–	599	–	599
Total	**3,172**	**2,931**	**5,343**	**5,665**	**3,887**	**3,725**
Service cost	168	166	2,582	394	1,604	421
Total compensation[2, 3]	**3,340**	**3,097**	**7,925**	**6,059**	**5,491**	**4,146**

	Karl-Ludwig Kley		Bernd Reckmann	
	Member of the Executive Board (left on: August 31, 2016)		Member of the Executive Board (left on: April 29, 2016)	
Allocation (€ thousand)	2017	**2018**	2017	**2018**
Fixed compensation	–		–	
Additional benefits	–		–	
Total	**–**		**–**	
Profit sharing	–		–	
Multi-year variable compensation	–		–	
LTI 2014 (2014 to 2016)	2,769		2,077	
LTI 2015 (2015 to 2017)	–	499	–	265
Total	**–**		**–**	
Service cost	–		–	
Total compensation	**2,769**	**499**	**2,077**	**265**

[1] Kai Beckmann's total compensation in 2017 comprised current service costs of € 396 thousand and past service revenues of € 2,424 thousand (total: € 2,028 thousand).
[2] Belén Garijo's total compensation in 2017 comprised current service costs of € 398 thousand and past service costs of € 2,184 thousand (total: € 2,582 thousand).
[3] Marcus Kuhnert's total compensation in 2017 comprised current service costs of € 426 thousand and past service costs of € 1,178 thousand (total: € 1,604 thousand).

COMPENSATION FOR THE SUPERVISORY BOARD MEMBERS OF MERCK KGAA, DARMSTADT, GERMANY

The compensation of the Supervisory Board members is defined by Article 20 of the Articles of Association of Merck KGaA, Darmstadt, Germany. The members of the Supervisory Board receive fixed compensation of € 47,000 per year. The Chairman receives double and the Vice Chairman receives one and a half times this amount. Moreover, the members receive additional compensation of € 750 per meeting. The individual values are presented in the following table:

	Fixed compensation		Compensation for meeting attendance		Total compensation	
in €	**2018**	2017	**2018**	2017	**2018**	2017
Wolfgang Büchele (Chairman)	94,000.00	94,000.00	3,000.00	3,000.00	97,000.00	97,000.00
Michael Fletterich (Vice Chairman)	70,500.00	70,500.00	2,250.00	3,000.00	72,750.00	73,500.00
Crocifissa Attardo	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Mechthild Auge	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Gabriele Eismann	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Edeltraud Glänzer	47,000.00	47,000.00	3,000.00	2,250.00	50,000.00	49,250.00
Michaela Freifrau von Glenck	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Siegfried Karjetta	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Albrecht Merck	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Dietmar Oeter	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Alexander Putz	47,000.00	47,000.00	3,000.00	2,250.00	50,000.00	49,250.00
Helga Rübsamen-Schaeff	47,000.00	47,000.00	3,000.00	2,250.00	50,000.00	49,250.00
Gregor Schulz	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Theo Siegert	47,000.00	47,000.00	2,250.00	3,000.00	49,250.00	50,000.00
Tobias Thelen	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Veit Ulshöfer	47,000.00	47,000.00	3,000.00	3,000.00	50,000.00	50,000.00
Total	**822,500.00**	**822,500.00**	**46,500.00**	**45,750.00**	**869,000.00**	**868,250.00**

As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Wolfgang Büchele received an additional payment of € 140,000 for performing this function in 2018 (2017: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Michaela Freifrau von Glenck received an additional payment of € 80,000 for performing this function in 2018 (2017: € 80,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Siegfried Karjetta received an additional payment of € 140,000 for performing this function in 2018 (2017: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Albrecht Merck received an additional payment of € 120,000 for performing this function in 2018 (2017: € 120,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Helga Rübsamen-Schaeff received an additional payment of € 150,000 for performing this function in 2018 (2017: € 150,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Gregor Schulz received an additional payment of € 140,000 for performing this function in 2018 (2017: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Theo Siegert received an additional payment of € 150,000 for performing this function in 2018 (2017: € 150,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Supervisory Board member Tobias Thelen received an additional payment of € 140,000 for performing this function in 2018 (2017: € 140,000).

OWNERSHIP, PURCHASE OR SALE OF SHARES IN THE COMPANY BY MEMBERS OF THE EXECUTIVE BOARD AND OF THE SUPERVISORY BOARD

As of December 31, 2018, the members of the Executive Board and of the Supervisory Board held less than 1% of the issued shares of Merck KGaA, Darmstadt, Germany. Transactions executed by members of the Executive Board and of the Supervisory Board are disclosed on our website at www.emdgroup.com/en/investors/corporate-governance/directors-dealings.html.

Information on corporate governance practices

REPORTING

It is the objective of Merck KGaA, Darmstadt, Germany, to provide the latest information to all shareholders, media, financial analysts and interested members of the public, while creating the greatest possible transparency. For this reason, we use a wide range of communication platforms to engage in a timely dialog with all interested parties about the situation of the company and business changes. Our principles include providing factually correct, comprehensive and fair information.

Information subject to disclosure requirements, as well as information that is not, can be accessed worldwide on the Merck KGaA, Darmstadt, Germany, website (www.emdgroup.com), which is the company's most important publication platform. Apart from a detailed financial calendar, quarterly statements and/or quarterly and half-year financial reports covering the past three years are available here in German and English. In addition, in line with the legal requirements, ad hoc announcements are published on the website. These contain information on circumstances and facts that could impact the share price of Merck KGaA, Darmstadt, Germany.

Regular press conferences, investor meetings on the occasion of investor conferences as well as road shows offer another platform for dialog. The company presentations prepared for this purpose are also available on the Merck KGaA, Darmstadt, Germany, website. In addition, the Investor Relations team is always available to private and institutional investors who wish to receive further information. To ensure the greatest possible transparency, all documents concerning the General Meeting are available on the company website. Additionally, some parts of the General Meeting are webcast live on the Internet.

DEALING WITH INSIDER INFORMATION

Dealing properly with insider information is very important to us. Our insider committee examines the existence of insider information, ensures compliance with legal obligations and prepares any necessary measures. The members of the insider committee are appointed by the Executive Board; at least two members work in Group Legal & Compliance. The insider committee meets at regular intervals, yet also meets when circumstances require. The Chief Financial Officer is vested with the authority to make the final decision on handling potential insider information.

In order to ensure a high level of protection for insider information, in 2011 the Executive Board issued internal insider guidelines applicable throughout the Group worldwide. The guidelines inform employees about their responsibilities under insider trading laws and give clear instructions for compliant behavior. In addition, they describe the function of the insider committee in detail. Moreover, our Code of Conduct, which is binding on all employees, also contains an explicit, detailed reference to the ban on using insider information. Within the scope of obligatory training courses on the Code of Conduct as well as specific training courses on insider law, all employees are instructed on the stipulations of insider trading.

ACCOUNTING AND AUDITS OF FINANCIAL STATEMENTS

Merck KGaA, Darmstadt, Germany, prepares its consolidated financial statements and combined management report in accordance with International Financial Reporting Standards (IFRS), as applicable in the EU, as well as the supplementary rules applicable under section 315e (1) of the German Commercial Code (HGB) and as stipulated by our Articles of Association. The consolidated financial statements and the combined management report are prepared by the Executive Board and examined by an auditor, taking into account the generally accepted standards for the audit of financial statements promulgated by the Institute of Public Auditors in Germany (Institut der Wirtschaftsprüfer – IDW).

The Supervisory Board commissioned KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, to audit the consolidated financial statements and the combined management report for 2018. Moreover, the Supervisory Board agreed with KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, that the auditor shall inform the Supervisory Board without delay of any grounds for disqualification or bias occurring during the audit if these cannot be immediately rectified. Additionally, the auditor shall immediately report to the Supervisory Board any findings and issues which emerge during the audit that have a direct bearing upon the tasks of the Supervisory Board. The auditor shall inform the Supervisory Board or note in the audit report any circumstances determined during the audit that would render inaccurate the Declaration of Conformity made by the Executive Board and the Supervisory Board. It has also been agreed with the auditor that in order to assess whether the Executive Board has fulfilled its obligations in accordance with section 91 (2) AktG, the audit will also cover the company's early warning risk identification system. Moreover, the auditor is required to examine and evaluate the accounting-relevant internal control system insofar as this is necessary and appropriate for assessing the accuracy of financial reporting.

Since 1995, KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, has been the audit firm for the statutory audit of the annual financial statements and consolidated financial statements of Merck KGaA, Darmstadt, Germany. The auditor responsible for auditing the consolidated financial statements changes regularly in accordance with the statutory requirements. Bodo Rackwitz is currently leading the audit engagement and has been the auditor in charge of the engagement since fiscal 2015. The Supervisory Board had KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, provide a statement regarding the scope of the business, financial, personal, and other relationships between KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, its bodies and head auditors, and Merck KGaA, Darmstadt, Germany, its Group companies and the members of their bodies (independence declaration). The statement also covers the scope of the services provided by KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, in the previous fiscal year as well as the services (other than auditing services) that are contracted for the upcoming year (especially consultancy services) for Merck KGaA, Darmstadt, Germany, and its subsidiaries. Having examined the declaration, the Supervisory Board has found no grounds to doubt the independence of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin. Neither party identified any conflicts of interest.

FURTHER REPORTS

The combined management report of Merck KGaA, Darmstadt, Germany, and the Group does not contain a non-financial declaration. Instead, we issue a separate combined non-financial (Group) report in accordance with sections 289b – 289e and 315b – 315c HGB. This is available effective April 15, 2019, as an online version on our website at https://www.emdgroup.com/en/cr-report/2018/. It is integrated into the 2018 Corporate Responsibility Report in accordance with DRS 20 subsection 252 (b). We have compiled an overview of the information contained in the combined non-financial (Group) report, which can be viewed at https://www.emdgroup.com/nfr18. The report on gender and salary equality pursuant to section 21 in conjunction with sections 25 and 22 of the German Transparency of Pay Act for fiscal 2017 is included as an appendix to the combined management report of Merck KGaA, Darmstadt, Germany.

VALUES AND COMPLIANCE

Based on a corporate culture that places the fundamental company values – courage, achievement, responsibility, respect, integrity and transparency – at the center of our entrepreneurial actions, the Code of Conduct (www.emdgroup.com/en/company/who-we-are/strategy-and-values.html) helps those involved in the business process to implement the values when dealing with one another on a daily basis.

With its Code of Conduct, a revised version of which was issued in mid-2017, our company has established a set of rules and regulations intended to help our employees to act responsibly and to make the right decisions in their daily work.

The Code of Conduct explains the company principles for dealings with business associates, shareholders, colleagues and employees, and within the scope of our responsibility for society. Thus, it supports all employees in acting ethically – not only in their dealings with one another, but also outside the company. The Code of Conduct is thus the main set of rules of our compliance program. In the newly published version, we have aligned its Code of Conduct even more closely with our company values. Additionally, it has expanded the Code of Conduct to include further important topics such as data privacy, healthcare compliance and bioethics. To us, compliance means observing legal and company-internal regulations and the basic ethical principles anchored in the company values. With the Code of Conduct and the various unit-specific ethical compliance rules, the values are integrated into daily work and business practice. The Code of Conduct is binding on all employees, both at headquarters and in the subsidiaries. We also expect our business associates worldwide to accept these principles or to have their own comparable principles. While supplier management ensures compliant behavior of suppliers, global business partner risk management encompasses the relations with sales-related business associates such as distributors and wholesalers.

The Compliance Office monitors observance of the Code of Conduct with support from corresponding monitoring and training programs throughout the Group. All employees are called upon to report potential compliance violations to their supervisor, Legal, HR or other relevant departments. Our company created the position of Group Compliance Officer in 2002. This employee is responsible for setting up, maintaining and further developing our global compliance program. By taking appropriate measures, the Group Compliance Officer and his team, including regional compliance officers, help to lower the risk of serious legal violations of, for instance, anti-trust law, anticorruption rules, or legal regulations and requirements of industry codes in the healthcare sector. Money laundering prevention was added in 2018, with Compliance coordinating the necessary organizational measures, including training.

In 2014, we began appointing compliance officers for the various business sectors. In particular, they are responsible for business-specific compliance input and they evaluate sector-specific risks that are incorporated in the design of the Compliance program.

A further focal area of the Compliance program is ensuring legally and ethically correct dealings with medical professionals and adhering to the transparency requirements. Since October 2013, the Group Compliance Officer has agreed extensive measures with the affected areas of the company in order to establish an internal framework of rules as well as the corresponding processes for approving and documenting interactions with experts that ensure correct publication. We of course also ensure compliance with the respectively valid data protection regulations.

The role of the Group Compliance Officer is reflected in the subsidiaries, which ensure via country representatives that compliance measures are implemented in the countries. Since 2013, Compliance tasks in the countries and on a regional basis have largely been performed by full-time compliance officers. As a result, a higher level of compliance expertise is based locally and the increasing tasks in all business sectors are taken into account. At the same time, the management structure was streamlined and the reporting lines for the countries were consolidated regionally. Since the end of 2016, the compliance officers in the countries have been reporting to the dedicated compliance officers for the respective business sectors (Healthcare, Life Science and Performance Materials). A separate responsibility was also created for Group functions. Regular regional compliance meetings are held to promote the exchange of information within the Compliance organization.

Newcomer training seminars were introduced in 2010 for newly appointed compliance officers. These seminars serve to build up compliance expertise and strengthen cooperation within the Compliance organization. This Group-wide network is used to steer the global compliance program. Within the Group Compliance function in Darmstadt, a team is occupied with continuously further developing the compliance program and shaping company-internal compliance projects. The Compliance organization is also involved in the relevant due diligence processes for the incorporation of new business units as well as possible divestments and acquisitions, and the subsequent integration of companies. Within the scope of the global compliance program, a high degree of importance is attached to regular compliance seminars of our Compliance Training Plan, which are conducted as Web-based training courses and classroom sessions. By presenting various training topics, particularly on the Code of Conduct, corruption, antitrust and competition law as well as healthcare compliance and data privacy, they serve to sensitize

employees and management to the consequences of compliance violations and to show ways of avoiding them. Since we set up a central SpeakUp line, employees and certain business partners have been able to report compliance violations by telephone or via a Web-based application in their respective national language. The SpeakUp line is available 24 hours a day, free of charge. Case numbers enable anonymous, two-way communication. The reports received are individually reviewed. If a compliance violation exists, corresponding corrective action is taken based on concrete action plans. If necessary, disciplinary measures are taken. These can range from a simple warning up to the dismissal of the employee who violated a compliance rule. In 2010, we set up a Compliance Case Committee to guide these processes. The Compliance Case Committee consists of senior members from various Group governance functions; they are involved in reviewing compliance violations and introducing countermeasures. The joint work in the Compliance Case Committee enables processes between the various Group functions to be optimally coordinated and designed efficiently.

Further significant elements of the Compliance program include requirements on locally identifying and assessing risks as well as reporting these, both within the subsidiary abroad and to the Group functions. The Compliance Office regularly reviews and assesses the implementation status of the Compliance program at the subsidiaries abroad. In cooperation with Group Internal Auditing, the Compliance Office regularly reviews the implementation of Group-wide compliance measures at the subsidiaries abroad. The audits regularly focus on the local compliance structure, the compliance measures taken, and the existence of corresponding compliance guidelines and processes.

The Compliance Office reports regularly to the Executive Board and the Supervisory Board, informing them of the status of compliance activities (including training status), compliance risks and serious compliance violations.

The Executive Board informs the supervisory bodies at least once a year about the key compliance issues.

RISK AND OPPORTUNITY MANAGEMENT

The Executive Board, the Supervisory Board and the Finance Committee are regularly informed about the current risk portfolio of the Group and the individual companies. More detailed information can be found in the Report on Risks and Opportunities on pages 137 et seq.

AVOIDANCE OF CONFLICTS OF INTEREST

Within the framework of their work, all Executive Board and Supervisory Board members of Merck KGaA, Darmstadt, Germany, are exclusively committed to the interests of the company and neither pursue personal interests nor grant unjustified advantages to third parties.

Before an Executive Board member takes on honorary offices, board positions or other sideline activities, this must be approved by the Personnel Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany. The Chairman of the Executive Board, Stefan Oschmann, and the Chief Financial Officer, Marcus Kuhnert, are both members of the Executive Board of E. Merck KG, Darmstadt, Germany. This does not, however, create conflicts of interest.

In its report to the General Meeting, the Supervisory Board discloses any conflicts of interest involving its members and how they were dealt with. Consultancy agreements as well as other service and work contracts of a Supervisory Board member with Group members require the approval of the Supervisory Board. In fiscal 2018, there were neither conflicts of interest nor consultancy agreements or other service or work contracts with Merck KGaA, Darmstadt, Germany, involving Supervisory Board members.

ADHERENCE TO ENVIRONMENTAL AND SAFETY STANDARDS

At our company, closed-loop thinking guides the way in which we address environmental protection issues. To this end, we integrate precautionary measures into our process, procedural and product development planning. Our Environment, Health and Safety Policy, with its principles and strategies, implements the guidelines formulated by the national and international associations of the chemical industry in the Responsible Care guidelines. The Responsible Care Global Charter, developed by the International Council of Chemical Associations (ICCA) in 2014, puts even more emphasis than before on overall responsibility for products, supply chains and the community. We signed this expanded version of Responsible Care Global Charter for the entire Group in the same year. It is currently being implemented by our company at an international level. We report our ecological, economic and social performance transparently in accordance with the internationally recognized principles of the Global Reporting Initiative (GRI), taking into account the requirements of the German Sustainability Code and the principles of the UN Global Compact. One of our major climate protection objectives is to achieve a 20% reduction in our greenhouse gas emissions by 2020, measured against the 2006 baseline.

Many guidelines specify how the sites and employees of the Group are to observe the principles in their daily work. The Group function Environment, Health, Safety, Security, Quality steers these global activities and ensures compliance with statutory requirements, internal standards and business needs throughout the entire Group. In this way, Group-wide risks are minimized and continuous improvement is promoted in the areas of Environment, Health, Safety, Security and Quality. Corporate Responsibility reports are also published at regular intervals.

Procedures of the Executive Board, Supervisory Board, Board of Partners and its Committees

MEMBERS OF THE EXECUTIVE BOARD OF MERCK KGAA, DARMSTADT, GERMANY

Information on memberships of statutory supervisory boards and comparable German and foreign supervisory bodies (section 285 No. 10 HGB in conjunction with section 125 (1) sentence 5 AktG).

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Stefan Oschmann Munich, Chairman	no board positions
Udit Batra Wellesley (Massachusetts, United States), CEO Life Science	(b) – EMD Millipore Corporation, Billerica, Massachusetts, United States (President)
Kai Beckmann Darmstadt, CEO Performance Materials	(a) – Bundesdruckerei GmbH, Berlin
Walter Galinat Eppertshausen, Member of the Executive Board until September 30, 2018	no board positions
Belén Garijo Frankfurt am Main, CEO Healthcare	(b) – Banco Bilbao Vizcaya Argentaria S.A., Bilbao, Spain – L'Oréal S.A., Clichy, France
Marcus Kuhnert Königstein, Chief Financial Officer	no board positions

The general partners with no equity interest (Executive Board) manage the business activities in accordance with the laws, the Articles of Association and the rules of procedure. They are appointed by E. Merck KG, Darmstadt, Germany, in accordance with the consent of a simple majority of the other general partners. The members of the Executive Board are jointly responsible for the entire management of the company. Certain tasks are assigned to individual Executive Board members based on a responsibility distribution plan. Each Executive Board member promptly informs the other members of any important actions or operations in his respective business area. The Executive Board is responsible for preparing the annual financial statements of Merck KGaA, Darmstadt, Germany, and of the Group as well as for approving the quarterly and half-year financial statements of the Group. In addition, the Executive Board ensures that all legal provisions, official regulations and the company's internal policies are abided by, and works to achieve compliance with them by all the companies of the Group. A Group-wide guideline defines in detail which transactions require prior Executive Board approval.

The Executive Board provides the Supervisory Board with regular, up-to-date and comprehensive reports about all company-relevant issues concerning strategy, planning, business developments, the risk situation, risk management and compliance. The rules of procedure of the Executive Board and of the Supervisory Board as well as a Supervisory Board resolution regulate further details on the information and reporting duties of the Executive Board vis-à-vis the Supervisory Board.

The Executive Board informs the Board of Partners and the Supervisory Board at least quarterly of the progress of business and the situation of the company. In addition, the Executive Board informs the aforementioned boards at least annually of the company's annual plans and strategic considerations.

The Executive Board passes its resolutions in meetings that are normally held once a month.

SUPERVISORY BOARD

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Wolfgang Büchele Munich, Chairman of Exyte AG, Stuttgart	(a) – Gelita AG, Eberbach (Vice Chairman) (b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1] – Kemira Oyj, Helsinki, Finland
Michael Fletterich Gernsheim, Chairman of the Joint Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	no board positions
Crocifissa Attardo Darmstadt, Full-time member of the Joint Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	b) – BKK of Merck KGaA, Darmstadt, Germany[1] (rotating chairperson)
Mechthild Auge Wehrheim, Full-time member of the Joint Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	no board positions
Gabriele Eismann Seeheim-Jugenheim, Senior Product Manager	no board positions
Edeltraud Glänzer Hanover, Vice Chairperson of IG Bergbau, Chemie, Energie (IG BCE), Hanover	(a) – B. Braun Melsungen AG, Melsungen – Evonik Industries AG, Essen (Vice Chairperson)
Michaela Freifrau von Glenck Zurich, Retired teacher	no board positions
Siegfried Karjetta[2] Darmstadt, Physician	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt1
Albrecht Merck Schriesheim, Commercial Director of the Castel Peter Winery, Bad Dürkheim	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt1
Dietmar Oeter Seeheim-Jugenheim, Vice President Corporate Quality Assurance	no board positions
Alexander Putz Michelstadt, Full-time member of the Joint Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	no board positions
Helga Rübsamen-Schaeff Langenburg, Chairperson of the Advisory Board of AiCuris Antiinfective Cures GmbH, Wuppertal	(a) – 4SC AG, Martinsried – Supervisory Board of Bonn University Hospital (b) – E. Merck KG, Darmstadt, Germany, Darmstadt1
Gregor Schulz Umkirch, Pediatrician	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Theo Siegert Düsseldorf, Managing Partner of de Haen Carstanjen & Söhne KG, Düsseldorf	(a) – Henkel AG & Co. KGaA, Düsseldorf (b) – E. Merck KG, Darmstadt, Germany, Darmstadt1 – DKSH Holding Ltd., Zurich, Switzerland
Tobias Thelen[2] Munich, Managing Partner of Altmann Analytik GmbH & Co. KG, Munich	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Veit Ulshöfer Sachsenheim, Global Head of Research and Bioinformatics	no board positions

[1] Internal board position.
[2] Members appointed according to Article 6 (5) of the Articles of Association.

The Supervisory Board performs a monitoring function. It supervises the management of the company by the Executive Board. In comparison with the supervisory board of a German stock corporation, the role of the supervisory board of a corporation with general partners (KGaA) is limited. This is due to the fact that the members of the Executive Board are personally liable partners and therefore are themselves responsible for the management of the company. In particular, the Supervisory Board is not responsible for appointing and dismissing general partners or for regulating the terms and conditions of their contracts. This is the responsibility of E. Merck KG, Darmstadt, Germany. Nor does the Supervisory Board have the authority to issue rules of procedure for the Executive Board or a catalog of business transactions requiring approval. This authority likewise belongs to E. Merck KG, Darmstadt, Germany (Article 13 (3) sentence 1 and (4) sentence 1 of the Articles of Association).

However, the fact that the Supervisory Board has no possibilities to directly influence the Executive Board restricts neither its information rights nor audit duties. The Supervisory Board must monitor the Executive Board in terms of legality, regularity, usefulness and economic efficiency. In particular, the Supervisory Board has the duty to examine the reports provided by the Executive Board. This includes regular reports on the intended business policy, as well as other fundamental issues pertaining to corporate planning, especially financial, investment and HR planning; the profitability of the Group; the progress of business; the risk situation; risk management (including compliance); and the internal auditing system. In addition, by means of consultation with the Executive Board, it creates the basis for supervision of the management of the company by the Supervisory Board according to section 111 (1) AktG.

The Supervisory Board examines the annual financial statements as well as the consolidated financial statements and the combined management report, taking into account in each case the reports of the auditor. Moreover, the Supervisory Board discusses the quarterly releases and the half-year financial report, taking into account in the latter case the report of the auditor on the audit review of the abridged financial statements and the interim management report of the Group. The adoption of the annual financial statements is not the responsibility of the Supervisory Board, but of the General Meeting. The Supervisory Board normally meets four times a year. Further meetings may be convened if requested by a member of either the Supervisory Board or the Executive Board. As a rule, resolutions of the Supervisory Board are passed at meetings. At the instruction of the chairman, in exceptional cases a resolution may be passed by other means, details of which are given in the rules of procedure.

The members of the Board of Partners of E. Merck KG, Darmstadt, Germany, and of the Supervisory Board may be convened to a joint meeting if so agreed by the chairmen of the two boards.

The rules of procedure prescribe that the Supervisory Board may form committees. The Supervisory Board has formed a Nomination Committee comprising three shareholder representatives. Its members are Albrecht Merck, Wolfgang Büchele and Theo Siegert. The Nomination Committee is responsible for proposing to the Supervisory Board suitable candidates for its proposal to the Annual General Meeting. Apart from legal requirements and the recommendations of the German Corporate Governance Code, the "Objectives of the Supervisory Board with respect to its composition", "Profile of skills and expertise" and the "Diversity Policy" are to be taken into consideration as well. Owing to the aforementioned limited authority, and since a corresponding need has not yet arisen, the Supervisory Board currently has no further committees.

The German Stock Corporation Act prescribes that the Supervisory Board of a publicly listed company must have at least one member who has professional expertise in accounting or auditing. Theo Siegert satisfies these requirements and is furthermore the Chairman of the Finance Committee of the Board of Partners of E. Merck KG, Darmstadt, Germany.

BOARD OF PARTNERS OF E. MERCK KG, DARMSTADT, GERMANY

Some of the responsibilities that lie with the supervisory board of a German stock corporation are fulfilled at our company by E. Merck KG, Darmstadt, Germany. This applies primarily to the Board of Partners of E. Merck KG, Darmstadt, Germany. Therefore, the Board of Partners as well as the composition and procedures of its committees are described in the following.

The Board of Partners has nine members. During fiscal 2018 and up until January 27, 2019, the Board of Partners was composed as follows:

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Johannes Baillou Vienna, Austria, Vice Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany, Chairman	no board positions
Frank Stangenberg-Haverkamp Darmstadt, Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany, Vice Chairman	(b) – Fortas GmbH, Rösrath (Chairman) – Oras Invest Ltd, Helsinki, Finland – Travel Asset Group Ltd., London, United Kingdom (Chairman)
Wolfgang Büchele Munich, Chairman of Exyte AG, Stuttgart	(a) – Merck KGaA, Darmstadt, Germany – Gelita AG, Eberbach (Vice Chairman) (b) – Kemira Oyj, Helsinki, Finland
Siegfried Karjetta Darmstadt, Physician	(a) – Merck KGaA, Darmstadt, Germany
Albrecht Merck Schriesheim, Commercial Director of the Castel Peter Winery, Bad Dürkheim	(a) – Merck KGaA, Darmstadt, Germany
Helga Rübsamen-Schaeff Langenburg, Chairperson of the Advisory Board of AiCuris Antiinfective Cures GmbH, Wuppertal	(a) – Merck KGaA, Darmstadt, Germany – 4SC AG, Martinsried – Supervisory Board of Bonn University Hospital
Gregor Schulz Umkirch, Pediatrician	(a) – Merck KGaA, Darmstadt, Germany
Theo Siegert Düsseldorf, Managing Partner of de Haen Carstanjen & Söhne KG, Düsseldorf	(a) – Merck KGaA, Darmstadt, Germany – Henkel AG & Co. KGaA, Düsseldorf (b) – DKSH Holding Ltd., Zurich, Switzerland
Tobias Thelen Munich, Managing Partner of Altmann Analytik GmbH & Co. KG, Munich	(a) – Merck KGaA, Darmstadt, Germany

On January 27, 2019, a new election of the Board of Partners was held. The Board of Partners now consists of the following members:

Member	Memberships of (a) statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Johannes Baillou Vienna, Austria, Vice Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany, Chairman	no board positions
Frank Stangenberg-Haverkamp Darmstadt, Chairman of the Executive Board and General Partner of E. Merck KG, Darmstadt, Germany, Vice Chairman	(b) – Fortas GmbH, Rösrath (Chairman) – Oras Invest Ltd, Helsinki, Finland – Travel Asset Group Ltd., London, United Kingdom (Chairman)
Wolfgang Büchele Munich, Chairman of Exyte AG, Stuttgart	(a) – Merck KGaA, Darmstadt, Germany – Gelita AG, Eberbach (Vice Chairman) (b) – Kemira Oyj, Helsinki, Finland
Helga Rübsamen-Schaeff Langenburg, Chairperson of the Advisory Board of AiCuris Antiinfective Cures GmbH, Wuppertal	(a) – Merck KGaA, Darmstadt, Germany – 4SC AG, Martinsried – Supervisory Board of Bonn University Hospital
Michael Kleinemeier Heidelberg, Member of the Executive Board of SAP SE, Walldorf	(a) – innogy SE, Essen
Katharina Kraft Mannheim, Senior Management Consultant at BASF SE, Ludwigshafen	No board positions
Helene von Roeder Frankfurt am Main, Member of the Executive Board of Vonovia SE, Bochum	(b) – AVW Versicherungsmakler GmbH, Hamburg – Vonovia Finance B.V., Amsterdam, Netherlands
Daniel Thelen Köln, Head of Infrastructure Development at DB Netz AG, Frankfurt am Main	No board positions
Simon Thelen Köln, Senior Physician at the Clinic for Trauma and Hand Surgery, University Hospital Düsseldorf	No board positions

The Board of Partners supervises the Executive Board in its management of the company. It informs itself about the business matters of Merck KGaA, Darmstadt, Germany, and may inspect and examine the company's accounts, other business documents and assets for this purpose. According to Article 13 (4) of the Articles of Association of Merck KGaA, Darmstadt, Germany, the Executive Board requires the approval of E. Merck KG, Darmstadt, Germany, for transactions that are beyond the scope of the Group's ordinary business activities. For such transactions, approval must first be obtained from the Board of Partners of E. Merck KG, Darmstadt, Germany. The Board of Partners convenes as and when necessary; however, it normally meets four times a year. The members of the Executive Board of Merck KGaA, Darmstadt, Germany, are invited to all meetings of the Board of Partners, unless the Board of Partners resolves otherwise in individual cases. The members of the Board of Partners may convene a joint meeting with the Supervisory Board of Merck KGaA, Darmstadt, Germany, if so agreed by the chairmen of the two boards.

The Board of Partners may delegate the performance of individual duties to committees. Currently, the Board of Partners has three committees in place: the Personnel Committee, the Finance Committee, and the Research and Development Committee.

PERSONNEL COMMITTEE

The Personnel Committee has four members. During fiscal 2018 and up until January 27, 2019, these were: Johannes Baillou (Chairman), Wolfgang Büchele, Theo Siegert and Frank Stangenberg-Haverkamp. As of January 27, 2019, the Personnel Committee comprises Johannes Baillou, Wolfgang Büchele, Michael Kleinemeier and Frank Stangenberg-Haverkamp. The Personnel Committee meets at least twice a year. Further meetings are convened as and when necessary. Meetings of the Personnel Committee are attended by the Chairman of the Executive Board of Merck KGaA, Darmstadt, Germany, unless the Committee decides otherwise.

The Personnel Committee is responsible for, among other things, the following decisions concerning members and former members of the Executive Board: contents of and entry into employment contracts and pension contracts; granting of loans and advance payments; changes to the compensation structure and adaptation of compensation; approval for taking on honorary offices, board positions and other sideline activities; and division of responsibilities within the Executive Board of Merck KGaA, Darmstadt, Germany. The Personnel Committee passes its resolutions by a simple majority; in matters concerning the Chairman of the Executive Board, unanimity is required. The Chairman of the Committee regularly informs the Board of Partners of its activities.

FINANCE COMMITTEE

The Finance Committe has four members. During fiscal 2018 and up until January 27, 2019 these were: Theo Siegert (Chairman), Johannes Baillou, Wolfgang Büchele and Tobias Thelen. As of January 27, 2019, the Finance Committee comprises Johannes Baillou, Wolfgang Büchele, Helene von Roeder and Daniel Thelen. The Finance Committee holds at least four meetings a year, at least one of which is a joint meeting with the auditor of Merck KGaA, Darmstadt, Germany. Further meetings are convened as and when necessary. Meetings of the Finance Committee are attended by the Chief Financial Officer of Merck KGaA, Darmstadt, Germany. Other members of the Executive Board of Merck KGaA, Darmstadt, Germany, may attend the meetings upon request of the Finance Committee. These meetings regularly include the Chairman of the Executive Board. The Finance Committee is responsible for, among other things, analyzing and discussing the annual financial statements, the consolidated financial statements and the respective reports of the auditor, as well as the half-year financial report (including the report of the auditors for the audit review of the abridged financial statements and interim management report contained in the half-year report) and the quarterly statements. Moreover, the Finance Committee recommends to the Chairman of the Supervisory Board annual audit focuses for the auditors of the annual financial statements. It also recommends to the Supervisory Board an auditor for the annual financial statements as well as auditors for the audit review of the abridged financial statements and interim management report contained in the half-year financial report for the Supervisory Board's corresponding suggestion to the General Meeting. In addition, the Finance Committee is concerned with the net assets, financial position, results of operations and liquidity of our company, as well as accounting, internal auditing, risk management and compliance issues. Upon request of the Board of Partners, the Finance Committee examines investment projects that must be approved by the Board of Partners and provides recommendations pertaining thereto. It passes its resolutions with a simple majority. The Committee Chairman regularly informs the Board of Partners of the activities of the Finance Committee.

RESEARCH AND DEVELOPMENT COMMITTEE

The Research and Development Committee has four members. During fiscal 2018 and up until January 27, 2019, these were: Helga Rübsamen-Schaeff (Chairperson), Johannes Baillou, Siegfrid Karjetta and Gregor Schulz. Since January 27, 2019, the Research and Development Committee comprises Helga Rübsamen-Schaeff, Johannes Baillou, Katharina Kraft und Simon Thelen. The Research and Development Committee is convened as and when necessary, but holds at least two meetings a year. Meetings of the Research and Development Committee are attended by members of the Executive Board of Merck KGaA, Darmstadt, Germany, upon request of the Committee. These meetings regularly include the Chairman of the Executive Board as well as the CEO Healthcare, the CEO Life Science and the CEO Performance Materials. The Research and Development Committee is responsible, among other things, for reviewing and discussing the research activities of the Healthcare and Life Science/Performance Materials business sectors. It passes its resolutions with a simple majority. The Chairperson of the Committee reports to the Board of Partners on the insights gained from the meetings held.

Stipulations to promote the percentage of management positions held by women pursuant to section 76 (4) and section 111 (5) of the German Stock Corporation Act (AktG)

STIPULATIONS PURSUANT TO SECTION 76 (4) AKTG (TARGET FOR THE PERCENTAGE OF POSITIONS HELD BY WOMEN ON THE TWO UPPER MANAGEMENT LEVELS BELOW THE EXECUTIVE BOARD)

We foster diversity within the company, which also includes ensuring a balance of genders in management. To this end, we pursue both voluntary and statutory objectives, and we work continuously and sustainably on achieving them. On December 15, 2016, the Executive Board of Merck KGaA, Darmstadt, Germany, set the new targets for the percentage of positions held by women on the two management levels of Merck KGaA, Darmstadt, Germany, below the Executive Board as follows:

- First management level of Merck KGaA, Darmstadt, Germany, below the Executive Board: 21% of positions held by women
- Second management level of Merck KGaA, Darmstadt, Germany, below the Executive Board: 26% of positions held by women

The deadline set for reaching the new targets is December 31, 2021. The first management level comprises all managers of Merck KGaA, Darmstadt, Germany, with a direct reporting line to the Executive Board of Merck KGaA, Darmstadt, Germany, or who belong to the global executive group. The second management level comprises all managers of Merck KGaA, Darmstadt, Germany, who report to managers with a direct reporting line to the Executive Board of Merck KGaA, Darmstadt, Germany, or the global executive group. In addition, as a global company with correspondingly aligned global (leadership) structures, our company continues to pursue a (voluntary) global target of maintaining the proportion of leadership positions held by women (managers, experts and project managers in roles 4 and above)[1] at a stable level of 30% in the period until 2021.

[1] The relevant group represents approximately 6% of the entire workforce; see the section entitled "Diversity and Management" (on page 94).

STIPULATIONS PURSUANT TO SECTION 111 (5) AKTG (TARGET FOR THE PERCENTAGE OF POSITIONS ON THE SUPERVISORY BOARD HELD BY WOMEN)

Pursuant to section 111 (5) AktG, the Supervisory Board of companies that are listed or subject to co-determination stipulates binding targets for the percentage of positions on the Supervisory Board and on the Management Board held by women. However, for Merck KGaA, Darmstadt, Germany, stipulations pursuant to section 111 (5) AktG need not be set for the following reasons:

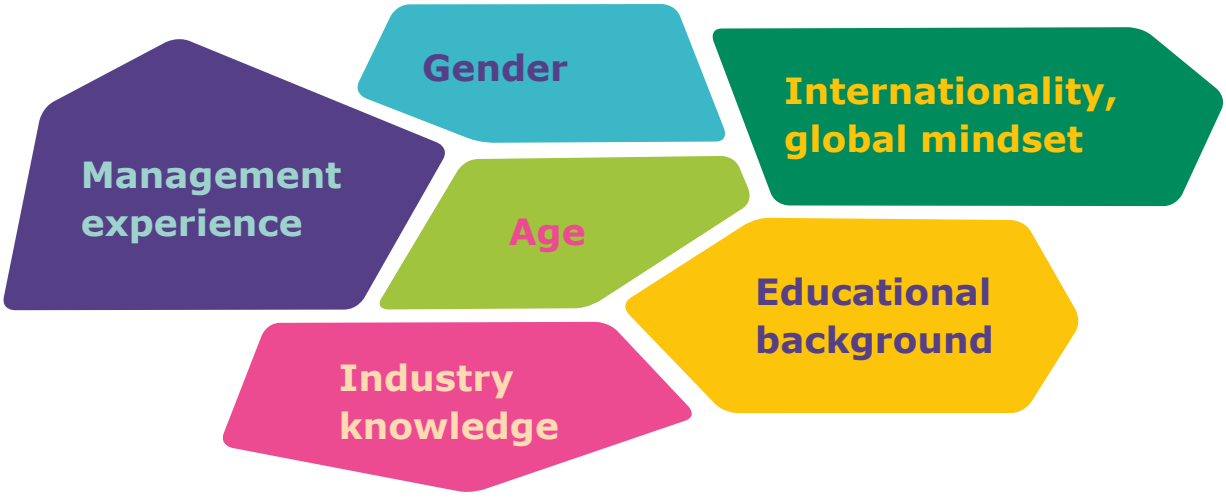
The statutory target of 30% pursuant to section 96 (2) AktG is already applied to the Supervisory Board of Merck KGaA, Darmstadt, Germany. This eliminates the obligation to stipulate a further target for the percentage of positions held by women on the Supervisory Board (see section 111 (5) sentence 5 AktG).

The obligation to stipulate a target for the percentage of positions held by women on the Management Board pursuant to section 111 (5) AktG is not applicable to the legal form of a corporation with general partners (Kommanditgesellschaft auf Aktien), as a corporation with general partners neither has a management board comparable to that of a stock corporation nor does the Supervisory Board have personnel authority over the Executive Board. Instead, the Executive Board consists of personally liable general partners (see also pages 186 et seq. for the description of Supervisory Board procedures).

Diversity policy pursuant to section 289f (2) No. 6 of the German Commercial Code (HGB)

We are pursuing a Group-wide, global diversity program. At our company, diversity stands for a culture of inclusion, mutual esteem and respect. To demonstrate this open and dynamic company culture, we promote diversity throughout the Group – and do so at all levels, including the Executive Board and Supervisory Board.

We believe that our innovative strength is driven by a diverse workforce and that an inclusive working environment sustainably contributes to entrepreneurial success. That is why we are furthering a culture of diversity independent of age, gender, disability, ethnic or cultural background, religion, industry experience and educational background. The diversity policy to strategically steer the topics of diversity and inclusion at our company thus focuses on the following key criteria:



Our Group-wide diversity policy encompasses both voluntary as well as legally defined objectives that we continuously and sustainably work on to achieve. In this context, it should be noted that with respect to the Executive Board of Merck KGaA, Darmstadt, Germany, many rules can only be applied correspondingly. This is because the Executive Board comprises personally liable general partners of Merck KGaA, Darmstadt, Germany, and is not a management board with employed members of a corporate body (for details, please also see the "Joint Report of the Executive Board and the Supervisory Board" on pages 166 et seq.).

In addition to the aspects presented in the following, reference is made to the objectives of the Supervisory Board with respect to its composition and the profile of skills and expertise of the Supervisory Board (see the information on the "Objectives of the Supervisory Board with respect to its composition and profile of skills and expertise" on pages 195 et seq.). The statements made there are part of the diversity policy for the Supervisory Board presented here.

AGE

Our boards are to have a balanced age structure. This permits future-oriented and consistent succession planning and is a key element of sustainable company management and monitoring. Our diversity policy aims for an age range of at least ten years between the youngest and the oldest member of the respective board.

In their current composition, both boards meet this objective. The age range of the Executive Board is 15 years; that of the Supervisory Board is 30 years. In addition, maximum age limits apply to both boards (for the Supervisory Board please see the information regarding the "Objectives of the Supervisory Board with respect to its composition, and profile of skills and expertise" on pages 195 et seq.). For Executive Board members, a maximum age of 70 applies.

GENDER

Gender diversity also plays a crucial role since it enables us to benefit from a larger talent pool, and allows us as a company to develop a better understanding of important customer groups. We have set ourselves the (global) strategic objective of maintaining the proportion of women in leadership positions (managers, experts and project managers in role 4 and higher[1]) at a stable level of 30% by 2021 (please also refer to the description on page 94 under "Diversity and Management").

Additionally, we continue to pursue representation of both genders as an objective for the Executive Board. With Ms. Belén Garijo as CEO Healthcare, at our company a woman is currently responsible for our largest business sector in terms of sales. The statutory target of 30% pursuant to section 96 (2) AktG is already applied to the Supervisory Board of Merck KGaA, Darmstadt, Germany. We consider further targets to be dispensable here.

INTERNATIONALITY AND GLOBAL MINDSET

As a science and technology company with global operations and major markets on five continents with around 50,000 employees at locations in 66 countries[2], internationality and the associated global mindset is one of our key success factors. According to our diversity policy, the Executive Board's internationality derives from leadership experience or national origin, relative to our key sales markets or those locations that are organizationally and culturally relevant to our employee development efforts. For both criteria, Europe, North America and Asia-Pacific are currently the key regions. The Executive Board meets this objective with management experience in the named regions, for instance in the following countries: France, Spain, Switzerland, the United States, Singapore, India, Taiwan, Malaysia and Australia. One-third of the Executive Board members are not German citizens.

MANAGEMENT EXPERIENCE

The key prerequisites for high-performance leadership teams are both the diversity of the individual competency profiles and a balance between a Group-internal and external management perspective. Therefore, as a whole the Executive Board must have in-depth knowledge and experience in the following key areas of importance to the company: Strategy & Planning, Finance & Accounting, Sales & Operations, Human Resources, Legal & Compliance and Information Technology. In addition, for the composition of the Executive Board it is important to ensure a good balance of members from within and outside the company. Our diversity policy seeks to derive inspiration and innovation from outside the company and to identify the latest trends of relevance to the core businesses of the company, while ensuring sustainability and continuity in line with our corporate culture. We have therefore set ourselves the global objective of filling two-thirds of our leadership positions with candidates from within the company.

The current Executive Board fulfills both of the aforementioned objectives: All required aspects of the competency profile are covered by at least one member of the Executive Board. Likewise, three members of the Executive Board possess multiple years of experience working within the Group prior to their appointment to the Executive Board.

INDUSTRY EXPERIENCE

To efficiently lead and manage the Group, the Executive Board must have in-depth knowledge of the key industries and business sectors that the company operates in. In accordance with the diversity policy, there should be at least one member of the Executive Board with in-depth expertise of Healthcare, Life Science or Performance Materials, respectively.

Currently, the Executive Board has the full breadth of the sector-specific experience required.

EDUCATIONAL BACKGROUND

In order to translate the tremendous innovative potential of a science and technology company into sustainable business success, interdisciplinary educational backgrounds are a key element of our diversity policy both for the Executive Board and for the Supervisory Board. The current composition of both boards illustrates this interdisciplinary aspect to a very high degree.

The members of the Executive Board contribute knowledge of various fields including veterinary medicine, economic sciences, medicine (pharmacology), chemistry and information technology. In addition, all members of the Executive Board hold a university degree and a doctorate from a German or foreign university.

Moreover, the members of the Supervisory Board have a background in one or more of the following fields of specialization: chemistry, biochemistry, nutrition, human medicine, business administration and economics, education and physics, among others.

More than one-half of our Supervisory Board members are university graduates and hold doctorates.

[1] Our company also has employees at sites that are not fully consolidated subsidiaries. These figures refer to all people directly employed by our company and therefore may deviate from figures in the financial section of this report.

[2] Each country with at least one active employee is considered one country.

Report of the Supervisory Board

The Supervisory Board again properly executed its duties in 2018 in accordance with the law as well as the company's Articles of Association and rules of procedure. In particular, the Supervisory Board monitored the work of the Executive Board diligently and regularly.

COOPERATION WITH THE EXECUTIVE BOARD

The cooperation with the Executive Board was characterized by intensive, trustworthy exchange. During fiscal 2018, the Executive Board provided the Supervisory Board with regular written and verbal reports on the business development of Merck KGaA, Darmstadt, Germany, and the Group. In particular, the Supervisory Board was informed about the market and sales situation of the company against the background of macroeconomic development, the financial position of the company and its subsidiaries, along with their earnings development and corporate planning. Within the scope of quarterly reporting, the sales and operating results were presented for the Group as a whole, and broken down by business sector. Aside from the Supervisory Board meetings, the Chairman of the Supervisory Board also maintained and continues to maintain a regular exchange of information with the Chairman of the Executive Board.

KEY TOPICS OF THE SUPERVISORY BOARD MEETINGS

Four Supervisory Board meetings were held in fiscal 2018. At these meetings, the Supervisory Board intensely discussed the reports of the Executive Board as well as company developments and strategic issues together with the Executive Board.

At the meeting held on February 28, 2018, the Executive Board first intensively addressed the annual financial statements and consolidated financial statements for 2017, the combined management report, the audit report of the auditor on the separate non-financial report (of the Group) for fiscal 2017 and the proposal for the appropriation of the net retained profit. The auditor explained the audit reports including the focus areas of the audit. The Executive Board and the Head of Accounting reported on the financial statements. The Supervisory Board took note of the information on the "Operational Infrastructure" project, the restructuring of Merck KGaA, Darmstadt, Germany. Furthermore, the Supervisory Board resolved upon the report and the objectives of the Supervisory Board with respect to its composition and the profile of skills and expertise, the Declaration of Conformity with the German Corporate Governance Code and the Statement on Corporate Governance, which simultaneously includes the joint report on Corporate Governance of the Executive Board and Supervisory Board. The Supervisory Board also approved the proposals to be made to the General Meeting. The Executive Board reported on business performance in 2017 and presented the plans for fiscal 2018. The "Roda" project, the divestment of the global Consumer Health business, was the subject of intense deliberations. The Supervisory Board also took note of the written risk report as well as the report from Group Internal Auditing for 2017.

The meeting held on May 9, 2018, focused on current business developments in the first quarter of 2018. The report of the Research and Development Committee Life Science/Performance Materials of the Board of Partners of E. Merck KG, Darmstadt, Germany, was a further focus of the meeting. The Supervisory Board also dealt with the Compliance and Data Protection Report for 2017.

At its meeting on July 31, 2018, the Supervisory Board focused intensively on the report of the Executive Board on business performance in the second quarter of 2018. In addition, the auditor explained the half-year financial report. Risk management within the company was a further topic. The Head of Risk Management presented the status report for the first half of 2018. No risks that threaten the continued existence of the company were identified. In addition, the list of permitted non-audit services was updated, an external audit of the non-financial declaration was resolved upon and various developments in the Corporate Governance area were discussed. Finally, the Supervisory Board elected the new members of the Nomination Committee as regularly scheduled.

At its fourth meeting on November 9, 2018, the Supervisory Board dealt with the report of the Executive Board on the third quarter of 2018. Additional topics of focus were the 2018 status reports of Group Internal Auditing, status reports on compliance and data protection, and the report of the Research and Development Committee Healthcare. Furthermore, the Group Executive Conference and the strategy of the Business Services of Merck KGaA, Darmstadt, Germany, were reported on and discussed. In addition, a revision of the Articles of Association due to the departure of Walter Galinat was discussed.

ANNUAL FINANCIAL STATEMENTS

The annual financial statements of Merck KGaA, Darmstadt, Germany, the consolidated financial statements of the Group and the combined management report for Merck KGaA, Darmstadt, Germany, and the Group, including the accounts, were audited by KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin.

The auditors issued an unqualified audit opinion on the annual financial statements of Merck KGaA, Darmstadt, Germany, in accordance with German Auditing Standards. The audit opinion for the annual financial statements contained the following key audit matters, i.e. those matters that, in the professional judgment of the auditor, were of most significance in the audit of the annual financial statements:

- Impairment testing of interests in associates
- Recognition and measurement of provisions for tax liabilities
- Spin-off of the Healthcare, Life Science and Performance Materials business sectors to three subsidiaries and leaseback of business sectors as part of business leases.

For the consolidated financial statements prepared in accordance with International Financial Reporting Standards and for the combined management report, the auditors issued the unqualified auditor's report reproduced in the Annual Report of the Group. The audit opinion for the consolidated financial statements contained the following audit topics of special importance:

- Goodwill impairment tests
- Recognisition and measurement of income tax liabilities and deferred tax liabilities
- Measurement of provisions for patent disputes
- Measurement of disposal gains/losses from the divestment of the Consumer Health business

In addition, the auditor audited the calculation of the participation of Merck KGaA, Darmstadt, Germany, in the profit of E. Merck KG, Darmstadt, Germany, in accordance with Article 27 (2) of the Articles of Association as well as the separate combined non-financial (Group) report. The annual financial statements of Merck KGaA, Darmstadt, Germany, the consolidated financial statements of the Group, the combined management report for Merck KGaA, Darmstadt, Germany, and the Group, the proposal of the Executive Board for the appropriation of net retained profit and the separate combined non-financial (Group) report were submitted to the Supervisory Board together with the auditor's report.

In accordance with Article 14 (2) of the Articles of Association, the Supervisory Board also examined the annual financial statements of Merck KGaA, Darmstadt, Germany, the proposal for the appropriation of net retained profit and the auditor's report presented in accordance with Article 27 (2) of the Articles of Association. It also examined the consolidated financial statements of the Group as well as the combined management report for Merck KGaA, Darmstadt, Germany, and the Group, and took note of the auditor's report of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin. It focused particularly on the aforementioned key audit matters of particular importance in the audit opinion, on the resulting risks for the financial statements, the approach adopted during the audit as described and the conclusions drawn by the auditor. Furthermore, the Supervisory Board also examined the separate combined non-financial (Group) report and the memorandum on a limited assurance engagement prepared by the auditor on behalf of the Supervisory Board. The discussion of the relevant agenda item at the Supervisory Board's meeting on February 26, 2019, to approve the financial statements was also attended by the auditors who sign the audit opinion on the annual financial statements of Merck KGaA, Darmstadt, Germany, and the consolidated financial statements of the Group as well as the separate combined non-financial (Group) report. These auditors furthermore reported on their audit at this meeting. The Supervisory Board took note of and approved the results of the audit. On completion of its examination, the Supervisory Board raised no objections and thus approved the annual financial statements for Merck KGaA, Darmstadt, Germany, the consolidated financial statements of the Group, the combined management report of Merck KGaA, Darmstadt, Germany, and the Group prepared by the Executive Board, the report presented by the auditor in accordance with Article 27 (2) of the Articles of Association and the separate non-financial (Group) report. The Supervisory Board gave its consent to the proposal of the Executive Board for the appropriation of net retained profit.

CORPORATE GOVERNANCE AND DECLARATION OF CONFORMITY

Corporate governance is a topic of high priority for the Supervisory Board.

In its own estimation, the Supervisory Board has an adequate number of independent members. There were no conflicts of interest, as defined by the German Corporate Governance Code, involving Supervisory Board members during the year under review. In fiscal 2018, the Chairman of the Supervisory Board was prepared to hold talks with investors on topics pertaining to the Supervisory Board as appropriate and remains willing to do so. The next efficiency review of the Supervisory Board will be held in the coming fiscal year, following the last efficiency audit in fiscal 2017.

After discussing corporate governance issues in detail, the Executive Board and the Supervisory Board on February 14, 2019 (Executive Board), and February 26, 2019 (Supervisory Board), respectively, adopted the updated Declaration of Conformity and issued it jointly on February 26, 2019 in accordance with section 161 AktG. The statement is permanently available on the website of Merck KGaA, Darmstadt, Germany (www.emdgroup.com/en/investors/corporate-governance.html). More information about corporate governance at Merck KGaA, Darmstadt, Germany, including the compensation of the Executive Board and Supervisory Board, is given in the Statement on Corporate Governance on pages 166 et seq. of the Annual Report.

COMMITTEES

Apart from the Nomination Committee, the Supervisory Board of Merck KGaA, Darmstadt, Germany, currently has no further committees on account of the special features that apply to the Supervisory Board of a corporation with general partners (KGaA) under German company law and because a corresponding need for this has not emerged to date. The members of the Nomination Committee convened on November 9, 2018, in order to recommend suitable candidates to the Supervisory Board for the Supervisory Board elections in 2019. At its meeting, the committee discussed potential candidates. The discussion took into account the statutory requirements as well as the candidate's fit into the full Supervisory Board, the objectives of the Supervisory Board regarding its composition, its profile of skills and expertise and the diversity policy. No report is given on the work of further committees.

PERSONNEL MATTERS

With the exception of Michael Fletterich, who was excused and absent from the meeting on November 9, 2018, all the Supervisory Board members attended all the Supervisory Board meetings.

Darmstadt, February 26, 2019

The Supervisory Board of Merck KGaA, Darmstadt, Germany

Wolfgang Büchele
Chairman

Objectives of the Supervisory Board with respect to Its Composition and Profile of Skills and Expertise

INITIAL SITUATION

According to section 5.4.1 of the German Corporate Governance Code, the Supervisory Board shall specify concrete objectives regarding its composition as well as prepare a profile of skills and expertise for the entire board. Within the scope of the company-specific situation, the composition of the Supervisory Board shall appropriately reflect the international activities of the enterprise, potential conflicts of interest, the number of independent Supervisory Board members, an age limit to be specified for the members of the Supervisory Board, a regular limit to be specified for the length of Supervisory Board membership and diversity.

GENERAL NOTES ON THE COMPOSITION OF THE SUPERVISORY BOARD

The Supervisory Board of Merck KGaA, Darmstadt, Germany, currently comprises 16 members, eight of whom represent the shareholders and a further eight who represent the employees. The eight employee representative members are elected by employee delegates pursuant to the provisions of the German Codetermination Act (Mitbestimmungsgesetz – "MitbestG"). These consist of six company employees, including a senior executive, as well as two union representatives. The Supervisory Board has no statutory proposal right with respect to electing the delegates or employee representatives. Owing to a delegation right of E. Merck Beteiligungen KG, Darmstadt, Germany, a related party of Merck KGaA, Darmstadt, Germany, two of the eight shareholder representatives are specified. The Supervisory Board likewise has no statutory proposal right with respect to exercising this delegation right. The other six shareholder representatives are elected by the General Meeting. In accordance with section 124 (3) sentence 1 AktG, the Supervisory Board shall propose to the General Meeting Supervisory Board members for election. These proposals require a majority of the votes of the shareholder representative members of the Supervisory Board. The next scheduled election to the Supervisory Board shall take place at the 2019 General Meeting. The General Meeting is not required to follow the election proposals. The appointment objectives and competency requirements that the Supervisory Board sets forth below therefore do not represent requirements to be met by those eligible to elect or to delegate members. Instead, they are intended to express the objectives pursued by the Supervisory Board in office with regard to its advisory and monitoring functions.

For the Supervisory Board of Merck KGaA, Darmstadt, Germany, professional qualifications and personal expertise are the two most important prerequisites for appointments to seats on the Supervisory Board. When proposing Supervisory Board candidates for election or delegation, the Supervisory Board will always give top priority to these prerequisites, which are essential for fulfilling its legal duties. Overall, the Supervisory Board's policy is to optimally meet its monitoring and advisory duties by having diversity among its members. Diversity includes, in particular, internationality as well as different experience backgrounds and career paths. The proportion of women on the Supervisory Board is also considered to be an aspect of diversity. When preparing proposals for election or delegation to the Supervisory Board, the Supervisory Board shall consider in each case to what extent different, complementary specialist skills, professional and life experience, and an appropriate representation of both genders benefits the work of the Supervisory Board. Additionally, the Supervisory Board shall support the Executive Board in its efforts to increase diversity within the company.

OBJECTIVES OF THE SUPERVISORY BOARD WITH RESPECT TO ITS COMPOSITION

In accordance with section 5.4.1 (2) of the German Corporate Governance Code, the Supervisory Board has specified the following objectives regarding its composition and reports on the status of implementation below:

Internationality

The Supervisory Board shall have at least three members with business experience in the main sales markets of Merck KGaA, Darmstadt, Germany. Currently, the main sales markets of Merck KGaA, Darmstadt, Germany, are Europe, North and Latin America, and Asia-Pacific. The present composition of the Supervisory Board satisfies this objective. More than three Supervisory Board members have entrepreneurial experience in a wide range of European countries. More than three Supervisory Board members have experience in management positions in companies that operate globally.

Women on the Supervisory Board
Six women are currently members of the Supervisory Board of Merck KGaA, Darmstadt, Germany. Accordingly, women make up 37.5% of the Supervisory Board. When nominating candidates for election to the Supervisory Board or making proposals for delegations, the Supervisory Board shall examine whether the percentage of women can be increased by suitable candidates. The Supervisory Board considers the 37.5% share of women members to be satisfactory at the present time. This applies both owing to the percentage of women in leadership positions at our company as well as the fact that the supervisory boards of other companies have a comparable percentage of women.

Number of independent members, no material conflicts of interest
The Supervisory Board shall have an appropriate number of independent members. Assuming that the status of being an employee representative per se does not justify doubts with respect to the independence criteria within the meaning of section 5.4.2 of the German Corporate Governance Code, as a rule all employee representatives shall be independent within the meaning of the Code. In any case, at least four of the shareholder representatives on the Supervisory Board shall be independent. According to the Articles of Association of Merck KGaA, Darmstadt, Germany, six members representing the shareholders are to be elected by the General Meeting and two members are to be delegated. Taking this and the special ownership structure of our company into account, the Supervisory Board considers four shareholder representatives to be an appropriate number of independent members. In the Supervisory Board's estimation, the objectives concerning independent members are met at the present time. The Supervisory Board considers the following members to be independent: Crocifissa Attardo, Mechthild Auge, Wolfgang Büchele, Gabriele Eismann, Michael Fletterich, Edeltraud Glänzer, Michaela Freifrau von Glenck, Siegfried Karjetta, Albrecht Merck, Dietmar Oeter, Alexander Putz, Helga Rübsamen-Schaeff, Gregor Schulz, Theo Siegert, Tobias Thelen and Veit Ulshöfer. In particular, the Supervisory Board does not believe that membership of the Board of Partners of E. Merck KG, Darmstadt, Germany, conflicts with independence. The Board of Partners exists complementary to the competencies and the activities of the Supervisory Board. It is not to be expected that this will lead to material and not merely temporary conflicts of interest. It should also be taken into account that due to its substantial capital investment and unlimited personal liability, E. Merck KG, Darmstadt, Germany, has a strong interest in the businesses of Merck KGaA, Darmstadt, Germany, operating efficiently and in compliance with procedures, counteracting from the outset conflicts of interest between E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, and thus also corresponding conflicts of interest between the members of the respective corporate boards. Moreover, no one shall be proposed for election to the Supervisory Board who simultaneously serves on a board of or advises a major competitor of the company, or owing to another function, such as advisor to major contract partners of the company, who could potentially become involved in a conflict of interest. No Supervisory Board member serves on a board of or advises a major competitor. No Supervisory Board member performs a function that could lead to a lasting conflict of interest.

Age limit
As a rule, the members of the Supervisory Board shall not exceed the age of 75. This objective is met at the present time.

Regular limit on the length of Supervisory Board membership
The objective of the Supervisory Board regarding its composition is that, as a rule, all members belong to the board for an uninterrupted period of no more than 15 years (corresponds to three regular terms of office). With one exception, this objective is also met at the present time.

PROFILE OF SKILLS AND EXPERTISE

Additionally, in accordance with section 5.4.1 (2) of the German Corporate Governance Code, the Supervisory Board has prepared a profile of skills and expertise, and reports on the status of implementation below.

In-depth knowledge of the fields relevant to the company
The Supervisory Board shall have at least four members with in-depth knowledge of and experience in fields that are important to the company, including at least one expert for the Healthcare and Life Science/Performance Materials sectors, respectively. This requirement is met at the present time. At present, the Supervisory Board has more than four members who have in-depth kknowledge of and experience in the Healthcare and Life Science/Performance Materials sectors. More than four Supervisory Board members also have executive experience in companies that also or specifically operate in the Healthcare and Life Science/Performance Materials sectors.

Management experience
The Supervisory Board shall have at least three members who have experience in managing or supervising a medium- or large-sized company. The Supervisory Board has more than three members who have the corresponding experience. They include supervisory board members who were or still are members of the management or executive board at relevant companies as well as supervisory board members who have gained experience in supervisory bodies of German or foreign companies of this size.

Knowledge of business administration
The Supervisory Board shall have at least four members who have in-depth knowledge of business administration. This requirement is met at the present time.

Experience on other supervisory or control boards
Lastly, the Supervisory Board shall have at least four members who have experience as members of other supervisory or control boards (whereby possible membership of the Board of Partners of E. Merck KG, Darmstadt, Germany, is not taken into account). This requirement is also met at the present time.

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CONSOLIDATED FINANCIAL STATEMENTS

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Consolidated Income Statement[1]

€ million	Note	2018	2017
Net sales	→ 8	**14,836**	**14,517**
Cost of sales	→ 9	–5,382	–5,071
Gross profit		**9,454**	**9,446**
Marketing and selling expenses	→ 10	–4,384	–4,349
Administration expenses		–993	–899
Research and development costs	→ 11	–2,225	–2,108
Impairment losses and reversals of impairment losses on financial assets (net)[2]	→ 38	27	
Other operating income	→ 12	627	1,212
Other operating expenses	→ 13	–780	–880
Operating result (EBIT)[3]		**1,727**	**2,423**
Finance income	→ 32	77	51
Finance costs	→ 32	–343	–345
Profit before income tax		**1,461**	**2,129**
Income tax	→ 14	–368	428
Profit after tax from continuing operations		**1,093**	**2,557**
Profit after tax from discontinued operation	→ 5	**2,303**	**57**
Profit after tax		**3,396**	**2,615**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany (net income)		3,374	2,605
thereof: attributable to non-controlling interests	→ 36	22	10
Earnings per share (in €)	→ 17		
basic		7.76	5.99
thereof: from continuing operations		2.51	5.87
thereof: from discontinued operation		5.25	0.12
diluted		7.76	5.99
thereof: from continuing operations		2.51	5.87
thereof: from discontinued operation		5.25	0.12

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Relevant for the first time as of January 1, 2018, given the first-time application of IFRS 9, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[3] Not defined by International Financial Reporting Standard (IFRSs).

Consolidated Statement of Comprehensive Income

€ million	Note	2018	2017
Profit after tax[1]		**3,396**	**2,615**
Items of other comprehensive income that will not be reclassified to profit or loss in subsequent periods			
Net defined benefit liability	→ 25		
Changes in remeasurement		–34	141
Tax effect		–7	2
Changes recognized in equity		**–41**	**142**
Equity instruments[2]			
Fair value adjustments		29	
Tax effect		–1	
Changes recognized in equity		29	
		–13	**142**
Items of other comprehensive income that may be reclassified to profit or loss in subsequent periods			
Debt instruments[2]			
Fair value adjustments		1	
Reclassification to profit or loss		–	
Tax effect		–	
Changes recognized in equity		**1**	
Available-for-sale financial assets[3]			
Fair value adjustments			–
Reclassification to profit or loss			8
Tax effect			–1
Changes recognized in equity			**7**
Cash flow hedge reserve	→ 37		
Fair value adjustments		–71	88
Reclassification to profit or loss		52	12
Reclassification to assets		–	–
Tax effect		12	–31
Changes recognized in equity		**–7**	**69**
Cost of cash flow hedge reserve[1]	→ 37		
Fair value adjustments		–47	–5
Reclassification to profit or loss		5	–
Tax effect		10	1
Changes recognized in equity		**–32**	**–4**
Exchange differences on translating foreign operations			
Changes taken directly to equity		626	–2,011
Reclassification to profit or loss		–7	–51
Changes recognized in equity		**619**	**–2,062**
		581	**–1,989**
Other comprehensive income[1]		**568**	**–1,847**
Comprehensive income		**3,964**	**767**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany		3,943	761
thereof: attributable to non-controlling interests	→ 36	22	6
Comprehensive income		**3,964**	**767**
thereof: from continuing operations		1,634	700
thereof: from discontinued operation		2,330	67

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Relevant for the first time as of January 1, 2018, given the first-time application of IFRS 9, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[3] Relevant until December 31, 2017, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

Consolidated Balance Sheet

€ million	Note	Dec. 31, 2018	Dec. 31, 2017
Non-current assets			
Goodwill	→ 19	13,764	13,582
Other intangible assets	→ 20	7,237	8,317
Property, plant and equipment	→ 21	4,811	4,512
Non-current financial assets	→ 34	610	444
Other non-current assets	→ 22	138	205
Deferred tax assets	→ 14	1,091	1,106
		27,652	**28,166**
Current assets			
Inventories	→ 23	2,764	2,632
Trade accounts receivable	→ 24	2,931	2,923
Current financial assets	→ 34	24	90
Other current assets	→ 22	886	731
Income tax receivables	→ 14	460	490
Cash and cash equivalents	→ 33	2,170	589
Assets held for sale	→ 5	–	–
		9,236	**7,455**
Total assets		**36,888**	**35,621**
Total equity	→ 36		
Equity capital		565	565
Reserves[1]		15,006	12,358
Gains/losses recognized in equity[1]		1,629	1,081
Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany		**17,200**	**14,003**
Non-controlling interests		33	63
		17,233	**14,066**
Non-current liabilities			
Provisions for pensions and other post-employment benefits	→ 25	2,336	2,257
Other non-current provisions	→ 26	780	788
Non-current financial liabilities	→ 35	6,681	8,033
Other non-current liabilities	→ 28	52	354
Deferred tax liabilities	→ 14	1,288	1,489
		11,138	**12,919**
Current liabilities			
Current provisions[1]	→ 26	600	457
Current financial liabilities	→ 35	2,215	2,790
Trade accounts payable[2]	→ 29	1,766	2,195
Refund liabilities[2]	→ 30	472	
Income tax liabilities[1]	→ 14	1,176	1,016
Other current liabilities	→ 28	2,288	2,175
Liabilities directly related to assets held for sale	→ 5	–	–
		8,517	**8,635**
Total equity and liabilities		**36,888**	**35,621**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] As of January 1, 2018, refund liabilities were reclassified from trade accounts payable into a separate item in the consolidated balance sheet, given the first-time application of IFRS 15, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

Consolidated Cash Flow Statement

€ million	Note	2018	2017
Profit after tax[1]		**3,396**	**2,615**
Depreciation/amortization/impairment losses/reversals of impairments		1,812	1,758
Changes in inventories		–172	–184
Changes in trade accounts receivable		–109	–221
Changes in trade accounts payable/refund liabilities		104	234
Changes in provisions		199	103
Changes in other assets and liabilities		–288	–1,256
Neutralization of gains/losses on disposal of assets		–2,733	–346
Other non-cash income and expenses[1]		11	–7
Net cash flows from operating activities	→ 18	**2,219**	**2,696**
thereof: from discontinued operation		24	103
Payments for investments in intangible assets		–106	–392
Payments from the disposal of intangible assets		67	4
Payments for investments in property, plant and equipment		–910	–919
Payments from the disposal of property, plant and equipment		31	44
Payments for investments in financial assets		–75	–219
Payments for acquisitions less acquired cash and cash equivalents		–	–17
Payments from the disposal of other financial assets		55	185
Payments from other divestments less transferred cash and cash equivalents		–	11
Payments from the disposal of assets held for sale less transferred cash and cash equivalents		3,129	156
Net cash flows from investing activities	→ 31	**2,191**	**–1,147**
thereof: from discontinued operation		3,042	–42
Dividend payments to shareholders of Merck KGaA, Darmstadt, Germany		–162	–155
Dividend payments to non-controlling interests		–13	–4
Dividend payments to E. Merck KG, Darmstadt, Germany		–593	–466
Payments from new borrowings of financial liabilities from E. Merck KG, Darmstadt, Germany		375	349
Repayment of financial liabilities to E. Merck KG, Darmstadt, Germany		–319	–314
Repayment of bonds		–323	–932
Payments from new borrowings of other current and non-current financial liabilities		32	147
Repayment of other current and non-current financial liabilities		–1,821	–496
Net cash flows from financing activities	→ 41	**–2,825**	**–1,870**
thereof: from discontinued operation		5	182
Changes in cash and cash equivalents		**1,586**	**–320**
Changes in cash and cash equivalents due to currency translation		–5	–30
Cash and cash equivalents as of January 1		589	939
Cash and cash equivalents as of December 31 (consolidated balance sheet)	→ 33	**2,170**	**589**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

Consolidated Statement of Changes in Net Equity

For details see Note (36) “Equity”.

	Equity capital			Retained earnings		
€ million	General partner’s equity Merck KGaA, Darmstadt, Germany	Subscribed capital Merck KGaA, Darmstadt, Germany	Capital reserves (share premium) Merck KGaA, Darmstadt, Germany	Retained earnings/ net retained profit	Remeasurement of defined benefit plans	Fair value reserve for equity instruments
January 1, 2017 (as reported)	**397**	**168**	**3,814**	**8,049**	**–1,501**	
Adjustment due to mandatory retrospective adoption of IFRS 9[1]	–	–	–	–3	–	
January 1, 2017 (restated)	**397**	**168**	**3,814**	**8,046**	**–1,501**	
Profit after tax[2]	–	–	–	2,605	–	
Other comprehensive income[2]	–	–	–	–	142	
Comprehensive income	**–**	**–**	**–**	**2,605**	**142**	
Dividend payments	–	–	–	–155	–	
Profit transfer to/from E. Merck KG, Darmstadt, Germany including changes in reserves	–	–	–	–593	–	
Transactions with no change of control	–	–	–	–	–	
Changes in scope of consolidation/Other	–	–	–	1	–	
December 31, 2017[2]	**397**	**168**	**3,814**	**9,903**	**–1,358**	
January 1, 2018	**397**	**168**	**3,814**	**9,903**	**–1,358**	**–**
Adjustment on initial application of IFRS 9[1]	–	–	–	23	–	–6
Adjustment on initial application of IFRS 15[1]	–	–	–	–	–	–
Adjustment on application of IAS 29[1]	–	–	–	4	–	–
January 1, 2018 (restated)	**397**	**168**	**3,814**	**9,930**	**–1,358**	**–6**
Profit after tax	–	–	–	3,374	–	–
Other comprehensive income	–	–	–	–	–41	29
Comprehensive income	**–**	**–**	**–**	**3,374**	**–41**	**29**
Dividend payments	–	–	–	–162	–	–
Profit transfer to/from E. Merck KG, Darmstadt, Germany including changes in reserves	–	–	–	–515	–	–
Transactions with no change of control	–	–	–	–55	–	–
Changes in scope of consolidation/Other	–	–	–	–46	59	–16
December 31, 2018	**397**	**168**	**3,814**	**12,525**	**–1,340**	**7**

[1] See Note (49) “Effects from new accounting standards and other presentation and measurement changes”.
[2] Previous year’s figures have been adjusted, see Note (49) “Effects from new accounting standards and other presentation and measurement changes”.

Gains/losses recognized in equity							
Available-for-sale financial assets[1]	Fair value reserve for debt instruments[1]	Cash flow hedge reserve	Cost of hedging reserve[1]	Currency translation difference	Equity attributable to Merck KGaA, Darmstadt, Germany	Non-controlling interests	Total equity
24		**–191**	**–**	**3,229**	**13,989**	**61**	**14,050**
–		–	3	–	–	–	–
24		**–191**	**3**	**3,229**	**13,989**	**61**	**14,050**
–		–	–	–	2,605	10	2,615
7		69	–4	–2,057	–1,843	–4	–1,847
7		**69**	**–4**	**–2,057**	**761**	**6**	**767**
–		–	–	–	–155	–4	–159
–		–	–	–	–593	–	–593
–		–	–	–	–	–	–
–		–	–	–	1	–	1
31		**–121**	**–1**	**1,171**	**14,003**	**63**	**14,066**
31	**–**	**–121**	**–1**	**1,171**	**14,003**	**63**	**14,066**
–31	–1	–	–	–	–15	–	–15
	–	–	–	–	–	–	–
	1	–	–	–	4	–	4
	–1	**–121**	**–1**	**1,171**	**13,992**	**63**	**14,055**
	–	–	–	–	3,374	22	3,396
	–	–7	–32	619	569	–1	568
	–	**–7**	**–32**	**619**	**3,943**	**22**	**3,964**
	–	–	–	–	–162	–13	–175
	–	–	–	–	–515	–	–515
	–	–	–	–	–55	55	–
	–	–	–	–	–3	–93	–96
	–1	**–128**	**–33**	**1,790**	**17,200**	**33**	**17,233**

Notes to the Consolidated Financial Statements

General Disclosures

(1) Company information

The accompanying consolidated financial statements as of December 31, 2018, have been prepared with MERCK Kommanditgesellschaft auf Aktien (Merck KGaA, Darmstadt, Germany), Frankfurter Strasse 250, 64293 Darmstadt, Germany, as parent company. Merck KGaA, Darmstadt, Germany, is registered under HRB 6164 with the Commercial Register of Darmstadt. In accordance with the provisions of the German financial reporting disclosure law (Publizitätsgesetz), consolidated financial statements are also prepared for E. Merck Kommanditgesellschaft (E. Merck KG, Darmstadt, Germany), Darmstadt, Germany, the ultimate parent company and general partner of Merck KGaA, Darmstadt, Germany, with an equity interest of 70.274% as of December 31, 2018 (December 31, 2017: 70.274%). These consolidated financial statements include Merck KGaA, Darmstadt, Germany, and its subsidiaries. The authoritative German versions of these financial statements are filed with the German Federal Gazette (Bundesanzeiger) and can be accessed at www.bundesanzeiger.de.

(2) Reporting principles

These consolidated financial statements have been prepared in accordance with the International Financial Reporting Standards in force on the reporting date as issued by the International Accounting Standards Board (IFRS and IAS) and the IFRS Interpretations Committee (IFRIC and SIC) and as adopted by the European Union as well as the additionally applicable provisions of section 315e of the German Commercial Code (HGB). The fiscal year corresponds to the calendar year. These financial statements have been prepared in euros, the reporting currency. The figures reported in the consolidated financial statements have been rounded, which may lead to individual values not adding up to the totals presented.

The accounting and measurement policies used in the consolidated financial statements are presented in Notes (50) “Measurement policies” to (69) “Share-based compensation programs”.

Regulations applicable as of fiscal 2018 and other presentation and measurement changes

The following regulations take effect as of fiscal 2018:

- IFRS 9 “Financial Instruments”
- IFRS 15 “Revenue from Contracts with Customers”
- IFRIC 22 “Foreign Currency Transactions and Advance Consideration”
- Amendment to IAS 40 “Investment Property”
- Amendment to IFRS 2 “Share-based payment”
- Amendment to IFRS 4 “Insurance Contracts”
- Amendments to IFRS 15 ”Revenue from Contracts with Customers”
- Annual Improvements to IFRS 2014 – 2016 Cycle: Amendments to IFRS 1 “First-time Adoption of International Financial Reporting Standards” and to IAS 28 “Investments in Associates and Joint Ventures”

Please refer to Note (49) “Effects from new accounting standards and other presentation and measurement changes” for further details on first-time application effects of IFRS 9 and IFRS 15. Note (49) also comprises details on the following effects: adjustments of the consolidated balance sheet as of January 1, 2018, resulting from the application of IAS 29 “Financial Reporting in Hyperinflationary Economies” regarding Argentina, disclosure adjustments for interest and penalties related to income taxes, and adjustments of the consolidated income statement according to IFRS 5, effective for 2017, in connection with the disposal of the Consumer Health business.

The other new regulations applicable for the first time in fiscal 2018 did not have a material impact on the consolidated financial statements.

Regulations applicable as of fiscal 2019

The following standards will take effect as of fiscal 2019:

- IFRS 16 “Leases”
- IFRIC 23 “Uncertainty over Income Tax Treatments”
- Amendment to IAS 28 “Investments in Associates and Joint Ventures”
- Amendment to IFRS 9 “Financial Instruments”

We did not opt for early application of any of these standards. With the exception of IFRS 16, none of these rules is expected to have a significant effect on the consolidated financial statements.

IFRS 16 “Leases” replaces IAS 17 “Leases” and the corresponding interpretations. The Group applies the modified retrospective method to implement IFRS 16. The cumulative transition effects will be recognized as at the date of first-time application (January 1, 2019). Previous-year figures will not be restated.

IFRS 16 introduces a uniform lessee accounting model that requires lessees to recognize all leases in the consolidated balance sheet. This model mandates that right-of-use assets be recognized for identified assets and lease liabilities recognized for entered payment obligations. The new lease accounting regulations affect the Group as a lessee, in particular regarding leased real estate and vehicles. The lessor accounting regulations remain largely unchanged; this business has no material relevance for the Group.

Furthermore, the Groups's consolidated financial statements will not be affected by the new sale-and-lease-back regulations introduced per IFRS 16.

Lease liabilities – recognized for leases with the Group as a lessee – are measured at the present value of the future lease payments, discounted using the interest rate implicit in the lease, or the relevant incremental borrowing rate. The resulting amount is also used to recognize the right-of-use asset, adjusted by directly attributable costs, if applicable. Furthermore, prepayments as well as liabilities relating to fiscal 2018 are taken into account. When remaining lease terms are determined at first-time application, the probability that purchase, extension, or termination options will be exercised is assessed based on the latest insights. These assessments were discretionary.

According to IFRS 16, right-of-use assets are recognized within property, plant and equipment, using the same line item that would have been used if the underlying asset had been purchased by the Group. Going forward, interest expenses from the unwinding of the discount on lease liabilities are recognized in the financial result; this differs from the previous accounting method, according to which operating lease expenses were recognized in full in the respective functional costs.

At the time these consolidated financial statements were prepared, and based on the knowledge and contractual status at that time, the Group expected the following impact on financial position and performance from the application of IFRS 16:

Consolidated Balance Sheet	The Group carried out a Group-wide analysis to establish the projected impact from the first-time application of IFRS 16. As of January 1, 2019, an increase in lease liabilities and corresponding right-of-use assets in the amount of € 470 million will be recognized. Financial liabilities will increase by 5.3% accordingly. As a result, the Groups's equity ratio will decline by about one percentage point (0.6%) according to our projections. The right-of-use assets to be recognized as of first-time application of IFRS 16 affect the following items within property, plant and equipment:
Consolidated Income Statement	Based on the leasing portfolio held at first-time application (January 1, 2019) and the latest contractual status, we expect for fiscal 2019 depreciation of about € 120 million, and corresponding interest expenses of about € 10 million. To date, expenses from operating lease agreements were recognized over the lease term, on a straight-line basis, in operating expenses. These changes in accounting principles will translate into improved KPIs. Based on the current contractual status, the operating result (EBIT) will improve by about € 10 million, and the EBITDA pre by about € 130 million. However, the first-time application of IFRS 16 will have no material impact on the business free cash flow (BFCF).
Consolidated Cash Flow Statement	The repayment components of about € 115 million included in the lease payments represent repayments of financial liabilities and are therefore recognized as cash flows from financing activities. To date, such repayment components were recognized within payments from operating lease agreements in cash flows from operating activities.

€ million

Non-current assets	**January 1, 2019**
Land, land rights and buildings, including buildings on third-party land	€ ~385 million
Plant and machinery	€ ~15 million
Other facilities, operating and office equipment	€ ~70 million

The Group will make use of the following practical expedients of IFRS 16:

- as before, right-of-use assets, including the corresponding liabilities, from leases of low-value assets will not be recognized in the consolidated balance sheet;
- leases of intangible assets within the scope of IAS 38 will not be recognized in accordance with IFRS 16;
- regarding all right-of-use assets – except land, land rights and buildings, including buildings on third-party land – the Group will not separate non-lease components from lease components;
- leases that were previously subject to IAS 17 and the corresponding interpretations, will be treated as leases under IFRS 16 as well;
- at first-time application, no impairment tests for right-of-use assets will be carried out – instead, the Group will charge provisions for onerous contracts against the respective right-of-use assets;
- at first-time application, directly attributable costs incurred at contract inception will not be taken into consideration.

The Group will not apply the practical expedient regarding leases with a term of less than 12 months.

Published accounting standards not yet endorsed by the European Union

As of the balance sheet date, the following standards were published by the International Accounting Standards Board, but not yet endorsed by the European Union:

- IFRS 17 "Insurance Contracts"
- Amendment to IAS 1 "Presentation of Financial Statements"
- Amendment to IAS 8 "Accounting Policies, Changes in Accounting Estimates and Errors"
- Amendment to IAS 19 "Employee Benefits"
- Amendment to IFRS 3 "Business Combinations"
- Annual Improvements to IFRSs 2015–2017 Cycle
- Amendments to References to the Conceptual Framework in IFRS Standards

From today's perspective, the new rules are not expected to have any material effects on the consolidated financial statements.

The European Union announced on October 30, 2015, that it would not endorse the interim standard "IFRS 14 Regulatory Deferral Accounts" published by the International Accounting Standards Board on January 30, 2014. On December 17, 2015, the International Accounting Standards Board decided to defer the date of the mandatory first-time application of the amendments to the IAS 28 "Investments in Associates and Joint Ventures" and IFRS 10 "Consolidated Financial Statements" standards published on September 11, 2014, indefinitely.

(3) Management judgments and sources of estimation uncertainty

The preparation of the consolidated financial statements required the Group to make discretionary decisions and assumptions as well as estimates to a certain extent. The discretionary decisions, assumptions relating to the future and sources of estimation uncertainty described below are associated with the greatest potential effects on these consolidated financial statements.

Items	Discretionary scope/ estimation uncertainty	**Carrying amount Dec. 31, 2018 (€ million)**	See Note for details	Sensitivity analysis	IFRSs
Goodwill		13,764	→ 19	yes	
Determination of recoverable amount	high				IAS 36
Other intangible assets		7,237	→ 20	yes	
In-licensing of intangible assets	medium				IAS 38
Identification of impairments (or reversal of impairments)	medium				IAS 36
Determination of amortization	medium				IAS 38
Property, plant and equipment		4,811	→ 21	no	
Identification of impairments (or reversal of impairments)	medium				IAS 36
Determination of depreciation	medium				IAS 16
Inventories		2,764	→ 23	no	
Identification of impairments (or reversal of impairments)	medium				IAS 2
Trade accounts receivable		2,931	→ 24, 38	yes	
Determination of impairment amount	medium				IFRS 9
Other financial assets			→ 34, 39	yes	
Determination of fair values of contingent considerations	high	259			IFRS 13
Determination of fair values of equity instruments	medium	274			IFRS 9, IFRS 13
Provisions for pensions and other post-employment benefits			→ 25	yes	
Determination of present value of defined-benefit obligations	medium	–4,719			IAS 19
Other provisions and contingent liabilities		–1,381	→ 26, 27	no	
Recognition and measurement of contingent liabilities	high				IAS 37
Recognition and measurement of other provisions	high				IAS 37
Determination of fair values of share-based compensation programs	medium				IFRS 2
Revenue recognition			→ 6, 8, 30	yes	
Determination of type and timing of revenue recognition (including upfront and milestone payments received)	medium				IFRS 15
Measurement of sales deductions, and refund liabilities	medium				IFRS 15
Income tax			→ 14	no	
Recognition and measurement of income tax liabilities	high	–1,176			IAS 12
Recognition and measurement of deferred taxes from temporary differences	medium				IAS 12
Recognition of deferred tax assets from loss carryforwards	medium	33			IAS 12
Assets held for sale		–	→ 5	no	
Date on which assets and liabilities are classified as “held for sale”	high				IFRS 5

Group Structure

(4) Changes in the scope of consolidation

The scope of consolidation changed as follows in the reporting period:

Consolidated subsidiaries as of December 31, 2017		**314**
Additions	Establishment	5
	Acquisitions	1
	Materiality	10
Retirements	Liquidations/mergers	– 16
	Divestments	– 13
	Immateriality	–
	Loss of control	–
Consolidated subsidiaries as of December 31, 2018		**301**
Non-consolidated subsidiaries as of December 31, 2017		59
Non-consolidated subsidiaries as of December 31, 2018		44

Overall, the impact of subsidiaries not consolidated due to immateriality on net sales, profit after tax, assets and equity was less than 1% relative to the entire Group. Investments held in non-consolidated subsidiaries were disclosed under non-current financial assets (see Note (34) "Financial assets"). The list of non-consolidated subsidiaries mainly comprises non-operating shelf companies as well as entities subject to liquidation procedures, which are measured at fair value through other comprehensive income.

The list of shareholdings presents all of the companies included in the consolidated financial statements as well as all of the shareholdings of Merck KGaA, Darmstadt, Germany (see Note (70) "List of shareholdings").

(5) Acquisitions and divestments

DIVESTMENT OF CONSUMER HEALTH BUSINESS

On April 19, 2018, the Group signed an agreement on the divestment of its global Consumer Health business to The Procter & Gamble Company, United States, (P&G). The transaction was completed on December 1, 2018. The selling price was € 3.4 billion in cash before defined purchase price adjustments for transferred operating assets and borrowed capital, among other things. The purchase price adjustments will be made in the first half of 2019. The transaction was executed through the sale of shareholdings in multiple subsidiaries of the Group as well as by way of various asset sales. Apart from the commercial operations in 44 countries, the Consumer Health business also comprised two production facilities in Austria and India. Moreover, with respect to the transfer of the shareholdings in Merck Ltd., Mumbai, India, a former subsidiary of Merck KGaA, Darmstadt, Germany, the commercial operations of other business sectors were transferred as well, and immediately repurchased. About 3,300 employees transferred to P&G as part of the Consumer Health business divestment. In addition to the divestment agreement, the Group and P&G signed a number of manufacturing, supply and service agreements.

With the signing of the agreement to divest the Consumer Health business, in the opinion of the Executive Board the preconditions for classification as a discontinued operation pursuant to IFRS 5 were given. Until transaction closing, the parts of the Consumer Health business being transferred to P&G were disclosed in the consolidated balance sheet as assets held for sale and as liabilities directly related to assets held for sale.

In accordance with IFRS 5, the financial figures disclosed in these consolidated financial statements relate exclusively to continuing operations unless expressly stated otherwise. Supplies and services provided by the Group after the conclusion of the sale transaction according to contractual agreements were taken into account for the presentation of the reporting period and the prior-year period. The amounts of earnings contributions allocated to the Group's continuing operations are based on the anticipated transactions that will be made with the disposed business after the divestment. In accordance with IFRS 5, the prior-year consolidated balance sheet was not adjusted. The cash flows from the discontinued operation are shown under separate items in the consolidated cash flow statement. A

detailed reconciliation of the reporting components published in previous periods to the reporting components adjusted in accordance with IFRS 5 can be found in Note (49) “Effects from new accounting standards and other presentation and measurement changes”. The financial figures of discontinued operations are presented below:

€ million	2018	2017
Net sales	**748**	**809**
Expenses	–680	–709
Gain on the disposal of discontinued operation	2,614	–
Profit/loss of discontinued operation before income tax	**2,682**	**101**
Income tax on ordinary activities	–8	–43
Income tax on the gain on the disposal of discontinued operation	–370	–
Proift/loss of discontinued operation after income tax	**2,303**	**57**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany	2,281	53
thereof: attributable to non-controlling interests	22	4

Neither net gains nor losses on fair value measurement less costs to sell were recognized for fiscal 2018 or the previous year.

The following table provides the reconciliation from the disposal proceeds to the preliminary net gain from the disposal of discontinued operation before tax:

€ million	2018
Disposal proceeds	3,364
less: net assets divested	–606
Subtotal	2,758
Transaction costs related to the disposal	–103
Realized currency translation effects on equity	–41
Disposal gain before tax	**2,614**

Net assets divested comprised the following items:

€ million	Carrying amounts on the disposal date
Non-current assets	
Goodwill	251
Property, plant and equipment	84
Deferred tax assets	48
Other non-current assets	8
	391
Current assets	
Cash and cash equivalents	241
Inventories	43
Receivables	115
Other current assets	38
	436
Total assets	**827**
Non-current liabilities	
Provisions for pensions and other post-employment benefits	46
Other non-current liabilities and provisions	7
	54
Current liabilities	
Trade accounts payable	60
Other current liabilities and provisions	14
	75
Total liabilities	**128**
Net assets divested (including non-controlling interests)	699
thereof: non-controlling interests	93
Net assets divested	**606**

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – ASSETS HELD FOR SALE, DISPOSAL GROUPS AND DISCONTINUED OPERATIONS

The assessment as to when a non-current asset, disposal group or discontinued operation meets the prerequisites of IFRS 5 for classification as "held for sale" is subject to significant discretionary judgment. Even in the case of an existing management decision to review a disposal, an assessment subject to uncertainties has to be made as to the probability that a corresponding disposal will occur during the year or not.

Regarding the divestment of the Consumer Health business, material information was made available to potential buyers first in fiscal 2018, using electronic data rooms. It was only on the basis of this information that potential buyers were able to submit binding offers that were analyzed by the Group based on its price expectations.

During the subsequent negotiations with potential buyers, the negotiating parties were able to define the transaction in more specific terms, i.e. material changes to the disposal plan were not unlikely at the balance sheet date (December 31, 2017). Against this background at December 31, 2017, the Executive Board did not consider the divestment of the Consumer Health business within the next twelve months as highly probable.

DIVESTMENT OF FLOW CYTOMETRY BUSINESS

On October 18, 2018, the Group signed an agreement with Luminex Corporation, United States, concerning the divestment of the flow cytometry business. These business activities comprised the flow cytrometry platforms Amnis® and Guava® as well as the associated reagents under these brands. The disposal proceeds amounted to € 66 million (US$ 75 million), of which € 61 million (US$ 70 million) was paid in fiscal 2018. The remaining € 5 million will be paid in fiscal 2019. The transaction was completed on December 31, 2018. The business activities assigned to the Life Science business sector primarily consisted of the allocated goodwill as well as intangible assets and inventories. This divestment generated a disposal gain of € 9 million which was recognized in other operating income.

DIVESTMENT OF BIOSIMILARS BUSINESS IN PREVIOUS YEAR

On August 31, 2017, the Group completed the divestment of the Biosimilars business to subsidiaries of Fresenius SE & Co. KGaA. In addition to the divestment of the business activities, the contract parties entered into supply and services agreements, which include drug development support and manufacturing services. As compensation for the sale of the business activities, the Group received an upfront payment of € 156 million. According to the agreed terms of the transaction, the Group was entitled to future milestone payments of up to € 497 million, which were partly covered by services to be performed, as well as tiered royalties on product sales. The disposal gain amounted to € 319 million and was recorded under other operating income. Further information regarding the fair values determined in 2017 by an external expert for the contingent consideration components and the sensitivity analysis can be found in Note (39) "Information on fair value measurement".

In addition to the aforementioned consideration components, the Group received an advance payment of € 45 million for services to be performed at short notice which was recognized in the period in which the services were provided. Proceeds from the provision of services were mainly recognized as part of net sales.

ACQUISITIONS IN THE PREVIOUS YEAR

On May 8, 2017, the Group acquired all of the shares in Grzybowski Scientific Inventions Ltd. (GSI) headquartered in Evanston, United States. GSI developed Chematica, a computer-aided retro-synthesis tool. The software uses advanced reaction rules and proprietary algorithms to identify synthesis pathways that meet user-defined requirements. GSI was integrated into the Life Science business sector. The purchase price comprised fixed compensation of US$ 7 million (€ 7 million) as well as milestone payments of up to US$ 1 million (€ 1 million).

On September 15, 2017, the Group acquired a 100% interest in Natrix Separations, Inc. (Natrix). The company, which is headquartered in Burlington, Canada, supplies hydrogel membrane products for single-use chromatography. Natrix was integrated into the Life Science business sector. The purchase price comprised fixed compensation of around US$ 14 million (€ 12 million) as well as milestone payments of up to US$ 8 million (€ 7 million).

The purchase price allocations for GSI and Natrix remained unchanged compared to December 31, 2017. The most significant impact from the purchase price allocations resulted, in both cases, from the remeasurement of technology-related intangible assets.

(6) Collaborations of material significance

STRATEGIC ALLIANCE WITH PFIZER INC., UNITED STATES, TO CO-DEVELOP AND CO-COMMERCIALIZE ACTIVE INGREDIENTS IN IMMUNO-ONCOLOGY

On November 17, 2014, the Group formed a global strategic alliance with Pfizer Inc., United States, (Pfizer) to co-develop and co-commercialize the anti-PD-L1 antibody avelumab and an anti-PD-1 antibody contributed by Pfizer. In 2017, avelumab was approved for the first time under the trade name Bavencio® for the treatment of patients with metastatic Merkel cell carcinoma as well as patients with locally advanced or metastatic urothelial cancer. This antibody is also being studied in multiple broad-based clinical trials as a potential treatment for further tumor types. The active ingredient is to be developed as a single agent as well as in various combinations with a broad portfolio of approved and investigational active ingredients. The overriding objective of the strategic alliance is sharing the development risks and to accelerate the two companies' presence in immuno-oncology.

According to the collaboration agreement, during the development period each company bears one-half of the development expenses. In the commercialization phase, the Group realizes the vast majority of sales from the commercialization of Bavencio® while the Group and Pfizer evenly split the net amount of sales less defined expense components. The execution of the collaboration agreement is not being structured through a separate vehicle.

Upon entry into the agreement in 2014, Pfizer made an upfront cash payment of US$ 850 million (€ 678 million) to the Group. Pfizer also committed to make further payments of up to US$ 2 billion to the Group subject to the achievement of defined regulatory and commercial milestones. Based on the collaboration agreement, the Group additionally received the right to co-promote for multiple years Xalkori®

(crizotinib), a kinase inhibitor indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are anaplastic lymphoma kinase (ALK)-positive or whose tumors are metastatic ROS1-positive. During co-promotion of Xalkori®, the Group receives from Pfizer a profit share, which is reported in net sales. In 2018, this profit share income amounted to € 58 million (2017: € 72 million). At initial recognition, the right was measured at fair value by an independent external expert using the multi-period excess earnings method. The right was capitalized when it was granted and is being amortized over the term of the agreement. The residual book value of this intangible asset as of December 31, 2018, was € 68 million (December 31, 2017: € 93 million). An impairment loss of € 33 million was recognized for rights to Xalkori® in 2017.

On the date the collaboration agreement was entered into, both the upfront payment received and the value of the right to co-promote Xalkori® were recognized in the balance sheet as deferred income under other liabilities. Both amounts are being recognized as income on a pro rata basis over the expected period during which the Group is to meet certain obligations and will be presented under other operating income (2018: € 191 million/2017: € 191 million). In fiscal 2018, the Group generated sales of € 69 million with Bavencio® (2017: € 21 million) and recorded research and development expenses of € 313 million (2017: € 264 million). In addition, the Group recognized income in a mid double-digit million euro amount in return for waiving rights to Pfizer's anti-PD-1 antibody, which had previously been included in the collaboration agreement; this income was reported under other operating income (2017: income of € 124 million for milestone payments for regulatory approvals received).

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – COLLABORATION AGREEMENTS

In the past, the Group occasionally recognized income for upfront and milestone payments as well as license fees received under collaboration agreements.

In this context, the Group had to assess the extent to which the requirements of IFRS 15 had to be applied directly or indirectly.

If so, the Group had to determine whether the Group's contractually promised goods or services contained in the collaboration agreement could be separated or not.

For the immuno-oncology collaboration agreement entered into with Pfizer Inc., United States, in November 2014, the various promises to transfer goods or services could not be separated, meaning that the promises had to be accounted for in their entirety as a single performance obligation – as is customary for collaboration agreements in the pharmaceutical industry.

Furthermore, for identified performance obligations, the Group had to determine whether income had to be recognized over time or at a point in time. If income is recognized over time, management judgments are required as to the appropriate revenue recognition method and the period over which income is to be recognized.

In the case of the collaboration agreement with Pfizer, income had to be recognized over time, i.e. the upfront payment received had to be allocated over the period in which the main development activities were conducted. If the consideration received in this context and deferred as a liability had been recognized in the income statement over a shorter period reduced by six months, in fiscal 2018 this would have increased other operating income, and profit before income tax would therefore have increased by € 64 million (2017: € 38 million). Recognition over a period extended by six months would have lowered other operating income and profit before income tax by € 38 million (2017: € 27 million).

AGREEMENT WITH BRISTOL-MYERS SQUIBB COMPANY, UNITED STATES, FOR THE CO-COMMERCIALIZATION OF GLUCOPHAGE® IN CHINA

In December 2012, the Group established an agreement with Bristol-Myers Squibb Company, United States, (BMS) for the co-commercialization of the antidiabetic agent Glucophage® (active ingredient: metformin hydrochloride) for the treatment of type 2 diabetes in China. Based on this agreement, as of fiscal 2017 the Group took over the exclusive distribution of Glucophage® in China. Since then, the Group has recorded sales of Glucophage® in China and pays license fees to BMS. In fiscal 2018, sales generated with Glucophage® in China amounted to € 329 million (2017: € 279 million) and license payments to BMS were € 53 million (2017: € 44 million).

AGREEMENT WITH INTREXON CORPORATION, UNITED STATES, ON THE JOINT DEVELOPMENT AND COMMERCIALIZATION OF CAR-T CANCER THERAPIES

In March 2015, the Group and Intrexon Corporation, United States, (Intrexon) entered into a strategic collaboration and license agreement to develop and commercialize chimeric antigen receptor T-cell (CAR-T) cancer therapies. The agreement provided the Group exclusive access to Intrexon's proprietary and complementary suite of technologies to engineer T-cells with optimized and inducible gene expression. Based on this agreement, Intrexon was responsible for all platform and product developments until the investigational new drug application was submitted for regulatory approval. In 2015, the Group made an upfront cash payment of US$ 115 million to Intrexon, which was recognized as part of intangible assets not yet available for use (carrying amount as of December 31, 2017: € 104 million).

Effective December 28, 2018, the Group transferred the above-mentioned exclusive rights back to Intrexon on the basis of a contractual agreement. At the time the contract was signed, the Group was entitled to receive Intrexon common stock worth US$ 150 million in return for the assignment of rights. Due to the intention to hold the shares for the long term, the shares were classified as equity instruments subsequently measured at fair value through other comprehensive income. Furthermore, the agreement contained another investment by the Group, amounting to US$ 25 million, in Intrexon's subsidiary Precigen, Inc., United States, (Precigen) which is involved in the development of T-cell cancer therapies. In return, the Group received a convertible note in an amount of US$ 25 million, with the option, under certain conditions, to acquire shares in either Intrexon or Precigen. The convertible note was classified as a debt instrument measured at fair value through profit or loss.

The closing conditions for the transaction to take effect, including the waiting period pursuant to the Hart-Scott-Rodino Antitrust Improvements Act (U.S. antitrust law) were met in fiscal 2018. The transaction led to the disposal of the intangible asset in an amount of € 104 million and to the recognition of a disposal gain, which was reported under other operating income.

DEVELOPMENT AGREEMENT WITH AVILLION LLP, UNITED KINGDOM, TO DEVELOP ANTI-IL-17-A/F NANOBODY®

On March 30, 2017, the Group announced an agreement with a subsidiary of Avillion LLP, United Kingdom, (Avillion) to develop the anti-IL-17-A/F Nanobody® M1095. The Group acquired full, exclusive rights to anti-IL-17-A/F Nanobody® through a global development and commercialization license from Ablynx nv, Belgium, in 2013. This Nanobody® is an investigational therapy which has completed Phase I development. As part of the cooperation, Avillion will be responsible for developing this anti-IL-17-A/F Nanobody® from Phase II through Phase III in plaque psoriasis. Avillion will also finance the clinical program through to regulatory submission. The drug candidate is currently in a Phase IIb trial that started on schedule in August 2018. During the development phase, the Group recognizes a financial liability for potential repayment obligations to Avillion and records a corresponding expense as research and development costs. Research and development costs in the low single-digit million euro range were incurred in fiscal 2018.

IMMUNO-ONCOLOGY COLLABORATION WITH F-STAR DELTA LTD., UNITED KINGDOM

On June 4, 2017, the Group announced a strategic collaboration with F-star Delta Ltd, United Kingdom, (F-star) for the development and commercialization of bispecific immuno-oncology antibodies. The Group has the option, upon delivery of pre-defined data packages by F-star, to fully acquire the company that owns five bispecific development programs, including F-star's lead asset FS118. In return, the Group made upfront payments to F-star and its shareholders totaling € 60 million, which were capitalized in 2017. Until the option can be exercised, the Group finances F-star's research and development activities and reports the corresponding expenses under research and development costs. In addition, since the collaboration began, the Group has made performance-related milestone payments of € 14 million, which have been capitalized. If the option is exercised and defined milestones are reached, the Group will incur further payment obligations.

DEVELOPMENT AGREEMENT WITH THE SFJ PHARMACEUTICALS GROUP, UNITED STATES, TO DEVELOP ABITUZUMAB

On May 2, 2018, the Group announced that it had signed an agreement with the SFJ Pharmaceuticals Group, United States, (SFJ) to develop abituzumab. Abituzumab is an investigational monoclonal antibody with potential for treating solid tumors such as colorectal cancer (mCRC). In a Phase II study of a patient population with KRAS wild-type mCRC, a subgroup of patients was identified as potentially benefiting from treatment with abituzumab in combination with Erbitux® and chemotherapy. SFJ will be responsible for Phase II and III development of abituzumab. During the development stages, the Group recognizes a financial liability for potential repayment obligations to SFJ and records a corresponding expense as research and development costs. No significant clinical development expenses were incurred in the 2018 reporting period.

Result from Operating Activities and Income Taxes

(7) Segment reporting

INFORMATION BY BUSINESS SECTOR[1]

	Healthcare		Life Science	
€ million	**2018**	2017	**2018**	2017
Net sales[2]	**6,246**	**6,190**	**6,185**	**5,882**
Intersegment sales	–	–	51	57
Operating result (EBIT)[3]	**731**	**1,337**	**1,036**	**834**
Depreciation and amortization	747	726	696	743
Impairment losses	13	53	23	3
Reversals of impairment losses	–	–87	–	–
EBITDA[3]	**1,492**	**2,028**	**1,755**	**1,580**
Adjustments[3]	63	–256	85	206
EBITDA pre (Segment result)[3]	**1,556**	**1,773**	**1,840**	**1,786**
EBITDA pre margin (in % of net sales)[3]	24.9%	28.6%	29.8%	30.4%
Assets by business sector	7,568	8,184	20,860	20,422
Liabilities by business sector	–2,893	–2,985	–1,333	–1,254
Investments in property, plant and equipment[4]	379	359	313	327
Investments in intangible assets[4]	59	310	19	55
Net cash flows from operating activities	1,159	1,629	1,621	1,516
Business free cash flow[3]	1,025	1,314	1,393	1,402

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Excluding intersegment sales.
[3] Not defined by International Financial Reporting Standard (IFRSs).
[4] According to the consolidated cash flow statement.

INFORMATION BY COUNTRY AND REGION[1]

	Europe		thereof: Germany		thereof: Switzerland		**North America**	
€ million	**2018**	2017	**2018**	2017	**2018**	2017	**2018**	2017
Net sales by customer location[2]	4,559	4,406	1,002	945	211	223	3,818	3,810
Net sales by company location[2]	5,012	4,828	1,407	1,416	390	360	3,871	3,835
Goodwill and other intangible assets	5,562	6,537	575	614	2,124	2,839	14,868	14,694
Property, plant and equipment	3,031	2,895	1,503	1,385	647	623	1,024	927
Research and development costs	–1,938	–1,840	–920	–681	–902	–1,050	–186	–166
Number of employees	25,791	25,979	13,513	13,302	2,234	2,151	10,978	10,520

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Excluding intersegment sales.

Performance Materials		Corporate and Other		**Group**	
2018	2017	**2018**	2017	**2018**	2017
2,406	**2,446**	**–**	**–**	**14,836**	**14,517**
–	–	–51	–57	–	–
508	**689**	**–548**	**–437**	**1,727**	**2,423**
240	232	60	41	1,743	1,742
21	26	–	4	58	86
–	–	–	–	–	–87
769	**947**	**–488**	**–391**	**3,528**	**4,164**
17	33	107	99	272	82
786	**980**	**–381**	**–292**	**3,800**	**4,246**
32.7%	40.1%	–	–	25.6%	29.3%
4,046	3,942	4,414	3,073	36,888	35,621
–489	–484	–14,940	–16,832	–19,655	–21,554
119	116	100	116	910	919
13	14	15	13	106	392
742	969	–1,303	–1,418	2,219	2,696
588	906	–497	–429	2,508	3,193

thereof: United States		**Asia-Pacific**		thereof: China		**Latin America**		**Middle East and Africa**		**Group**	
2018	2017	**2018**	2017	**2018**	2017	**2018**	2017	**2018**	2017	**2018**	2017
3,627	3,623	4,965	4,761	1,869	1,583	950	996	544	544	14,836	14,517
3,704	3,672	4,718	4,532	1,659	1,416	879	959	357	364	14,836	14,517
14,857	14,675	570	665	32	39	2	2	–	–	21,001	21,899
1,020	923	585	531	266	214	127	114	43	45	4,811	4,512
–185	–165	–69	–73	–30	–26	–17	–17	–14	–12	–2,225	–2,108
10,800	10,339	10,486	11,294	3,550	3,324	3,337	4,027	1,121	1,060	51,713	52,880

Segmentation was performed in accordance with the organizational and reporting structure of the Group that applied during 2018. The combination into segments is based on the business models of the business sectors and led to homogeneous risk structures within the segments. Resource allocation and the assessment of the earning power of the business sectors was performed by the Executive Board of Merck KGaA, Darmstadt, Germany, as the main decision-maker.

The Healthcare business sector comprises the businesses with prescription pharmaceuticals, allergy products and medical devices. The customers of this business sector mainly comprise wholesalers, hospitals and pharmacies. The Life Science business sector offers solutions to research and analytical laboratories in the pharmaceutical/biotechnology industry or in academic institutions, and customers manufacturing large- and small-molecule drugs. In accordance with the field of activity, the customers of this business sector largely include companies of the pharmaceuticals and biotech sector as well as retailers and universities. The Performance Materials business sector consists of the entire specialty chemicals business and primarily services industrial companies. The fields of activity of the individual segments are described in detail in the sections about the business sectors in the combined management report.

Corporate and Other included income and expenses, assets and liabilities as well as cash flows that could not be directly allocated to the reportable segments presented. This related mainly to central Group functions. Moreover, the column served the reconciliation to the Group numbers. As these are steered at Group level, the expenses and income as well as cash flows attributable to the financial result and income taxes were also disclosed under Corporate and Other.

Apart from sales, the success of a segment is mainly determined by EBITDA pre (segment result) and business free cash flow. EBITDA pre and business free cash flow are performance indicators not defined by International Financial Reporting Standards. However, they represent important variables used to steer the Group. To permit a better understanding of operational performance, EBITDA pre excludes depreciation and amortization, impairment losses, and reversals of impairment losses as well as the adjustments presented in the following. Among other things, business free cash flow is also used for internal target agreements.

Neither in 2018 nor in 2017 did any single customer account for more than 10% of Group sales. Transfer prices for intragroup net sales were determined on an arm's-length basis.

The following table presents the reconciliation of EBITDA pre of all operating businesses to the profit before income tax of the Group:

€ million	2018	2017[1]
EBITDA pre of the operating businesses[2]	**4,181**	**4,538**
Corporate and Other	–381	–292
EBITDA pre of the Group[2]	**3,800**	**4,246**
Depreciation/amortization/impairment losses/reversals of impairment losses	–1,801	–1,741
Adjustments[2]	–272	–82
Operating result (EBIT)[2]	**1,727**	**2,423**
Financial result	–266	–294
Profit before income tax	**1,461**	**2,129**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Not defined by International Financial Reporting Standard (IFRSs).

The adjustments comprised the following:

€ million	2018	2017[1]
Restructuring expenses	–46	–61
Integration expenses/IT expenses	–142	–188
Gains (+)/losses (–) on the divestment of businesses	–25	310
Acquisition-related adjustments	–2	–63
Other adjustments	–58	–81
Adjustments before impairment losses/reversals of impairment losses[2]	**–272**	**–82**
Impairment losses	–55	–68
Reversals of impairment losses	–	87
Adjustments (total)[2]	**–327**	**–64**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Not defined by International Financial Reporting Standard (IFRSs).

The adjustments recognized under integration and IT expenses in the amount of € 142 million (2017: € 188 million) mainly result from expenses for ERP systems (2018: € 50 million/2017: € 64 million) and the integration of the Sigma-Aldrich Corporation, United States (2018: € 66 million/2017: € 95 million). These amounts were recorded under other operating expenses.

Losses on the divestment of businesses in the amount of € 25 million (2017: gains on the divestment of businesses of € 310 million) were mainly attributable to the subsequent measurement of contingent considerations received in connection with the divestment of the Biosimilars business in the previous year, and were included in other operating expenses.

The majority of other adjustments in the amount of € 58 million (2017: € 81 million) was related to the activities on the occasion of the company's 350th anniversary (2018: € 31 million/2017: € 62 million).

The adjustments were included in the consolidated income statement under cost of sales as well as under other operating expenses and income, and were allocable to functional costs as follows:

€ million 2018	thereof: cost of sales	thereof: marketing and selling expenses	thereof: administration expenses	thereof: research and development costs	thereof: other operating income and expenses	**Total**
Restructuring expenses	–1	–6	–39	–	–	–46
Integration expenses/IT expenses	–39	–3	–99	–1	–	–142
Gains (+)/losses (–) on the divestment of businesses	–	–	–	–	–25	–25
Acquisition-related adjustments	–	–	–2	–	–	–2
Other adjustments	–6	–3	–50	–1	2	–58
Adjustments before impairment losses/ reversals of impairment losses[1]	**–45**	**–13**	**–190**	**–2**	**–23**	**–272**
Impairment losses	–18	–14	–19	–	–3	–55
Reversals of impairment losses	–	–	–	–	–	–
Adjustments (total)[1]	**–63**	**–27**	**–209**	**–2**	**–26**	**–327**

[1] Not defined by International Financial Reporting Standards (IFRSs).

€ million 2017	thereof: cost of sales[1]	thereof: marketing and selling expenses[1]	thereof: administration expenses[1]	thereof: research and development costs[1]	thereof: other operating income and expenses[1]	**Total[1]**
Restructuring expenses	–5	–12	–41	–	–3	–61
Integration expenses/IT expenses	–31	–21	–131	–1	–3	–188
Gains (+)/losses (–) on the divestment of businesses	–	–	–	–	310	310
Acquisition-related adjustments	–1	–	–5	–	–56	–63
Other adjustments	–13	–10	–42	–5	–11	–81
Adjustments before impairment losses/ reversals of impairment losses[2]	**–50**	**–43**	**–219**	**–5**	**235**	**–82**
Impairment losses	–6	–33	–	–16	–14	–68
Reversals of impairment losses	87	–	–	–	–	87
Adjustments (total)[2]	**31**	**–76**	**–219**	**–21**	**222**	**–64**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Not defined by International Financial Reporting Standards (IFRSs).

Business free cash flow was determined as follows:

€ million	**2018**	2017[1]
EBITDA pre[2]	**3,800**	**4,246**
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–932	–1,012
Changes in inventories	–214	–18
Changes in trade accounts receivable as well as receivables from royalties and licenses	–145	–22
Elimination first-time consolidation of BioControl Systems	–	–2
Business free cash flow[2]	**2,508**	**3,193**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Not defined by International Financial Reporting Standard (IFRSs).

(8) Net sales

The following tables present a more detailed breakdown of net sales from contracts with customers by business sector.

€ million/in %	2018							
Net sales by nature of the products	**Healthcare**		**Life Science**		**Performance Materials**		**Group**	
Goods	6,085	98%	5,413	87%	2,404	100%	13,902	94%
Equipment/hardware	4	–	343	6%	–	–	347	2%
Services	84	1%	424	7%	2	–	510	4%
License income	–	–	4	–	–	–	4	–
Commission income	14	–	1	–	–	–	15	–
Income from co-commercialisation agreements	58	1%	–	–	–	–	58	–
Total	**6,246**	**100%**	**6,185**	**100%**	**2,406**	**100%**	**14,836**	**100%**
Net sales by region (customer location)								
Europe	2,203	35%	2,136	35%	220	9%	4,559	31%
North America	1,432	23%	2,173	35%	214	9%	3,818	26%
Asia-Pacific (APAC)	1,501	24%	1,532	25%	1,932	80%	4,965	33%
Latin America	661	11%	256	4%	32	2%	950	6%
Middle East and Africa (MEA)	448	7%	88	1%	8	–	544	4%
Total	**6,246**	**100%**	**6,185**	**100%**	**2,406**	**100%**	**14,836**	**100%**

The following tables present a breakdown of net sales by key product lines/products:

HEALTHCARE

€ million/in %	2018	
Oncology	**944**	**15%**
thereof: Erbitux®	816	13%
thereof: Bavencio®	69	1%
Neurology & Immunology	**1,529**	**24%**
thereof: Rebif®	1,438	23%
thereof: Mavenclad®	90	1%
Fertility	**1,162**	**19%**
thereof: Gonal-f®	708	11%
General Medicine & Endocrinology	**2,341**	**38%**
thereof: Glucophage®	733	12%
thereof: Concor®	475	8%
thereof: Euthyrox®	363	6%
thereof: Saizen®	234	4%
Other	**270**	**4%**
Total	**6,246**	**100%**

LIFE SCIENCE

€ million/in %	2018	
Process Solutions	2,487	40%
Research Solutions	2,048	33%
Applied Solutions	1,650	27%
Total	**6,185**	**100%**

PERFORMANCE MATERIALS

€ million/in %	2018	
Display Solutions	1,332	55%
Surface Solutions	476	20%
Semiconductor Solutions	596	25%
Other	1	–
Total	**2,406**	**100%**

Further income was reported within other operating income. This relates in particular to income from upfront and milestone payments as well as royalty and license income not generated in the course of ordinary activities.

Group net sales stood at € 14,836 million in fiscal 2018, out of which an amount of € 557 million was recognized over time. Over-time revenue recognition related mainly to net sales from services and from customer-specific equipment/hardware in the Life Science business sector.

As of December 31, 2018, future income from concluded contracts with an originally expected contract term of more than one year amounted to € 294 million, of which € 191 million will be recognized in other operating income. The Group expects to generate the majority of income from these contracts in 2019 and 2020.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – REVENUE RECOGNITION

Sales deductions

The Group granted its customers various kinds of rebates and discounts. In addition, expected customer refund claims, state compulsory charges as well as rebates from health plans and programs are also deducted from sales. The most significant portion of these deductions from sales was attributable to the Healthcare business sector. The most substantial sales deductions in this business sector were attributable to health plans and programs in the United States. The measurement of sales deductions and the corresponding refund liabilities required extensive estimates.

The measurement of sales deductions and refund liabilities resulting from expected rebates and discounts took

- historical experience,
- pricing information as well as
- expected product growth rates

into consideration.

The measurement of sales deductions and refund liabilities resulting from rights of return took

- historical return rates of individual product groups,
- information from distributors on inventory levels as well as
- publicly available information on product sales from sector-specific service providers (Healthcare business sector)

into consideration.

Changes in estimates of the parameters listed above have an impact on the net sales recognized in the respective adjustment period. Further information can be found in Note (30) “Refund liabilities”.

(9) Cost of sales

Cost of sales primarily included the cost of manufactured products sold as well as merchandise sold. Cost comprises the following items: directly attributable costs, such as cost of materials, or personnel and energy costs; depreciation and amortization; overheads attributable to the production process; inventory impairments and impairment reversals. Cost of sales included amortization of intangible assets (excluding amortization of internally generated or separately acquired software) in the amount of € 175 million (2017: € 179 million).

(10) Marketing and selling expenses

Marketing and selling expenses comprised the following items:

€ million	2018	2017[1]
Sales force	–913	–918
Internal sales services	–808	–795
Sales promotion	–509	–504
Logistics	–702	–649
Amortization of intangible assets[2]	–975	–1,014
Royalty and license expenses	–213	–224
Other marketing and selling expenses	–263	–245
Marketing and selling expenses	**–4,384**	**–4,349**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Excluding amortization of internally generated or separately acquired software.

Amortization of intangible assets was mainly attributable to customer relationships, marketing authorizations, licenses and similar rights, brands and trademarks, which could be functionally allocated to Marketing and Selling.

€ 84 million (2017: € 90 million) of royalty and license expenses related to the commercialization of Erbitux®, and € 53 million (2017: € 44 million) to the license expenses for Glucophage® in China with the distribution partner Bristol-Myers Squibb.

(11) Research and development costs

Subsidies received and reimbursements made resulted in net expenses of € 1 million in 2018 (2017: net income of € 29 million) recognized in research and development costs. These expenses comprised reimbursements from governmental institutions as well as repayments of previously recognized governmental subsidies with a total net amount of € 4 million (2017: net income of € 6 million). The reimbursements recognized in the previous year mainly referred to the strategic alliance with Pfizer Inc., United States, in the field of immuno-oncology.

(12) Other operating income

Other operating income was as follows:

€ million	2018	2017[1]
Income from upfront payments, milestone payments, rights and royalties	368	564
Gains on disposal of businesses and non-current assets	83	350
Gains from the release of provisions for litigation	21	10
Income from miscellaneous services	15	10
Income from the revaluation of contingent considerations	1	–
Reversal of impairment losses on financial assets[2]		91
Reversal of impairment losses on non-financial asset	–	87
Remaining other operating income	138	100
Other operating income	**627**	**1,212**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Given the first-time application of IFRS 9, effective January 1, 2018, reversals of impairment losses on financial assets are offset against impairment losses on financial assets, and disclosed separately in the consolidated income statement.

Income from upfront payments, milestone payments, rights and royalties of € 368 million (2017: € 564 million) primarily resulted from the collaboration agreement entered into with Pfizer Inc., United States, in the field of immuno-oncology in 2014. This related to the pro rata recognition of deferred income in the amount of € 191 million (2017: € 191 million) (see Note (6) "Collaborations of material significance"). Furthermore, the Group recognized a milestone payment of € 50 million for the submission of an application; the corresponding drug candidate was sold to BioMarin Pharmaceutical Inc., United States, in 2016. License income was mainly due to the licenses granted for interferon beta products (Biogen Inc., United States), which amounted to € 79 million in the year under review (2017: € 87 million).

The gains on disposal of businesses and non-current assets of € 83 million in 2018 (2017: € 350 million) were related to the out-licensing of two DNA-dependent protein kinase (DNA-PK) inhibitors and another preclinical compound used in gene editing for six defined genetic diseases to Vertex Pharmaceuticals Incorporated, United States. Furthermore, the Group recognized gains from the transfer of exclusive rights regarding the development of T cell-based therapies using chimeric antigen receptors (CAR-T) to the Intrexon Corporation, United States, and from the termination of a license agreement in China. The gains recognized in the previous year were mainly attributable to the divestment of the Biosimilars business (€ 319 million).

Remaining other operating income in a mid double-digit million euro amount was generated from payment claims resulting from the waiver of rights to an anti PD-1 antibody previously included in the strategic alliance with Pfizer Inc., United States, (see Note (6) "Collaborations of material significance") and from the reversal of a provision for insurance obligations.

(13) Other operating expenses

The breakdown of other operating expenses was as follows:

€ million	2018	2017[1]
Integration expenses/IT expenses	–104	–156
Litigation	–74	–108
Exchange rate differences from operating activities (net)	–62	–3
Impairment losses on non-financial assets	–58	–86
Non-income related taxes	–53	–54
Profit share expenses	–46	–27
Restructuring expenses	–45	–64
Premiums, fees and contributions	–36	–38
Expenses for the revaluation of contingent considerations	–31	–2
Expenses for the company's 350-year anniversary (including employee bonus)	–31	–40
Project expenses	–25	–7
Expenses for miscellaneous services	–23	–13
Losses on disposal of businesses and non-current assets	–6	–23
Acquisition expenses	–2	–6
Impairment losses on financial assets[2]		–36
Remaining other operating expenses	–185	–218
Other operating expenses	**–780**	**–880**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".
[2] Given the first-time application of IFRS 9, effective January 1, 2018, impairment losses on financial assets are offset against reversals of impairment losses on financial assets, and disclosed separately in the consolidated income statement.

Integration and IT expenses amounting to € 104 million (2017: € 156 million) were incurred for the global harmonization of the IT landscape and in connection with the integration of acquired and existing businesses.

Litigation expenses amounting to € 74 million (2017: € 108 million) arose primarily from additions to provisions for legal disputes (see Note (26) "Other provisions").

Impairments of non-financial assets amounted to € 58 million (2017: € 86 million), € 20 million of which were attributable to a technology in the Performance Materials business sector and € 19 million of which were attributable to software modules in the Life Science business sector which are not further developed and no longer used (see Note (20) "Other intangible assets").

Restructuring expenses in the amount of € 45 million (2017: € 64 million) resulted, among other things, from the adjustment of corporate structures in Darmstadt and Gernsheim. In addition, the Group incurred further expenses from the relocation of the shared service organization. In the previous year, restructuring expenses also arose in connection with the planned closure of German sites of the Life Science business sector.

The expenses for the revaluation of contingent considerations in the amount of € 31 million (2017: € 2 million) were mainly attributable to value changes (recognized through profit or loss) of the variable consideration resulting from the divestment of the Biosimilars business in the previous year.

Remaining other operating expenses included, among others, special environmental protection costs as well as personnel expenses not allocable to the functional areas. This item also included the expense for the donation of Cesol® 600 tablets containing the active ingredient praziquantel to the World Health Organization (WHO) and expenses for insurance services.

The restructuring expenses and impairment losses contained in other operating expenses as well as the expenses for company's 350-year anniversary anniversary were allocated to the functional costs as follows:

	Restructuring expenses		Impairment losses on non-financial assets		Expenses for company's 350-year anniversary (including employee bonus)	
€ million	**2018**	2017[1]	**2018**	2017[1]	**2018**	2017[1]
Cost of sales	–	–	–23	–6	–	–
Marketing and selling expenses	–6	–17	–15	–33	–1	–12
Administration expenses	–39	–45	–19	–	–30	–21
Research and development costs	–	–	–	–33	–	–5
Other operating expenses	–	–3	–	–14	–	–1
Total	**–45**	**–64**	**–58**	**–86**	**–31**	**–40**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

(14) Income tax

€ million	**2018**	2017[1]
Current income taxes in the period	–579	–694
Income taxes for previous periods	–79	–14
Deferred taxes in the period	290	1,137
Income taxes	**–368**	**428**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

TAX RECONCILIATION

The following table presents the tax reconciliation from theoretical income tax expense to income tax expense according to the consolidated income statement. The theoretical income tax expense is determined by applying the statutory tax rate of a corporation headquartered in Darmstadt.

€ million	2018	2017[1]
Profit before income tax	1,461	2,129
Tax rate	31.7%	31.7%
Theoretical income tax expense	–463	–675
Tax rate differences	150	263
Tax effect of companies with a negative contribution to consolidated profit	–37	–71
Income tax for previous periods	–79	–14
Tax credits	52	193
Tax effect on tax loss carryforwards	34	–
Tax effect of non-deductible expenses/tax-free income/other tax effects	–25	732
thereof: from the US tax reform (deferred taxes on temporary differences)	–	619
thereof: from the US tax reform (deferred taxes on oustide basis differences)	–	401
thereof: from the US tax reform (one-time transition tax on foreign earnings)	–	–114
Income tax expense according to consolidated income statement	**–368**	**428**
Tax ratio according to consolidated income statement	25.2%	–20.1%

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

Income taxes consisted of corporation and trade taxes for the companies domiciled in Germany as well as comparable income taxes for foreign companies. Income taxes for previous periods recognized in fiscal 2018 resulted mainly from completed tax audits and mutual agreement procedures, and from additions to provisions for tax audits.

IMPACT OF TAX REFORM IN THE UNITED STATES IN 2017

The Tax Cuts and Jobs Act became effective in the US on December 22, 2017, and introduced new rules on the taxation of profits of foreign subsidiaries. This resulted in additional taxation of past profits and led to an increase in the current tax expense of the previous year by € 114 million. Please refer to the tax reconciliation of the previous year for further information on material effects from the US tax reform.

DEFERRED TAXES (CONSOLIDATED INCOME STATEMENT)

The reconciliation between deferred taxes in the consolidated balance sheet and deferred taxes in the consolidated income statement is presented in the following table:

€ million	2018	2017[1]
Change in deferred tax assets (consolidated balance sheet)	–15	93
Change in deferred tax liabilities (consolidated balance sheet)	201	1,235
Changes from reclassification into assets held for sale	–30	–41
Deferred taxes credited/debited to equity	–2	15
Changes in scope of consolidation/currency translation/other	135	–164
Deferred taxes (consolidated income statement)	**290**	**1,137**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

As in the previous year, changes in scope of consolidation/currency translation/other mainly resulted from exchange rate fluctuations between the euro and the U.S. dollar.

CHANGES IN TAX LOSS CARRYFORWARDS

Tax loss carryforwards were structured as follows:

	Dec. 31, 2018			Dec. 31, 2017		
€ million	Germany	Abroad	Total	Germany	Abroad	Total
Tax loss carryforwards	118	1,069	**1,187**	117	1,054	**1,171**
Tax loss carry forwards for which a deferred tax asset is recognized	59	152	**211**	56	160	**216**
Tax loss carry forwards for which no deferred tax asset is recognized	59	917	**976**	61	894	**955**
Potential deferred tax assets for tax loss carry forwards	27	254	**281**	19	269	**288**
Recognized deferred tax assets on tax loss carryforwards	9	24	**33**	7	25	**32**
Not recognized deferred tax assets on tax loss carryforwards	18	230	**248**	12	244	**256**

The vast majority of the tax loss carryforwards either has no expiry date or can be utilized for up to 20 years. In 2018, the income tax expense was reduced by € 34 million (2017: € 0 million) due to the utilization of tax loss carryforwards from prior years for which no deferred tax asset had been recognized in prior periods.

DEFERRED TAXES (CONSOLIDATED BALANCE SHEET)

Deferred tax assets and liabilities correspond to the following balance sheet items:

	Dec. 31, 2018		Dec. 31, 2017	
€ million	Assets	Liabilities	Assets	Liabilities
Intangible assets	119	1,479	111	1,555
Property, plant and equipment	34	84	23	98
Current and non-current financial assets	12	3	5	41
Inventories	564	18	554	14
Current and non-current receivables/other assets	25	5	21	2
Provisions for pensions and other post-employment benefits	454	37	485	92
Other provisions	236	66	190	35
Liabilities	67	12	69	9
Tax loss carryforwards	33	–	32	–
Tax refund claims/other	60	98	58	86
Deferred taxes (before offsetting)	**1,606**	**1,803**	**1,548**	**1,931**
Offset deferred tax assets and liabilities	–515	–515	–442	–442
Deferred taxes (consolidated balance sheet)	**1,091**	**1,288**	**1,106**	**1,489**

Deferred tax liabilities from outside basis differences for planned dividend payouts were recorded in the amount of € 30 million (December 31, 2017: € 17 million). Temporary differences relating to the retained earnings of subsidiaries, for which no deferred taxes are recognized, amounted to € 9,934 million (December 31, 2017: € 2,856 million).

INCOME TAX RECEIVABLES AND INCOME TAX LIABILITIES

Income tax receivables amounted to € 460 million (December 31, 2017: € 490 million). Tax receivables resulted primarily from tax prepayments that exceeded the actual amount of tax payable for 2018 and prior fiscal years, and from refund claims for prior years.

As of December 31, 2018, income tax liabilities, including provisions for uncertain tax obligations, amounted to € 1,176 million (December 31, 2017: € 1,016 million).

The disclosure of interest and penalties related to income taxes was adjusted with retrospective effect as of January 1, 2017, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – INCOME TAXES

The calculation of the reported assets and liabilities from current and deferred income taxes required extensive discretionary judgments, assumptions and estimates.

The recognized income tax liabilities and provisions were partially based on estimates and interpretations of tax laws and ordinances in different jurisdictions.

With regard to deferred tax items, there were degrees of uncertainty concerning the date on which an asset is realized or a liability settled and concerning the tax rate applicable on this date. This particularly related to deferred taxes recognized in the context of the acquisitions of the Sigma-Aldrich Corporation, the Millipore Corporation, Serono SA, and AZ Electronic Materials S.A.

The recognition of deferred tax assets from loss carryforwards required an estimate of the probability of the future realizability of loss carryforwards. The following influencing factors were taken into account as part of this assessment:

- results history,
- results planning and
- the existing tax planning of the respective Group company.

(15) Cost of materials

Material costs in 2018 amounted to € 2,598 million (2017: € 2,322 million) and were largely reported under cost of sales.

(16) Personnel expenses/headcount

Personnel expenses comprised the following:

€ million	2018	2017
Wages and salaries	4,111	3,953
Compulsory social security contributions and special financial assistance	619	586
Pension expenses	295	304
Personnel expenses (including Consumer Health)	**5,024**	**4,843**
Consumer Health	204	211
Personnel expenses (as reported in the functional costs)	**4,820**	**4,632**

Personnel expenses comprised expenses of € 91 million (2017: € 86 million) for defined contribution plans which are funded exclusively using external funds and therefore do not represent any obligation for the Group other than making contribution payments. In 2017, this included an amount of € 1 million attributable to the Consumer Health business. In addition, employer contributions amounting to € 81 million (2017: € 76 million) were transferred to the German statutory pension insurance system and € 44 million (2017: € 46 million) to statutory pension insurance systems abroad. Each of these total transfer amounts included an amount of € 1 million attributable to the Consumer Health business (2017: € 2 million).

Effective December 31, 2018, the number of employees at Group stood at 51,713 (December 31, 2017: 52,880 employees). The previous year's figure included all employees at the Consumer Health business.

The following table provides the number of employees by function (annual average):

	2018		2017	
	Total	thereof: Consumer Health[1]	Total	thereof: Consumer Health
Production	16,239	623	15,570	680
Administration	9,856	160	9,272	197
Research and Development	7,243	146	6,786	143
Supply Chain	4,012	191	3,726	172
Marketing and Sales	15,445	1,973	15,073	2,253
Other	965	7	1,563	11
Average number of employees	**53,760**	**3,100**	**51,990**	**3,456**

[1] The average number of employees of the Consumer-Health-business during the time of affiliation to the group from January to November 2018 was 3,358.

(17) Earnings per share

Basic earnings per share are calculated by dividing the profit after tax (net income of the Group) attributable to the shareholders of Merck KGaA, Darmstadt, Germany, by the weighted average number of theoretical shares outstanding. The calculation of the theoretical number of shares is based on the fact that the general partner's capital is not represented by shares. The share capital of € 168 million was divided into 129,242,252 shares. Accordingly, the general partner's capital of € 397 million was divided into 305,535,626 theoretical shares. Overall, equity capital thus amounted to € 565 million or 434,777,878 theoretical shares outstanding. The weighted average (basic) number of shares in 2018 was likewise 434,777,878.

The calculation of diluted earnings per share had to take into account a potential dilution effect that arose from the free grant of shares of Merck KGaA, Darmstadt, Germany, to eligible employees on the occasion of the 350th anniversary of the company. The shares required for this were purchased on the market. Pursuant to IAS 33, this led to an increase of 17,924 in the weighted average (diluted) number of shares to 434,795,802 shares. However, this did not lead to an arithmetical dilution effect on the indicator so that diluted earnings per share corresponded to basic earnings per share.

(18) Net cash flows from operating activities

In 2018, tax payments totaled € 900 million (2017: € 702 million). Tax refunds totaled € 65 million (2017: € 73 million). Interest paid totaled € 286 million (2017: € 297 million). Interest received amounted to € 34 million (2017: € 28 million).

In the previous year, the changes of other assets and liabilities included the adjustment of deferred taxes as a result of the U.S. tax reform.

In the period under review, the neutralization of the profits/losses from the disposal of assets and other disposals mainly comprised the gain from the divestment of the Consumer Health business; in the previous year, this item mainly comprised the gain from the divestment of the Biosimilars business.

Operating Assets, Liabilities and Contingent Liabilities

(19) Goodwill

	Goodwill			
€ million	Healthcare	Life Science	Performance Materials	**Total**
Cost as at January 1, 2017	**1,811**	**11,752**	**1,452**	**15,015**
Changes in scope of consolidation	–	17	–	17
Additions	–	–	–	–
Disposals	–	–	–	–
Transfers	–	–	–	–
Classification as held for sale or transfer to a disposal group	–25	–	–	–25
Currency translation	–1	–1,250	–174	–1,425
December 31, 2017	**1,785**	**10,519**	**1,278**	**13,582**
Accumulated amortization and impairment losses, January 1, 2017	**–**	**–**	**–**	**–**
Changes in scope of consolidation	–	–	–	–
Impairment losses	–	–	–	–
Disposals	–	–	–	–
Transfers	–	–	–	–
Reversals of impairment losses	–	–	–	–
Classification as held for sale or transfer to a disposal group	–	–	–	–
Currency translation	–	–	–	–
December 31, 2017	**–**	**–**	**–**	**–**
Net carrying amount as of December 31, 2017	**1,785**	**10,519**	**1,278**	**13,582**
Cost as at January 1, 2018[1]	**1,785**	**10,519**	**1,278**	**13,582**
Changes in scope of consolidation	–	–	–	–
Additions	–	–	–	–
Disposals	–	–	–	–
Transfers	–	–	–	–
Classification as held for sale or transfer to a disposal group	–251	–31	–	–282
Currency translation	–1	408	57	464
December 31, 2018	**1,534**	**10,896**	**1,334**	**13,764**
Accumulated amortization and impairment losses, January 1, 2018	**–**	**–**	**–**	**–**
Changes in scope of consolidation	–	–	–	–
Impairment losses	–	–	–	–
Disposals	–	–	–	–
Transfers	–	–	–	–
Reversals of impairment losses	–	–	–	–
Classification as held for sale or transfer to a disposal group	–	–	–	–
Currency translation	–	–	–	–
December 31, 2018	**–**	**–**	**–**	**–**
Net carrying amount as of December 31, 2018	**1,534**	**10,896**	**1,334**	**13,764**

[1] Values effective January 1, 2018, have been adjusted, see Note (49) “Effects from new accounting standards and other presentation and measurement changes”.

Goodwill was incurred mainly in connection with the acquisitions of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A., the Millipore Corporation and Serono SA. The changes in goodwill caused by foreign exchange rates resulted almost exclusively from translating the goodwill from the acquisitions of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A. and the Millipore Corporation, which were partially denominated in U.S. dollars, into the reporting currency.

In the Healthcare business sector, the reclassifications to assets held for sale were attributable to the divestment of the Consumer Health business to The Procter & Gamble Company, United States, and in the Life Science business sector to the divestment of the flow cytometry business Amnis® and Guava® to the Luminex Corporation, United States (see Note (5) "Acquisitions and divestments").

As in 2017, goodwill was not subject to impairment in fiscal 2018.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – GOODWILL

The determination of the recoverable amount is subject to management judgements and estimation uncertainties.

When conducting the impairment tests the following parameters were used:

Measurement basis	Value in use
Impairment test level	Healthcare (excluding Consumer Health) Consumer Health[1] (previous year) Life Science Performance Materials
Planning basis	Most recent financial medium-term planning approved by the Executive Board and used for internal purposes
Detailed planning period	4 years
Key assumptions	Net cash flows Long-term growth rate after the detailed planning period Discount rate after tax (weighted average cost of capital – WACC)
Determination of the value of the key assumptions	Net cash flows • Sales growth Based on internal planning, taking into consideration internal and external market information and market estimations, i.e. regarding market shares, excluding possible approvals of new compounds from the development pipeline and other expansion investments • Profit margins Based on past experiences, adjusted for expected changes
	Long-term growth rate after the detailed planning period Based on long-term inflation expectations and expected long-term sector growth
	Discount rate after taxes (weighted average cost of capital – WACC) • Cost of equity Risk-free interest rate: Derived from the returns of long-term government bonds Beta factor: Derived from the respective peer group Market risk premium: Range as recommended by the Technical Committee for Business Valuation and Commerce of the Institute of Public Auditors in Germany (Institut der Wirtschaftsprüfer e.V. – IDW) • Cost of debt and capital structure Derived from market data and the respective peer group

[1] At the date of the impairment test in the previous year, Consumer Health was not classified as a discontinued operation pursuant to IFRS 5.

The long-term growth rates and weighted average costs of capital (WACC) used to conduct the goodwill impairment tests were as follows:

	Goodwill		Long-term growth rate		Cost of capital after tax		Cost of capital before tax	
€ million/in%	**2018**	2017	**2018**	2017	**2018**	2017	**2018**	2017
Healthcare (excluding Consumer Health)	1,534	1,534	0.00%	0.00%	6.4%	6.7%	8.5%	8.9%
Consumer Health[1]		251		2.00%		6.6%		8.2%
Life Science	10,896	10,519	1.75%	1.75%	7.2%	6.8%	8.8%	8.4%
Performance Materials	1,334	1,278	0.50%	0.50%	5.8%	5.9%	7.4%	7.5%

[1] At the date of the impairment test in the previous year, Consumer Health was not classified as a discontinued operation pursuant to IFRS 5.

Net cash flows were discounted using cost of capital after tax. The aforementioned cost of capital before tax was subsequently derived iteratively. All of the aforementioned assumptions are considered a source of estimation uncertainty due to their inherent uncertainty.

In all the impairment tests performed, the recoverable amount was more than 10% higher than the carrying amount of the respective cash-generating unit or group of cash-generating units. Irrespective of this, the planning data used were checked for plausibility against externally available forecasts and the recoverable amounts determined were validated using valuation multiples based on peer group information. In addition, sensitivity analyses of the key assumptions were performed as part of the impairment tests. As a result, no change of a significant assumption deemed possible by management would have resulted in an impairment. The following table presents the amount by which key assumptions would have to change before an impairment would need to be recognized as a result of the impairment tests:

	Decrease in long-term growth rate		Increase in cost of capital after tax		Decrease in net cash flows	
	2018	2017	**2018**	2017	**2018**	2017
	in percentage points		in percentage points		in %	
Healthcare (excluding Consumer Health)	> 2	> 2	> 2	> 2	> 5	> 5
Consumer Health[1]		> 2		> 2		> 5
Life Science	1.2	> 2	0.9	1.8	> 5	> 5
Performance Materials	> 2	> 2	> 2	> 2	> 5	> 5

[1] At the date of the impairment test in the previous year, Consumer Health was not classified as a discontinued operation pursuant to IFRS 5.

The lower sensitivity of the impairment test for the cash-generating unit Life Science regarding changes in the long-term growth rate and the capital costs declined compared to 2017. This was due to an increase in weighted average costs of capital (WACC) on account of the higher beta factor of individual entities in the peer group. The resulting effects more than offset the increase in net cash flows during the detailed planning period compared to the previous period.

(20) Other intangible assets

€ million	Customer relationships, brands and trademarks	Marketing authorizations, patents, licenses, similar rights and other		Software and software in development	Advance payments	Total
		Finite useful life	Not yet available for use			
Cost at January 1, 2017	**8,011**	**10,824**	**766**	**639**	**–**	**20,239**
Changes in scope of consolidation	–1	21	–	–	–	20
Additions	–	24	263	110	1	398
Disposals	–	–1	–5	–27	–	–32
Transfers	–2	6	–8	8	–2	4
Classification as held for sale or transfer to a disposal group	–	–	2	–	–	2
Currency translation	–838	–190	–1	–25	–	–1,053
December 31, 2017	**7,171**	**10,685**	**1,017**	**705**	**–**	**19,577**
Accumulated amortization and impairment losses, January 1, 2017	**–1,560**	**–7,759**	**–585**	**–356**	**–**	**–10,259**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–451	–751	–	–41	–	–1,243
Impairment losses	–	–50	–17	–	–	–67
Disposals	–	1	5	27	–	33
Transfers	–	2	–	–2	–	1
Reversals of impairment losses	–	17	–	–	–	17
Classification as held for sale or transfer to a disposal group	–	–	–	–	–	–
Currency translation	142	100	1	15	–	258
December 31, 2017	**–1,868**	**–8,438**	**–596**	**–357**	**–**	**–11,260**
Net carrying amounts as of December 31, 2017	**5,303**	**2,246**	**421**	**348**	**–**	**8,317**
Cost at January 1, 2018	**7,171**	**10,685**	**1,017**	**705**	**–**	**19,577**
Changes in scope of consolidation	–	–	–	–	–	–
Additions	1	14	35	55	1	106
Disposals	–6	–37	–111	–8	–	–162
Transfers	–	57	–56	4	–1	4
Classification as held for sale or transfer to a disposal group	–29	–51	–	–7	–	–87
Currency translation	265	71	–	6	–	342
December 31, 2018	**7,402**	**10,739**	**885**	**755**	**–**	**19,780**
Accumulated amortization and impairment losses, January 1, 2018	**–1,868**	**–8,438**	**–596**	**–357**	**–**	**–11,260**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–427	–747	–	–57	–	–1,231
Impairment losses	–	–21	–	–19	–	–40
Disposals	5	14	–	7	–	26
Transfers	–	–1	–	–	–	–
Reversals of impairment losses	–	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	24	38	–	2	–	65
Currency translation	–61	–40	–	–3	–	–104
December 31, 2018	**–2,326**	**–9,195**	**–596**	**–426**	**–**	**–12,544**
Net carrying amounts as of December 31, 2018	**5,076**	**1,543**	**289**	**329**	**–**	**7,237**

The carrying amounts of customer relationships, brands and trademarks as well as marketing authorizations, patents, licenses, similar rights and other were attributable to the business sectors as follows:

€ million	Remaining useful life in years	Healthcare	Life Science	Performance Materials	**Total Dec. 31, 2018**	Total Dec. 31, 2017
Customer relationships, brands and trademarks		**–**	**4,914**	**162**	**5,076**	**5,303**
Customer relationships	0.5 – 18.9	–	4,108	155	4,263	4,422
thereof: acquisition of Sigma-Aldrich Corporation	17.9 – 18.9	–	3,495	1	3,496	3,693
thereof: acquisition of Millipore Corporation	0.5 – 8.5	–	569	–	569	681
Brands and trademarks	4.5 – 8.9	–	806	7	813	881
thereof: acquisition of Sigma-Aldrich Corporation	8.9	–	655	–	655	695
Marketing authorizations, patents, licenses, similar rights and other						
Finite useful life	**–**	**561**	**329**	**653**	**1,543**	**2,246**
Marketing authorizations						
Rebif®	1.0	369	–	–	369	737
Xalkori®	3.0	68	–	–	68	93
Saizen®	1.0	31	–	–	31	62
Gonal-f®	–	–	–	–	–	95
Other marketing authorizations	–	32	–	–	32	49
Patents, licenses and similar rights	0.5 – 14.3	–	323	643	966	1,156
thereof: acquisition of AZ Electronic Materials S. A.	2.3 – 14.3	–	–	616	616	741
Others	–	61	6	10	77	54
Not yet available for use	**–**	**285**	**4**	**–**	**289**	**421**

The net carrying amount of capitalized customer relationships, disclosed under customer relationships, brands and trademarks, amounting to € 5,076 million (December 31, 2017: € 5,303 million), mainly included the identified and capitalized intangible assets in connection with the acquisition of the Sigma-Aldrich Corporation, AZ Electronic Materials S. A., the Millipore Corporation, and Serono SA. These acquisitions account for the majority of marketing authorizations, patents, licenses, similar rights and other with finite useful lives (€ 1,543 million; December 31, 2017: € 2,246 million). The impairment losses on market authorizations, patents, licenses, similar rights and other with finite useful lives in the amount of € 21 million (2017: € 50 million) in 2018 was essentially related to a technology in the Performance Materials business sector. In 2017, an impairment loss was recognized for the co-promotion right Xalkori® in the Healthcare business sector (€ 33 million) and for technologies no longer used in the Performance Materials business sector (€ 17 million). These impairments were recognized in the consolidated income statement in impairment losses on non-financial assets under other operating expenses.

The additions to marketing authorizations, patents, licenses, similar rights and other not yet available for use amounted to € 35 million in fiscal 2018 (2017: € 263 million) and were attributable almost entirely to the Healthcare business sector. The disposals of marketing authorizations, patents, licenses, similar rights and other that were not yet available for use mainly referred to the transfer of rights to develop and commercialize T-cell cancer therapies (CAR-T) (€ 104 million) to the collaboration partner Intrexon Corporation, United States (see Note (6) “Collaborations of material significance”).

The additions to software and software in development in the amount of € 55 million (2017: € 110 million) were mainly attributable to new ERP developments.

The impairment losses recognized for software and software in development in the amount of € 19 million (2017: € 0 million) were attributable to software modules not further developed and used in the Life Science business sector. The impairment was recognized in the consolidated income statement in impairment losses on non-financial assets under other operating expenses.

The reclassifications to assets held for sale were made in connection with the divestment of the Consumer Health business and of the flow cytrometry platforms Amnis® and Guava® (see Note (5) “Acquisitions and divestments”).

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – OTHER INTANGIBLE ASSETS

In-licensing of intangible assets

The Group is regularly a partner of research and development collaborations with research institutions, biotechnology companies or other contract parties. These collaborations are aimed at developing marketable products. The Group also enters into in-licensing agreements regarding intellectual property of contract partners. Such agreements typically involve making upfront payments and payments for the achievement of certain milestones related to development and commercialization. In this context, the Group has to judge to what extent upfront or milestone payments represent remuneration for services received (research and development costs) or whether such payments result in an in-licensing of an intangible asset that has to be capitalized. This assessment is regularly subject to judgment.

Identification of impairment or reversals of impairment

Discretionary decisions were required in the identification of objective evidence of impairment as well as in the identification of a reversal of impairment of other intangible assets. External and internal information was used to identify indications of impairment and reversals of impairment. For example, the closure of a site or the approval of a competing product in the Healthcare business sector can be an indicator of impairment.

Determination of impairment amount

Substantial assumptions and estimates were required to determine the appropriate level of amortization of other intangible assets. This related in particular to the determination of the underlying remaining useful life, which the Group reviews regularly and adjusts if necessary. The Group considered factors including the typical product life cycles for each asset and publicly available information about the estimated useful lives of similar assets.

If the amortization of intangible assets from customer relationships, brands, trademarks, marketing authorizations, patents, licenses and similar rights and other had been 10% higher, for example due to shortened remaining useful lives, profit before income tax would have been € 117 million lower in fiscal 2018 (2017: € 120 million).

In fiscal 2018, a reduction of the useful life of the intangible asset reported in connection with the drug Rebif® by one year would have lowered profit before income tax by € 369 million (2017: € 184 million). An extension of the useful life by one year would have increased profit before income tax by € 123 million (2017: € 92 million).

(21) Property, plant and equipment

€ million	Land, land rights and buildings, including buildings on third-party land	Plant and machinery	Other facilities, operating and office equipment	Construction in progress and advance payments to vendors and contractors	Total
Cost at January 1, 2017	**3,391**	**4,068**	**1,136**	**807**	**9,402**
Changes in the scope of consolidation	49	2	–24	–	28
Additions	30	54	35	818	936
Disposals	–50	–142	–34	–16	–241
Transfers	184	258	96	–543	–5
Classification as held for sale or transfer to a disposal group	41	–2	–	–	39
Currency translation	–131	–103	–33	–40	–306
December 31, 2017	**3,514**	**4,136**	**1,176**	**1,026**	**9,852**
Accumulated depreciation and impairment losses January 1, 2017	**–1,361**	**–2,949**	**–858**	**–4**	**–5,171**
Changes in the scope of consolidation	–31	2	21	–	–9
Depreciation	–147	–266	–103	–	–516
Impairment losses	–2	–2	–	–	–5
Disposals	39	138	32	–	209
Transfers	–	–	–	–	–
Reversals of impairment losses	35	35	–	–	69
Classification as held for sale or transfer to a disposal group	–41	1	–	–	–40
Currency translation	37	63	21	–	122
December 31, 2017	**–1,472**	**–2,978**	**–886**	**–4**	**–5,340**
Net carrying amounts as of December 31, 2017	**2,042**	**1,158**	**291**	**1,022**	**4,512**
Cost at January 1, 2018[1]	**3,517**	**4,136**	**1,178**	**1,026**	**9,857**
Changes in the scope of consolidation	–	–	–	–	–
Additions	16	41	47	786	890
Disposals	–14	–64	–46	–28	–152
Transfers	319	237	140	–696	–
Classification as held for sale or transfer to a disposal group	–43	–69	–20	–2	–134
Currency translation	43	31	6	10	90
December 31, 2018	**3,837**	**4,313**	**1,305**	**1,096**	**10,551**
Accumulated depreciation and impairment losses January 1, 2018[1]	**–1,474**	**–2,978**	**–887**	**–4**	**–5,343**
Changes in the scope of consolidation	–	–	–	–	–
Depreciation	–156	–246	–115	–	–517
Impairment losses	–12	–3	–1	–2	–18
Disposals	11	59	42	2	116
Transfers	24	–	–24	–	–
Reversals of impairment losses	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	13	40	13	–	66
Currency translation	–16	–23	–5	–	–44
December 31, 2018	**–1,609**	**–3,150**	**–977**	**–4**	**–5,740**
Net carrying amounts as of December 31, 2018	**2,228**	**1,163**	**328**	**1,092**	**4,811**

[1] Values effective January 1, 2018, have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

In fiscal 2018, material additions to construction in progress were attributable to the construction of a pharma packaging center, investments into the administrative buildings at the Darmstadt site as well as the expansion of US and Chinese production capacities in the Life Science business sector. Furthermore, the Group invested in its pharmaceutical production facilities and logistic hub in China. Additional investments were made into our laboratory, production and logistic facilities in China, Italy and Germany.
Reclassifications from construction in progress were mainly attributable to the completion of the expansion of the Group's global headquarters at the Darmstadt site, and to the completion of the pharma packaging center.

In 2018, impairment losses amounted to € 18 million (2017: € 5 million). These were attributable primarily to assets allocated to the Healthcare business sector, and mainly referred to buildings and production facilities. Reversals of impairment losses were insignificant overall. In 2017 impairment losses for the biopharmaceutical production facility in Corsier-sur-Vevey (Switzerland) were reversed in the amount of € 69 million to depreciated cost. The decision to reverse the impairment loss was due to improved expectations for the capacity utilization of the production facility, particularly owing to the approvals of the immune-oncology medicine Bavencio®, which is to be produced in this facility. An impairment loss of € 165 million was originally recognized for the facility in 2011.

The reclassifications to assets held for sale were made in connection with the divestment of the Consumer Health business (see Note (5) "Acquisitions and divestments").

The carrying amounts of assets classified as finance leases were as follows:

€ million	Dec. 31, 2018	Dec. 31, 2017
Land and buildings	8	5
Other property, plant and equipment	1	1
Net carrying amount of assets classified as finance lease	**9**	**5**

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – PROPERTY, PLANT AND EQUIPMENT

Identification of impairment or reversals of impairment
Discretionary decisions were required in the identification of objective evidence of impairment as well as in the identification of a reversal of impairment of property, plant and equipment. External and internal information was used in this context. For example, the closure of a site can be an indicator of impairment.

Determination of impairment amount
Substantial assumptions and estimates were required to determine the appropriate level of amortization of property, plant and equipment. The underlying remaining useful life of property, plant and equipment was reviewed regularly by the Group and adjusted if necessary. The Group considered factors including the typical product life cycles for each asset and publicly available information about the estimated useful lives of similar assets.

(22) Other assets

Other assets comprised:

	Dec. 31, 2018			Dec. 31, 2017		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Subsequent measurement at amortized cost						
Other receivables	295	17	312	247	29	276
Subsequent measurement at fair value through profit or loss						
Derivatives without a hedging relationship (operational)	–	45	45	–	46	46
Derivatives with a hedging relationship (operational)	4	1	4	30	15	45
Financial items	**299**	**63**	**361**	**277**	**91**	**367**
Receivables from non-income related taxes	318	8	326	239	38	277
Prepaid expenses	117	5	121	99	8	107
Contract assets[1]	52	1	52			
Assets from defined benefit plans	7	–	7	1	–	1
Remaining other assets[1]	94	62	156	115	69	184
Non-financial items	**587**	**76**	**663**	**454**	**114**	**568**
Other assets	**886**	**138**	**1,024**	**731**	**205**	**936**

[1] Due to the first-time application of IFRS 15 as of January 1, 2018, contract assets included in other assets in 2017 were reported separately as of January 1, 2018; see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

Other receivables were subsequently measured at amortized cost and mainly contained claims from service agreements in connection with the divested Consumer Health business, which the Group continues to fulfill for the acquiring party. In the previous year, other receivables mainly comprised current receivables from related parties resulting from refund claims to companies from taxes paid for the account of such companies.

Other receivables also comprised license receivables in the amount of € 29 million (December 31, 2017: € 28 million).

For further information on impairment losses and credit risks from financial items associated with other assets, please refer to Note (38) "Management of financial risks". Please refer to Note (49) "Effects from new accounting standards and other presentation and measurement changes" for further details on the first-time application effects of IFRS 9 regarding the classification and measurement of financial assets.

The following table provides details on contract assets representing completed performances not yet invoiced:

	Contract assets		
€ million	Current	Non-current	**Total**
January 1, 2018	35	–	35
Additions	94	1	95
Reclassification to receivables	–78	–	–78
Reclassification from non-current to current	–	–	–
Classification as held for sale or transfer to disposal group	–	–	–
Currency effects	1	–	1
Changes in scope of consolidation/other	–1	–	–1
December 31, 2018	**52**	**1**	**52**

(23) Inventories

This item comprises the following items:

€ million	**Dec. 31, 2018**	Dec. 31, 2017
Raw materials and supplies	510	481
Work in progress	834	795
Finished goods/goods for resale	1,420	1,355
Inventories	**2,764**	**2,632**

The increase in inventories in 2018 was due to the overall accelerating business volume in all three business sectors.

Impairments of inventories in 2018 amounted to € 183 million (2017: € 144 million); reversals amounted to € 77 million (2017: € 110 million).

The increase in impairment losses was attributable in particular to the realignment of the Performance Materials business sector. In addition, quality-related write-downs increased in the Healthcare business sector.

As of the balance sheet date, no inventories were pledged as security for liabilities.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – INVENTORIES

Identification of impairments or reversal of impairments
Discretionary decisions were required in the identification of impairment as well as in the identification of a reversal of impairment of inventories. There were estimation uncertainties with respect to the calculation of the net realizable value. It was determined, in particular, on the basis of information on changes in selling and procurement prices and on the expected cost of completion.

(24) Trade accounts receivable

€ million	Dec. 31, 2018	Dec. 31, 2017
Subsequently measured at amortized cost	2,983	3,290
Subsequently measured at fair value through other comprehensive income	21	–
Gross trade accounts receivable	**3,004**	**3,290**
Allowances on receivables subsequently measured at amortized cost	–73	–367
Allowances on receivables subsequently measured at fair value through other comprehensive income	–	–
Net trade accounts receivable	**2,931**	**2,923**

In the period from January 1 to December 31, 2018, trade accounts receivable in Italy with a nominal value of € 28 million (2017: € 25 million) were sold for € 28 million (2017: € 24 million). The sold receivables did not involve any further rights of recovery against the Group.

The following table provides details on the development of trade accounts receivable before loss allowances during the period under review:

€ million	Gross trade accounts receivable
December 31, 2017	**3,290**
Adjustment on initial application of IFRS 9	–9
Adjustment on initial application of IFRS 15	–4
January 1, 2018	**3,277**
Additions	16,395
thereof: attributable to performance obligations satisfied in prior periods	1
Customer payments/defaults	–16,590
Currency effects	6
Classification as held for sale or transfer to disposal group	–86
Change in scope of consolidation/other	3
December 31, 2018	**3,004**

For further information on loss allowances as well as credit and market risks affecting trade accounts receivable, please refer to Note (38) “Management of financial risks”, section “Credit risks”. Please refer to Note (49) “Effects from new accounting standards and other presentation and measurement changes” for further details on the first-time application effects of IFRS 9 regarding the classification and measurement of financial assets.

(25) Provisions for pensions and other post-employment benefits

Depending on the legal, economic and fiscal circumstances prevailing in each country, different retirement benefit systems are provided for the employees. Generally, these systems are based on the years of service and salaries of the employees. Pension obligations comprise both obligations from current pensions and accrued benefits for pensions payable in the future.

In order to limit the risks of changing capital market conditions and other developments, for many years now newly hired employees have been offered plans that are not based on final salary.

The value recognized in the consolidated balance sheet for pensions and other post-employment benefits was derived as follows:

€ million	Dec. 31, 2018	Dec. 31, 2017
Present value of all defined benefit obligations	**4,719**	**4,707**
Fair value of the plan assets	–2,391	–2,452
Funded status	**2,328**	**2,255**
Effects of asset ceilings	1	1
Net defined benefit liability recognized in the balance sheet	**2,329**	**2,256**
Assets from defined benefit plans	7	1
Provisions for pensions and other post-employment benefits	**2,336**	**2,257**

The calculation of the defined benefit obligations was based on the following actuarial parameters:

	Germany		Switzerland		United Kingdom		Other countries	
	2018	2017	**2018**	2017	**2018**	2017	**2018**	2017
Discount rate	1.97%	1.90%	1.00%	0.70%	2.95%	2.56%	3.16%	2.99%
Future salary increases	2.51%	2.51%	1.74%	1.80%	2.00%	2.00%	3.21%	3.66%
Future pension increases	1.75%	1.75%	–	–	2.94%	3.04%	1.77%	1.94%

These were average values weighted by the present value of the respective benefit obligation.

The defined benefit obligations were based on the following types of benefits provided by the respective plan:

	Dec 31, 2018				
€ million	Germany	Switzerland	United Kingdom	Other countries	**Total**
Benefit based on final salary					
Annuity	2,602	1	450	84	3,137
Lump sum	–	–	–	93	93
Installments	1	–	–	–	1
Benefit not based on final salary					
Annuity	563	777	–	67	1,407
Lump sum	–	–	6	33	39
Installments	6	–	–	–	6
Other	–	–	–	10	10
Medical plan	–	–	–	26	26
Present value of defined benefit obligations	**3,172**	**778**	**456**	**313**	**4,719**
Fair value of the plan assets	**1,137**	**656**	**450**	**148**	**2,391**

The vast majority of defined benefit obligations of German entities were attributable to plans that encompass old-age, disability and surviving dependent pensions. On the one hand, these obligations were based on benefit rules comprising benefit commitments dependent upon years of service and final salary from which newly hired employees have been excluded. On the other hand, the benefit rules applicable to employees newly hired since January 1, 2005, comprised a direct commitment that is not based on the final salary.

The benefit entitlement resulted from the cumulative total of annually determined pension components that were calculated on the basis of a defined benefit expense and an age-dependent annuity table. Statutory minimum funding obligations did not exist.

Pension obligations in Switzerland comprised old-age, disability and surviving dependent benefits regulated by law. The employer and the employees made contributions to the plans. The Group had to observe the existing statutory minimum funding obligations.

Pension obligations in the United Kingdom resulted primarily from benefit plans which are based on years of service and final salary and were closed to newly hired employees in 2006. The agreed benefits comprised old-age, disability and surviving dependent benefits. The employer and the employees made contributions to the plans. The Group had to observe the existing statutory minimum funding obligations.

The following table shows the development of the net defined benefit liability recognized in the balance sheet:

€ million	Present value of the defined benefit obligations	Fair value of the plan assets	Effects of the asset ceilings	**Net defined benefit liability**
January 1, 2018	**–4,707**	**2,452**	**–1**	**–2,256**
Current service cost	–161	–	–	–161
Interest expense	–85	–	–	–85
Interest income	–	42	–	42
Plan administration costs recognized in income	–	–2	–	–2
Past service cost	4	–	–	4
Gains (+) or losses (–) on settlement	–	–	–	–
Currency translation differences recognized in income	–17	14	–	–3
Other effects recognized in income	3	–	–	3
Items recognized in income	**–256**	**54**	**–**	**–202**
thereof: attributable to the divested Consumer Health business	–7	2	–	–5
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (–) arising from changes in demographic assumptions	–40	–	–	–40
Actuarial gains (+)/losses (–) arising from changes in financial assumptions	139	–	–	139
Actuarial gains (+)/losses (–) arising from experience adjustments	–18	–	–	–18
Remeasurements of plan assets				
Actuarial gains (+)/losses (–) arising from experience adjustments	–	–115	–	–115
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (–)	–	–	–	–
Actuarial gains (+)/losses (–)	**81**	**–115**	**–**	**–34**
Pension payments	124	–49	–	75
Employer contributions	–	48	–	48
Employee contributions	–14	14	–	–
Payment transactions	**110**	**13**	**–**	**123**
Changes in the scope of consolidation	–	–	–	–
Reclassification to liabilities directly related to assets held for sale	48	–5	–	43
Currency translation differences recognized in equity	–10	5	–	–5
Other changes	15	–13	–	2
Other	**53**	**–13**	**–**	**40**
December 31, 2018	**–4,719**	**2,391**	**–1**	**–2,329**

€ million	Present value of the defined benefit obligations	Fair value of the plan assets	Effects of the asset ceilings	**Net defined benefit liability**
January 1, 2017	**–4,698**	**2,386**	**–1**	**–2,313**
Current service cost	–160	–	–	–160
Interest expense	–86	–	–	–86
Interest income	–	43	–	43
Plan administration costs recognized in income	–	–2	–	–2
Past service cost	–8	–	–	–8
Gains (+) or losses (–) on settlement	–	–	–	–
Currency translation differences recognized in income	40	–33	–	7
Other effects recognized in income	–3	–2	–	–5
Items recognized in income	**–217**	**6**	**–**	**–211**
thereof: attributable to the divested Consumer Health business	–8	3	–	–5
Remeasurements of defined benefit obligations				
Actuarial gains (+)/losses (–) arising from changes in demographic assumptions	5	–	–	5
Actuarial gains (+)/losses (–) arising from changes in financial assumptions	8	–	–	8
Actuarial gains (+)/losses (–) arising from experience adjustments	7	–	–	7
Remeasurements of plan assets				
Actuarial gains (+)/losses (–) arising from experience adjustments	–	121	–	121
Changes in the effects of the asset ceilings				
Actuarial gains (+)/losses (–)	–	–	–	–
Actuarial gains (+)/losses (–)	**20**	**121**	**–**	**141**
Pension payments	127	–51	–	76
Employer contributions	–	36	–	36
Employee contributions	–13	13	–	–
Payment transactions	**114**	**–2**	**–**	**112**
Changes in the scope of consolidation	–	–	–	–
Reclassification to liabilities directly related to assets held for sale	20	–14	–	6
Currency translation differences recognized in equity	67	–46	–	21
Other changes	–13	1	–	–12
Other	**74**	**–59**	**–**	**15**
December 31, 2017	**–4,707**	**2,452**	**–1**	**–2,256**

With the exception of the net balance of interest expense on the defined benefit obligations and interest income from the plan assets, which is recorded under the financial result, the expenses for defined benefit pension systems were allocated to the individual functional areas in the consolidated income statement.

The actual loss on plan assets amounted to € 73 million in 2018 (2017: return of € 164 million).

The development of cumulative actuarial gains (+) and losses (–) was as follows:

€ million	2018	2017
Cumulative actuarial gains (+)/losses (–) recognized in equity, January 1	**–1,668**	**–1,820**
Currency translation differences	–	11
Remeasurements of defined benefit obligations		
Actuarial gains (+)/losses (–) arising from changes in demographic assumptions	–40	5
Actuarial gains (+)/losses (–) arising from changes in financial assumptions	139	8
Actuarial gains (+)/losses (–) arising from experience adjustments	–18	7
Remeasurements of plan assets		
Actuarial gains (+)/losses (–) arising from experience adjustments	–115	121
Effects of the asset ceilings		
Actuarial gains (+)/losses (–)	–	–
Reclassification within retained earnings	65	–
Cumulative actuarial gains (+)/losses (–) recognized in equity, December 31	**–1,637**	**–1,668**

Plan assets for funded defined benefit obligations primarily comprised fixed-income securities, stocks, and investment funds. They did not directly include financial instruments issued by Group companies or real estate used by Group companies.

The plan assets serve exclusively to meet the defined benefit obligations. Covering the benefit obligations with financial assets represents a means of providing for future cash outflows, which occur in some countries (e.g. Switzerland and the United Kingdom) on the basis of legal requirements and in other countries (e.g. Germany) on a voluntary basis.

Both the benefit obligations as well as the plan assets are subject to fluctuations over time. This could lead to (an increase in) underfunding. Depending on the statutory regulations, it could become necessary in some countries to reduce underfunding through additions of liquid assets. The reasons for such fluctuations could include changes in market interest rates and thus the discount rate as well as adjustments to other actuarial assumptions (e.g. life expectancy, inflation rates).

In order to minimize fluctuations of the net defined benefit liability recognized in the balance sheet, in managing its plan assets, the Group also pays attention to potential fluctuations in liabilities. The portfolio is structured in such a way that, in the ideal case, assets and defined benefit obligations develop in opposite directions when exposed to exogenous factors – in particular interest rate fluctuations – thus creating a natural defense against these factors.

The fair value of the plan assets can be allocated to the following categories:

	Dec. 31, 2018			Dec. 31, 2017		
€ million	**Quoted market price in an active market**	**No quoted market price in an active market**	**Total**	Quoted market price in an active market	No quoted market price in an active market	Total
Cash and cash equivalents	147	–	147	77	–	77
Equity instruments	592	–	592	814	–	814
Debt instruments	993	–	993	957	–	957
Direct investments in real estate	–	105	105	–	94	94
Investment funds	458	–	458	420	1	421
Insurance contracts	–	77	77	–	81	81
Other	19	–	19	8	–	8
Fair value of the plan assets	**2,209**	**182**	**2,391**	**2,276**	**176**	**2,452**

Employer contributions to plan assets and direct payments to beneficiaries will probably amount to around € 33 million and € 74 million, respectively, in the subsequent year. The weighted duration amounted to 20 years.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – PROVISIONS FOR PENSIONS AND OTHER POST-EMPLOYMENT BENEFITS

Determination of present value of defined-benefit obligations
The determination of the present value of the obligation from these defined benefit pension plans primarily requires discretionary judgment as regards the selection of methods to determine discount rates as well as estimates of future salary increases and future pension increases. The actuarial assumptions which are used as the basis for the calculation of the defined benefit obligation, e.g. discount rates, salary and pension trends, were determined on a country-by-country basis in line with the economic conditions prevailing in each country; the latest country-specific actuarial mortality table was used in each case. The respective discount rates are generally determined on the basis of the returns on high-quality corporate bonds issued with adequate maturities and currencies. For euro-denominated obligations, bonds with ratings of at least "AA" from one of the three rating agencies Standard & Poor's, Moody's or Fitch, and a euro swap rate of adequate duration served as the basis for the data.

The following overview shows how the present value of all defined benefit obligations would have been impacted by changes to relevant ctuarial assumptions.

€ million	Dec. 31, 2018	Dec. 31, 2017
Increase (+)/decrease (–) in present value of all defined benefit obligations if		
the discount rate is 50 basis points higher	–435	–438
the discount rate is 50 basis points lower	503	508
the expected rate of future salary increases is 50 basis points higher	151	155
the expected rate of future salary increases is 50 basis points lower	–130	–133
the expected rate of future pension increases is 50 basis points higher	251	256
the expected rate of future pension increases is 50 basis points lower	–196	–198

To determine the sensitivities, in principle each of the observed parameters was varied while keeping the measurement assumptions otherwise constant. The amounts for social security vary in line with the salary trend.

(26) Other provisions

Other provisions developed as follows:

€ million	Litigation	Restructuring	Personnel	Environmental protection	Acceptance and follow-on obligations	Interest and penalties related to income taxes	Other	**Total**
January 1, 2018	**526**	**92**	**254**	**137**	**26**	**43**	**166**	**1,245**
Additions	65	30	203	9	15	13	176	511
Utilizations	–22	–22	–78	–8	–3	–	–40	–174
Release	–21	–9	–66	–2	–7	–10	–90	–206
Interest portion	11	–	2	2	–	–	–	14
Currency translation	–1	–	5	–	–	–	2	6
Changes in scope of consolidation/other	–	–	–1	–	–1	–	–	–2
Reclassification to liabilities directly related to assets held for sale	–6	–1	–4	–	–	–	–3	–15
December 31, 2018	**551**	**90**	**316**	**137**	**30**	**46**	**211**	**1,381**
thereof: current	182	32	112	26	19	46	184	600
thereof: non-current	370	58	203	111	11	–	27	780

LITIGATION

As of December 31, 2018, the provisions for legal disputes amounted to € 551 million (December 31, 2017: € 526 million). The legal matters described below represented the most significant legal risks.

Product-related and patent disputes

Rebif®: The Group is involved in a patent dispute with Biogen Inc., United States, (Biogen) in the United States. Biogen claims that the sale of Rebif® in the United States infringes on a Biogen patent. The disputed patent was granted to Biogen in the United States in 2009. Subsequently, Biogen sued the Group and other pharmaceutical companies for infringement of this patent. The Group defended itself against all allegations and brought a countersuit claiming that the patent was invalid and not infringed by the Group's actions. In the first instance, a jury recognized the invalidity of the patent. This jury verdict was overturned by a first-instance federal judge in September 2018. For the time being, the patent is thus deemed to be legally valid and to have been infringed. The Group filed a complaint with the CAFC (second instance) against the first-instance ruling in October 2018. In this context, the Group recognized provisions in a three-digit million euro amount. Cash outflow is not expected to occur within the next 12 months.

PS-VA liquid crystals mixtures: In the Performance Materials business sector, the Group is involved in a legal dispute with JNC Corporation, Japan, (JNC). JNC claims that by manufacturing and marketing certain liquid crystals mixtures, the Group has infringed JNC patents. JNC asserts its claims in court in various jurisdictions. In two JNC patent infringement cases, a first-instance and a second-instance decision, respectively, were taken in the Group's favor, against which JNC has appealed or is highly likely to appeal.

The Group maintains that JNC's patent infringement assertion is invalid owing to relevant prior art and has filed the corresponding nullity actions, which in three cases were already successful in first-instance proceedings. JNC has filed complaints in each case. In a correction trial in Korea, a decision in favor of JNC was issued in the second instance. Both the Group and the Korean Patent Office have filed complaints with the Korean High Civil Court.

In this context, the Group recognized provisions in a double-digit million euro amount. Cash outflow within the next 12 months is considered possible at present.

Antitrust and other proceedings

Antitrust review proceedings for the Sigma-Aldrich acquisition: On July 6, 2017, the Group received notice from the European Commission (EU Commission) in connection with the antitrust review proceedings for the acquisition of Sigma-Aldrich, in which the EU Commission informed the Group of its preliminary conclusion that the Group and Sigma-Aldrich allegedly transmitted incorrect and/or misleading information within the scope of the acquisition of Sigma-Aldrich. The EU Commission received registration of the merger on April 21, 2015, and granted clearance on June 15, 2015, subject to the condition that the Group and Sigma-Aldrich divest parts of the European solvents and inorganic chemicals businesses of Sigma-Aldrich in order to resolve antitrust concerns. According to the preliminary viewpoint of the EU Commission communicated in a letter dated July 6, 2017, the Group and Sigma-Aldrich withheld related important information about an innovation project. According to the EU Commission, the innovation project should have been included in the remedies package. At present, an administrative procedure is carried out at the EU Commission which might result in the issuance of a fine. The Group is entitled to legal recourse should a fine be imposed. The ongoing investigations are limited to the examination of violations of EU merger control procedures and do not affect the validity of the EU Commission's decision to approve the merger. In this context, the Group recognized provisions in a mid double-digit million euro amount. An outflow of resources is expected in 2019.

Paroxetine: In connection with the divested generics business, the Group is subject to antitrust investigations by the British Competition and Market Authority (CMA) in the United Kingdom. In March 2013, the authorities informed the Group of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd. and several subsidiaries of GlaxoSmithKline plc, United Kingdom, in connection with the antidepressant drug paroxetine violates British and European competition law. The Group, the then owner of Generics (UK) Ltd., was allegedly involved in the negotiations for the settlement agreement and is therefore liable. The investigations into Generics (UK) Ltd. started in 2011, without this being known to the Group. On February 11, 2016, the CMA imposed a fine in this matter. The Group has taken legal action against this fine. Appropriate accounting measures have been taken. As things stand at present, a decision and outflow of resources are not expected within the next 12 months because the Appeal Tribunal has since submitted the relevant legal questions to the European Court of Justice (CJEU) for a preliminary ruling.

In addition to provisions for the mentioned litigation, provisions existed as of the balance sheet date for various other pending legal disputes.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – OTHER PROVISIONS FOR LEGAL DISPUTES

The assessment of the recognition obligation and the measurement of provisions for legal disputes was subject to estimation uncertainty to a particular extent. The main factors used to assess the recognition obligation in relation to provisions for legal disputes were

- the validity of the arguments put forward by the opposing party and
- the legal situation and current legislation in comparable proceedings in the jurisdiction in question.

The main parameters when determining the amount of provisions were

- the duration of proceedings in pending litigation,
- the likelihood of possible outcomes of the proceedings,
- the license rate to be applied (in patent disputes) and
- the discount rate to be used.

To assess a recognition obligation in relation to provisions and to quantify pending outflows of resources, the Group drew on the knowledge of the legal department as well as outside counsel. In spite of this, both the assessment of the existence of a present obligation and the estimate of the probability of a future outflow of resources were highly subject to uncertainty.

RESTRUCTURING

Restructuring provisions mainly included commitments to employees in connection with restructuring projects and provisions for related onerous contracts.

The additions to restructuring provisions in the amount of € 30 million were mainly attributable to the relocation of shared service functions in Finance from Darmstadt to Wrocław, Poland, and Manila, the Philippines, and to the reorganization of the distribution structure in the Healthcare business sector in Southern Europe. Outflows of resources are expected within the next three years.

The utilization of restructuring provisions in the amount of € 22 million was mainly attributable to the "Fit for 2018" transformation and growth program, which was introduced in 2012. The provisions in this context mainly consist of commitments to employees from partial and early retirement arrangements. Further cash outflows within the scope of the "Fit for 2018" program are largely expected in 2019.

Besides the aforementioned programs, the restructuring provisions also comprise obligations from the Life Science business sector, which will make relocations and gradually close operations in the course of the years 2019 to 2022 at various German sites.

PROVISIONS FOR EMPLOYEE BENEFITS/SHARE-BASED PAYMENT

Provisions for employee benefits include obligations from long-term variable compensation programs. More information on these compensation programs can be found in Note (69) "Share-based compensation programs". The following table presents the key parameters as well as the development of the potential number of Share Units of Merck KGaA, Darmstadt, Germany, (MSUs) for the individual tranches:

	2016 tranche	2017 tranche	2018 tranche
Performance cycle	Jan. 1, 2016 – Dec. 31, 2018	Jan. 1, 2017 – Dec. 31, 2019	Jan. 1, 2018 – Dec. 31, 2020
Term	3 years	3 years	3 years
Reference price of shares of Merck KGaA, Darmstadt, Germany, in € (60-day average share price of Merck KGaA, Darmstadt, Germany, prior to the start of the performance cycle)	87.92	95.63	91.73
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	10,669.76	10,822.06	13,089.39
Potential number of MSUs			
Potential number offered for the first time in 2016	763,463	–	–
Forfeited	24,392	–	–
Dec. 31, 2016	739,071	–	–
Potential number offered for the first time in 2017	–	853,624	–
Forfeited	31,105	24,897	–
Dec. 31, 2017	707,966	828,727	–
Potential number offered for the first time in 2018	–	–	891,345
Forfeited	47,676	13,988	37,953
Transferred as part of the disposal of Consumer Health	16,336	39,889	23,760
Dec. 31, 2018	**643,954**	**774,850**	**829,632**

The value of the provisions was € 114 million as of December 31, 2018 (December 31, 2017: € 45 million). Net expenses of € 92 million were incurred in fiscal 2018 (2017: net income of € 13 million). The three-year tranche issued in 2015 ended at the end of 2017; an amount of € 23 million was paid out in 2018.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – SHARE-BASED COMPENSATION PROGRAMS

The measurement of long-term share-based compensation programs implies extensive estimation uncertainty. The two main parameters in the measurement of the long-term share-based compensation programs in the form of cash-settled share-based compensation programs are long-term indicators of company performance and price fluctuations of shares of Merck KGaA, Darmstadt, Germany, in relation to the DAX®.

The amount recognized in the consolidated balance sheet as of December 31, 2018, as non-current provisions, which comprises the 2017 and 2018 tranches from long-term variable compensation programs, amounted to € 54 million (December 31, 2017: 2016 and 2017 tranches € 22 million). The following overview shows the amounts by which the non-current provisions would have been impacted by changes in the DAX® (increase or decrease by 10%, respectively) and the closing price of shares of Merck KGaA, Darmstadt, Germany, as of December 31, 2018 (increase or decrease by 10%, respectively). The amounts stated would have led to a corresponding reduction or increase in profit before income tax.

€ million		Increase (+)/decrease (–) of the provision	
		Dec. 31, 2018	Dec. 31, 2017
Variation of share price of Merck KGaA, Darmstadt, Germany	+10%	14	15
	–10%	–15	–2
Variation of DAX® value	+10%	–10	–
	–10%	8	16

Sensitivities were determined on the basis of the respective parameters in question, with all other measurement assumptions remaining unchanged. The 2016 tranche reported under current provisions will not be subject to any value fluctuations between December 31, 2018, and the payout date and was therefore not included in the sensitivity analysis (December 31, 2017: 2015 tranche).

Provisions for employee benefits included an amount of € 51 million for the promise of a one-time bonus for employees on the occasion of the company's 350th anniversary, which was recognized in 2017 and paid out in 2018.

Provisions for employee benefits also included obligations for partial retirement programs and other severance payments that were not set up in connection with restructuring programs as well as obligations in connection with long-term working hour accounts and anniversary bonuses.

With respect to provisions for pensions and other post-employment benefits, see Note (25) "Provisions for pensions and other post-employment benefits".

ENVIRONMENTAL PROTECTION

Provisions for environmental protection, particularly for obligations from soil remediation and groundwater protection, mainly existed in connection with the crop protection business in Germany and Latin America that was discontinued in 1987.

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – OTHER PROVISIONS FOR ENVIRONMENTAL PROTECTION

The calculation of the present value of the future settlement amount of provisions for environmental protection required estimates to be made of

- the future settlement date,
- the actual severity of the identified contamination,
- the applicable remediation methods,
- the associated future costs, and
- the discount rate.

The measurement was carried out regularly in consultation with independent experts.

ACCEPTANCE AND FOLLOW-ON OBLIGATIONS

Provisions for acceptance and follow-on obligations primarily took into account costs stemming from discontinued development projects as well as obligation surpluses from onerous contracts. Utilizations and releases were mainly attributable to development projects discontinued in previous years.

INTEREST AND PENALTIES RELATED TO INCOME TAXES

Provisions for interest and penalties related to income taxes mainly comprised interest payables associated with or resulting from tax payables. In previous periods, such items were disclosed in income tax liabilities in full.

For further information on these disclosure changes, please refer to Note (49) "Effects from new accounting standards and other presentation and measurement changes".

MISCELLANEOUS OTHER PROVISIONS

Miscellaneous other provisions mainly comprised provisions for warranty obligations and for uncertain commitments from contributions, fees and other duties.

(27) Contingent liabilities

€ million	Dec. 31, 2018	Dec. 31, 2017
Contingent liabilities from legal disputes and tax matters	47	66
Other contingent liabilities	1	1

Contingent liabilities from legal disputes included potential obligations, for which the probability of occurrence, or an outflow of resources, did not suffice to recognize a provision as of the balance sheet date. These mainly related to obligations under civil law, labor law and antitrust law. The potential civil law obligations primarily related to potential liabilities to pay damages due to a legal dispute under antitrust law. It was possible that the Group would be subject to claims for compensation for damages asserted by health insurance companies due to excessively high drug prices in case of a valid judgment under antitrust law.

In addition, there were contingent liabilities from various legal disputes with Merck & Co., Inc. of the United States (outside the United States and Canada: Merck Sharp & Dohme Corp. (MSD)), among other things due to breach of the co-existence agreement between the two companies and/or trademark/name right infringement regarding the use of the designation “Merck”. In this context, the Group has sued MSD in various countries and has been sued by MSD in the United States. An outflow of resources – except costs for legal defense – was not deemed sufficiently probable as of the balance sheet date to justify the recognition of a provision. Since the contingent liability from these legal disputes could not be reliably quantified as of the balance sheet date, this matter was not taken into account in the table presented above.

Contingent liabilities from tax matters included various non-German income and non-income-related tax matters that were mainly attributable to the determination of earnings under tax law, customs regulations and excise tax matters.

SIGNIFICANT MANAGEMENT JUDGEMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – CONTINGENT LIABILITIES

Identification and measurement

The identification and measurement of contingent liabilities are largely subject to management judgments and estimation uncertainties. The most important parameters used in the measurement of contingent liabilities are the estimated amounts and probabilities of individual proceeding outcomes that are considered possible.

(28) Other liabilities

Other liabilities comprised the following:

	Dec. 31, 2018			Dec. 31, 2017		
€ million	**Current**	**Non-current**	**Total**	Current	Non-current	Total
Other financial liabilities	1,019	13	1,032	1,038	21	1,059
thereof: payroll liabilies	172	–	172	174	–	174
thereof: interest accruals	94	–	94	95	–	95
Liabilities from derivatives with a hedging relationship (operative)	58	20	78	25	18	43
Financial items	**1,077**	**33**	**1,110**	**1,063**	**39**	**1,102**
Accruals for personnel expenses	687	–	687	665	–	665
Contract liabilities[1]	332	4	336			
Liabilities from non-income related taxes	171	15	186	144	5	150
Deferred income[1]	21	–	21	303	211	514
Other non-financial liabilities	–	–	–	–	99	99
Non-financial items	**1,211**	**19**	**1,230**	**1,112**	**315**	**1,427**
Other liabilities	**2,288**	**52**	**2,341**	**2,175**	**354**	**2,529**

[1] Due to the first-time application of IFRS 15 as of January 1, 2018, contract liabilities included in deferred income in 2017 were reported separately as of January 1, 2018; see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

As of December 31, 2018, other financial liabilities included liabilities to related companies amounting to € 511 million (December 31, 2017: € 584 million). These were profit entitlements of E. Merck KG, Darmstadt, Germany.

The following table provides details on the development of contract liabilities related to payments received before performance completion:

	Contract liabilities		
€ million	Current	Non-current	**Total**
January 1, 2018	**311**	**194**	**506**
Additions	410	2	412
Recognition of income/reversal	–582	–2	–583
Cumulative catch-up adjustments to revenue	–	–	–
Reclassification from non-current to current	193	–193	–
Reclassification to liabilities directly related to assets held for sale	–	–	–
Currency translation	2	–	2
Change in scope of consolidation/other	–2	2	–
December 31, 2018	**332**	**4**	**336**

Contract liabilities resulted mainly from the collaboration agreement with Pfizer Inc., United States, in immuno-oncology and were released further as planned on a pro-rata basis through profit or loss in other operating income in 2018.

As of January 1, 2018, contract liabilities amounted to € 506 million, of which € 299 million was recognized in fiscal 2018.

(29) Trade accounts payable

Trade accounts payable amounted to € 1,766 million (December 31, 2017: € 2,195 million). This item included accrued amounts of € 622 million (December 31, 2017: € 653 million) from outstanding invoices.

Given the first-time application of IFRS 15 as of January 1, 2018, some items previously recognized in trade accounts payable were reclassified into the consolidated balance sheet, in particular in refund liabilities. This led to a decline in trade accounts payable of € 434 million as of January 1, 2018 (see Note (49) "Effects from new accounting standards and other presentation and measurement changes").

(30) Refund liabilities

The following table shows the development of refund liabilities in the period under review:

	Rebates/bonus payments		Rights of return		
€ million	Total	thereof: United States	Total	thereof: United States	**Total**
January 1, 2018	**379**	**244**	**52**	**32**	**431**
Additions	1,273	951	44	23	1,317
Utilizations/reversals	–1,193	–902	–43	–22	–1,235
Cumulative catch-up adjustments to revenue	–31	–30	–3	–3	–34
thereof: attributable to performance obligations satisfied in prior periods	–25	–24	–3	–3	–28
Currency translation	12	12	1	1	13
Reclassification to liabilities directly related to assets held for sale	–16	–	–3	–	–19
Change in scope of consolidation/other	–1	–	–	–	–1
December 31, 2018	**423**	**274**	**49**	**31**	**472**

Besides regulatory discounts, rebates and bonus payments comprised discounts agreed upon with customers. The most significant portion of these deductions from sales was attributable to the Healthcare business sector and related to government rebate programs in the US.

Please refer to Note (8) "Net sales" for further information on judgments and sources of estimation uncertainty.

(31) Net cash flows from investing activities

The payments for investments in intangible assets primarily included payments for the development of ERP systems. In the previous year, this item included payments for a license agreement with Vertex Pharmaceuticals Inc., United States, for the acquisition of research programs in the area of oncology and immuno-oncology.

Net cash outflows from investments in current and non-current financial assets amounting to € 75 million (2017: € 219 million) mainly resulted from the purchase of short-term investments in securities not classified as cash and cash equivalents. In the previous year, this item included payments for the purchase of an equity instrument option.

Cash inflows from the divestment of assets held for sale essentially included the payment received from the divestment of the Consumer Health business, less transferred cash and cash equivalents, in the amount of € 3,052 million. To the extent that income tax payments were already included in the disposal gain, such payments were taken into account in the disclosed amount. In the previous year, the Group received an upfront payment of € 156 million associated with the divestment of the Biosimilars business.

Capital Structure, Investments and Financing Activities

(32) Financial result/net gains or losses from financial instruments

€ million	2018	2017[1]
Interest income and similar income	55	23
Income from fair value changes		
from debt instruments with subsequent measurement at fair value through profit or loss	5	
Income from the change of the fair value of share-based compensation programs	–	1
Currency differences from financing activities	16	27
Finance income	**77**	**51**
Interest expenses and similar expenses	–268	–294
Capitalized borrowing costs of qualifying assets		
in property, plant and equipment	7	5
in other intangible assets	8	7
Interest expenses from interest rate derivatives	–14	–13
Capital loss from disposal of debt instruments with subsequent measurement at amortized cost	–1	
Expenses from fair value changes		
from debt instruments with subsequent measurement at fair value through profit or loss	–2	
Expenses from fair value changes of share-based compensation programs	–15	–
Interest component of the additions to pension provisions and other non-current provisions	–56	–51
Other interest expenses	–1	–
Finance costs	**–343**	**–345**
Financial result	**–266**	**–294**

[1] Previous year's figures have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

The currency differences from financing activities mainly comprised gains or losses from hedging intragroup transactions in foreign currency.

The following table shows the development of net gains or losses, interest income or expenses as well as dividend income from financial instruments (excluding items recognized in other comprehensive income) in the period under review by measurement category:

			Interest result		Net gains and losses			
2018 € million	**Currency translation**	**Dividends**	Interest income	Interest expenses	Impairment losses	Reversals of impairment losses	Fair value adjustments	Disposal gains/losses
Financial assets								
Subsequent measurement at amortized cost	–47		12		–77	105		–
Subsequent measurement at fair value through other comprehensive income								
Equity instruments		–						
Debt instruments	–		1		–	–		–
Subsequent measurement at fair value through profit or loss	–	–	22	–			–669	
Financial liabilities								
Subsequent measurement at amortized cost	–54			–259				–
Subsequent measurement at fair value through profit or loss	–		–	–			735	

		Net gains and losses			
2017 € million	**Interest**	Impairment losses	Reversals of impairment losses	Fair value adjustments	Disposal gains/losses
Held for trading				–203	
Held to maturity	–	–	–		–
Loans and receivables	21	–39	97		–
Available for sale	5	–14	–		–1
Other liabilities	–294				–

In the table above, interest income or expenses related to derivatives without a hedging relationship are recognized within fair value adjustments. The currency translation result from equity instruments with subsequent measurement at fair value through other comprehensive income was recognized in other comprehensive income.

(33) Cash and cash equivalents

Cash and cash equivalents comprised the following items:

€ million	Dec. 31, 2018	Dec. 31, 2017
Cash, bank balances and checks	780	481
Short-term cash investments (up to 3 months)	1,391	108
Cash and cash equivalents	**2,170**	**589**

Changes in cash and cash equivalents as defined by IAS 7 are presented in the consolidated cash flow statement.

Cash and cash equivalents included restricted cash amounting to € 295 million (December 31, 2017: € 238 million). This relates mainly to cash and cash equivalents with subsidiaries which the Group only had restricted access to owing to foreign exchange controls.

The maximum default risk is equivalent to the carrying value of the cash and cash equivalents.

(34) Financial assets

	Dec. 31, 2018			Dec. 31, 2017		
€ million	Current	Non-current	Total	Current	Non-current	Total
Available-for-sale financial assets				35	420	454
Loans and receivables				47	12	59
Derivative assets (financial transactions)				9	13	22
Subsequent measurement at amortized cost	**1**	**9**	**10**			
Loans against third parties	1	9	9			
Subsequent measurement at fair value through other comprehensive income	**8**	**278**	**285**			
Equity instruments	–	274	274			
Debt instruments	8	4	12			
Subsequent measurement at fair value through profit and loss	**16**	**324**	**340**			
Equity instruments	–	–	–			
Contingent considerations	–	259	259			
Other debt instruments	–	50	50			
Derivatives without a hedging relationship (financial transactions)	16	14	30			
Financial assets	**24**	**610**	**635**	**90**	**444**	**535**

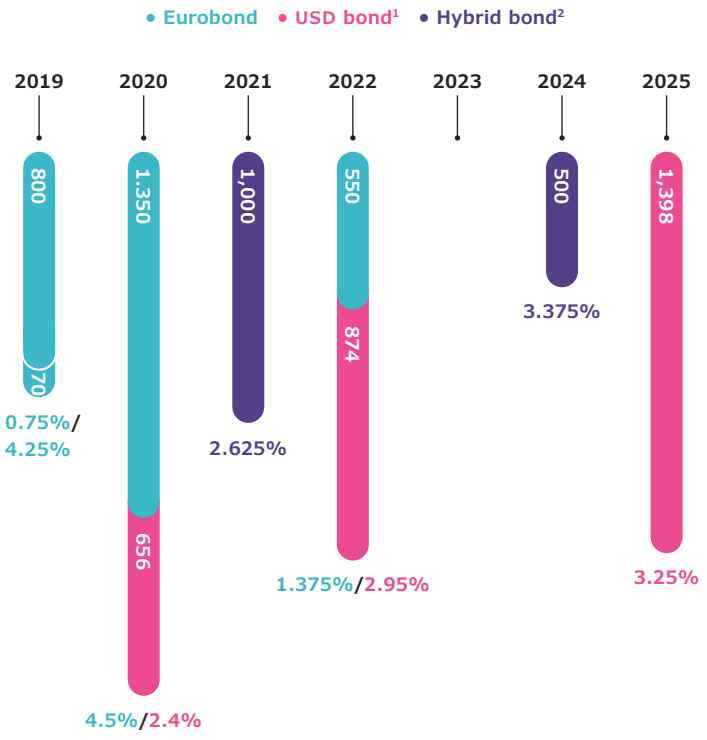
As in the previous year, contingent considerations were mainly attributable to the divestments of the Biosimilars business (see Note (5) “Acquisitions and divestments”) and Kuvan®. In the previous year, these items were disclosed as available-for-sale financial assets. The shares held in Intrexon Corporation, United States, acquired in fiscal 2018, were disclosed in equity instruments with subsequent measurement at fair value through other comprehensive income. Please refer to Note (70) “List of shareholdings” for a detailed list of all investments made in equity instruments with subsequent measurement at fair value through other comprehensive income. Given the Group’s intention to hold these items for the long term, they were classified as equity instruments and subsequently measured at fair value through other comprehensive income. For further information on impairment losses and credit risks associated with these items, please refer to Note (38) “Management of financial risks”. Please refer to Note (49) “Effects from new accounting standards and other presentation and measurement changes” for further details on the first-time application effects of IFRS 9 regarding the classification and measurement of financial assets.

(35) Financial liabilities/ capital management

The composition of financial liabilities as well as a reconciliation to net financial debt are presented in the following table:

	Dec. 31, 2018 € million	Dec. 31, 2017 € million	Maturity	Interest rate %	Nominal value million	Nominal value Currency
USD bond 2015/2018	–	335	March 2018	1.700%	400	USD
Eurobond 2015/2019	799	–	Sept. 2019	0.750%	800	€
Eurobond 2009/2019	70	–	Dec. 2019	4.250%	70	€
Bonds (current)	**869**	**335**				
Commercial paper	113	838				
Bank loans	370	803				
Liabilities to related parties	824	767				
Loans from third parties and other financial liabilities	20	19				
Liabilities from derivatives (financial transactions)	16	27				
Finance lease liabilities	2	1				
Current financial liabilities	**2,215**	**2,790**				
Eurobond 2015/2019	–	799	Sept. 2019	0.750%	800	€
Eurobond 2009/2019	–	70	Dec. 2019	4.250%	70	€
USD bond 2015/2020	655	626	March 2020	2.400%	750	USD
Eurobond 2010/2020	1,348	1,347	March 2020	4.500%	1,350	€
USD bond 2015/2022	872	833	March 2022	2.950%	1,000	USD
Eurobond 2015/2022	548	548	Sept. 2022	1.375%	550	€
USD bond 2015/2025	1,389	1,328	March 2025	3.250%	1,600	USD
Hybrid bond 2014/2074	994	992	Dec. 2074[1]	2.625%	1,000	€
Hybrid bond 2014/2074	498	497	Dec. 2074[2]	3.375%	500	€
Bonds (non-current)	**6,304**	**7,040**				
Bank loans	250	850				
Liabilities to related parties	–	–				
Loans from third parties and other financial liabilities	51	54				
Liabilities from derivatives (financial transactions)	73	86				
Finance lease liabilities	2	2				
Non-current financial liabilities	**6,681**	**8,033**				
Financial liabilities	**8,896**	**10,823**				
less:						
Cash and cash equivalents	2,170	589				
Current financial assets	24	90				
Net financial debt[3]	**6,701**	**10,144**				

[1] Merck KGaA, Darmstadt, Germany, has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in June 2021.
[2] Merck KGaA, Darmstadt, Germany, has the right to prematurely repay this tranche of the hybrid bond issued in December 2014 for the first time in December 2024.
[3] Not defined by International Financial Reporting Standard (IFRSs).



[1] The nominal volumes of bonds denominated in U.S. dollars were converted into euros at the closing rate on December 31, 2018.
[2] For the hybrid bonds repayment is assumed at the earliest possible date.

The Group repaid a USD bond with a volume of € 323 million in March 2018.

For the hybrid bond 2014/2074 issued by Merck KGaA, Darmstadt, Germany, in two tranches, the rating agencies Standard & Poor's, Moody's and Scope have given equity credit treatment to half of the issuance, thus making the issuance more favorable to the Group's credit rating than a classic bond issue. The bond is recognized in full as financial liabilities in the balance sheet.

The financial liabilities of the Group were not secured by liens or similar forms of collateral. The loan agreements do not contain any financial covenants. The Group's average borrowing cost as of the balance sheet date was 2.7% (December 31, 2017: 2.2%).

Information on liabilities to related parties can be found in Note (42) "Related-party disclosures".

CAPITAL MANAGEMENT

The objective of capital management is to secure financial flexibility in order to maintain long-term business operations and to realize strategic options. Maintaining a stable investment grade rating, ensuring liquidity, limiting financial risks as well as optimizing the cost of capital are the objectives of our financial policy and set important framework conditions for capital management. The responsible committees decide on the target capital structure of the balance sheet, the appropriation of net retained profit and the dividend level. In this context, net financial debt is one of the leading capital management indicators.

Traditionally, the capital market represents a major source of financing for the Group, for instance via bond issues. As of December 31, 2018, there were liabilities of € 2.77 billion (December 31, 2017: € 2.77 billion) from a debt issuance program most recently renewed in 2015. In addition, the Group had access to a commercial paper program to meet short-term capital requirements with a volume of € 2 billion, of which € 113 million had been utilized as of December 31, 2018 (December 31, 2017: € 838 million).

Loan agreements represent a further source of financing for the Group. At the balance sheet date, the bank financing commitments vis-à-vis the Group were as follows:

	Dec. 31, 2018		Dec. 31, 2017			
€ million	**Financing commitments from banks**	**Utilization**	Financing commitments from banks	Utilization	Interest	Maturity of financing commitments
Syndicated loan	2,000	–	2,000	–	variable	2020
Bilateral credit agreement with banks	–	–	700	700	variable	
Bilateral credit agreement with banks	–	–	400	400	variable	
Bilateral credit agreement with banks	250	250	250	250	variable	2022
Various bank credit lines	549	370	581	303	variable	<1 year
	2,799	**620**	**3,931**	**1,653**		

There are no indications that the availability of credit lines already extended was restricted.

(36) Equity

EQUITY CAPITAL

The total capital of the company consists of the share capital composed of shares and the equity interest held by the general partner E. Merck KG, Darmstadt, Germany. As of the balance sheet date, the company's share capital amounting to € 168 million was divided into 129,242,251 no-par value bearer shares plus one registered share and is disclosed as subscribed capital. Each share therefore corresponds to € 1.30 of the share capital. The amount resulting from the issue of shares by Merck KGaA, Darmstadt, Germany, exceeding the nominal amount was recognized in the capital reserves. The equity interest held by the general partner amounted to € 397 million. As in the prior year, the share capital did not change in fiscal 2018.

SHARE OF NET PROFIT OF E. MERCK KG, DARMSTADT, GERMANY

E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, engage in reciprocal net profit transfers. This makes it possible for E. Merck KG, Darmstadt, Germany, the general partner of Merck KGaA, Darmstadt, Germany, and the shareholders to participate in the net profit/loss of Merck KGaA, Darmstadt, Germany, in accordance with the ratio of the general partner's equity interest and the share capital (70.274% or 29.726% of the total capital).

The allocation of net profit/loss is based on the net income of both E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, determined in accordance with the provisions of the German Commercial Code. These results are adjusted for trade tax and/or corporation tax and create the basis for the allocation of net profit/loss. The adjustment for corporation tax is made to compensate for the difference in the tax treatment between the general partner and the limited liability shareholders. Corporation tax is only calculated on the income received by the limited liability shareholders. Its equivalent is the income tax applicable to the partners of E. Merck KG, Darmstadt, Germany, which has to be paid by them directly. The adjustment thus ensures that the share in net profit corresponds to the respective interests held by the two shareholder groups. The reciprocal net profit/loss transfer between E. Merck KG, Darmstadt, Germany, and Merck KGaA, Darmstadt, Germany, as stipulated by the Articles of Association was as follows:

		2018		2017	
€ million		E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany	E. Merck KG, Darmstadt, Germany	Merck KGaA, Darmstadt, Germany
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer, adjusted for trade tax		–24	–	–16	–
Net income of Merck KGaA, Darmstadt, Germany, before reciprocal profit transfer		–	616	–	723
Corporation tax		–	20		56
Basis for appropriation of profits	**(100%)**	**–24**	**637**	**–16**	**780**
Profit transfer to E. Merck KG, Darmstadt, Germany Ratio general partner's capital to total capital	(70.274%)	447	–447	548	–548
Profit transfer from E. Merck KG, Darmstadt, Germany Ratio of share capital to total capital	(29.726%)	7	–7	5	–5
Corporation tax		–	–20	–	–56
Net income		**430**	**162**	**537**	**171**

The result of E. Merck KG, Darmstadt, Germany, on which the appropriation of profits adjusted for trade tax is based amounted to € –24 million (2017: € –16 million). This resulted in a profit/loss transfer to Merck KGaA, Darmstadt, Germany, of € –7 million (2017: € –5 million). The net income of Merck KGaA, Darmstadt, Germany, adjusted for corporation tax, on which the appropriation of its profit is based, amounted to € 637 million (2017: € 780 million). Merck KGaA, Darmstadt, Germany, transferred a gain in the amount of € 447 million of its profit to E. Merck KG, Darmstadt, Germany (2017: € 548 million). In addition, an expense from corporation tax charges amounting to € 20 million resulted (2017: expense of € 56 million).

APPROPRIATION OF PROFITS

The profit distribution to be resolved upon by shareholders also defines the amount of that portion of net profit/loss freely available to E. Merck KG, Darmstadt, Germany. If the shareholders resolve to carry forward or to allocate to retained earnings a portion of net retained profit of Merck KGaA, Darmstadt, Germany, to which they are entitled, then E. Merck KG, Darmstadt, Germany, is obligated to allocate to the profit brought forward/retained earnings of Merck KGaA, Darmstadt, Germany, a comparable sum determined in accordance with the ratio of share capital to general partner's capital. This ensures that the retained earnings and the profit carried forward of Merck KGaA, Darmstadt, Germany, correspond to the ownership ratios of the shareholders on the one hand and E. Merck KG, Darmstadt, Germany, on the other hand. Consequently, for distributions to E. Merck KG, Darmstadt, Germany, only the amount is available that results after netting the profit transfer of Merck KGaA, Darmstadt, Germany, with the amount either allocated or withdrawn by E. Merck KG, Darmstadt, Germany, from retained earnings/profit carried forward. This amount corresponds to the amount that is paid as a dividend to the shareholders and reflects their pro rata shareholding in the company.

€ million	2018 E. Merck KG, Darmstadt, Germany	2018 Merck KGaA, Darmstadt, Germany	2017 E. Merck KG, Darmstadt, Germany	2017 Merck KGaA, Darmstadt, Germany
Net income	430	162	537	171
Profit carried forward previous year	60	25	39	16
Withdrawal from revenue reserves	–	–	–	–
Transfer to revenue reserves	–	–	–	–
Retained earnings Merck KGaA, Darmstadt, Germany		**187**		**187**
Withdrawal by E. Merck KG, Darmstadt, Germany	–430		–515	
Dividend proposal		–162		–162
Profit carried forward	**61**	**26**	**60**	**25**

For 2017, a dividend of € 1.25 per share was distributed. The dividend proposal for fiscal 2018 will again be € 1.25 per share, corresponding to a total dividend payment of € 162 million (2017: € 162 million) to shareholders. The amount withdrawn by E. Merck KG, Darmstadt, Germany, would amount to € 430 million (2017: € 515 million).

APPROPRIATION OF PROFITS AND CHANGES IN RESERVES

€ million	2018 Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany	2018 Merck KGaA, Darmstadt, Germany	2018 Total	2017 Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany	2017 Merck KGaA, Darmstadt, Germany	2017 Total
Profit transfer to E. Merck KG, Darmstadt, Germany	–62	–447	–509	–63	–548	–611
Profit transfer from E. Merck KG, Darmstadt, Germany	–	–7	–7	–	–5	–5
Changes in reserves	–	1	1	–	22	22
Profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves	**–62**	**–454**	**–515**	**–63**	**–531**	**–593**
Result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer adjusted for trade tax		–24			–16	
Profit transfer to E. Merck KG, Darmstadt, Germany/withdrawal by E.Merck KG, Darmstadt, Germany	**–62**	**–430**		**–63**	**–515**	

Based on the assumed appropriation of profits, the profit transfer to E. Merck KG, Darmstadt, Germany, for 2018, including changes in reserves, amounted to € –515 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ –447 million), the result transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ –7 million), the change in profit carried forward of E. Merck KG, Darmstadt, Germany, (€ 1 million) as well as the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ –62 million). For 2017 the profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves amounted to € –593 million. This consisted of the profit transfer to E. Merck KG,

Darmstadt, Germany (€ –548 million), the result transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany (€ –5 million), the change in profit carried forward of E. Merck KG, Darmstadt, Germany, (€ 22 million) as well as the profit transfer from Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ –63 million).

Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, is a partnership under Swiss law that is controlled by Merck KGaA, Darmstadt, Germany, but distributes its operating result directly to E. Merck KG, Darmstadt, Germany. This distribution is a payment to shareholders and is therefore also presented under changes in equity.

The proposed withdrawal of E. Merck KG, Darmstadt, Germany, in the amount of € 430 million (2017: € 515 million) results from the total amount of the profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves, and the result of E. Merck KG, Darmstadt, Germany, before reciprocal profit transfer.

NON-CONTROLLING INTERESTS

The calculation of non-controlling interests was based on the stated equity of the subsidiaries concerned after any adjustment required to ensure compliance with the accounting policies of the Group as well as pro rata consolidation entries.

The net equity and profit attributable to non-controlling interests mainly related to the minority interests in the publicly traded company P.T. Merck Tbk, Jakarta, Indonesia, a subsidiary of Merck KGaA, Darmstadt, Germany, and in Merck Ltd., Bangkok, Thailand, a subsidiary of Merck KGaA, Darmstadt, Germany. As part of the divestment of the Consumer Health business with effect from December 1, 2018, the shareholdings in the publicly traded company Merck Ltd., Mumbai, India, a subsidiary of Merck KGaA, Darmstadt, Germany, were also divested; as of December 31, 2018, therefore, non-controlling interests in this company are only included in profit after tax and no longer in equity.

OTHER CHANGES IN EQUITY

On the occasion of the 350th anniversary of the company in 2018, a promise of a one-time grant in the form of shares of Merck KGaA, Darmstadt, Germany, in the amount of € 350 was made to employees of the Group in Germany. For the grant of shares of Merck KGaA, Darmstadt, Germany, in 2018, the required shares were purchased on the stock market by a third party on behalf of the Group and then transferred to the eligible employees. New shares were not issued. In fiscal 2018, in accordance with IFRS 2, the award led to personnel expenses of € 4 million as well as to a decline in retained earnings of € 1 million. In the previous year, personnel expenses of € 1 million and a corresponding increase in retained earnings in equity were recognized; the latter was recorded in the item “other” in the consolidated statement of changes in net equity.

(37) Derivative financial instruments

The following derivatives were held by the Group as of the balance sheet date:

DEC. 31, 2018

	Nominal volume	
€ million	Current	Non-current
Cash flow hedge	**1,573**	**366**
Interest	–	–
Currency	1,573	366
No hedge accounting	**5,286**	**1,100**
Interest	–	1,100
Currency	5,286	–
Equity	–	–
	6,859	**1,466**

DEC. 31, 2017

	Nominal volume	
€ million	Current	Non-current
Cash flow hedge	**1,898**	**1,360**
Interest	–	–
Currency	1,898	1,360
No hedge accounting	**4,376**	**1,100**
Interest	–	1,100
Currency	4,376	–
Equity	–	–
	6,274	**2,460**

Derivative financial instruments in connection with financial transactions are shown in financial assets and liabilities. Derivative financial instruments in connection with transactions in operating business are shown in other assets and other liabilities. As in the previous year, all hedging relationships were recognized at a point in time.

Netting of derivatives from an economic perspective was possible due to the existing framework agreements on derivatives trading that the Group had entered into with commercial banks. Actual netting only takes place in the case of insolvency of the contract partner. Balance sheet netting of derivatives did not take place, as with other financial assets and financial liabilities.

Fair value/carrying amount							
Positive market values				Negative market values			
Financial transactions		Operative transactions		Financial transactions		Operative transactions	
Current	Non-current	Current	Non-current	Current	Non-current	Current	Non-current
–	**–**	**4**	**1**	**–**	**–**	**58**	**20**
–	–	–	–	–	–	–	–
–	–	4	1	–	–	58	20
16	**14**	**–**	**45**	**16**	**73**	**–**	**–**
–	14	–	–	–	73	–	–
16	–	–	–	16	–	–	–
–	–	–	45	–	–	–	–
16	**14**	**4**	**46**	**16**	**73**	**58**	**20**

Fair value/carrying amount							
Positive market values				Negative market values			
Financial transactions		Operative transactions		Financial transactions		Operative transactions	
Current	Non-current	Current	Non-current	Current	Non-current	Current	Non-current
–	**–**	**30**	**15**	**–**	**–**	**25**	**18**
–	–	–	–	–	–	–	–
–	–	30	15	–	–	25	18
9	**13**	**–**	**46**	**27**	**86**	**–**	**–**
–	13	–	–	–	86	–	–
9	–	–	–	27	–	–	–
–	–	–	46	–	–	–	–
9	**13**	**30**	**62**	**27**	**86**	**25**	**18**

The following table presents the potential netting volume of the reported derivative assets and liabilities:

€ million Dec. 31, 2018	Gross presentation	Netting	Net presentation	Potential netting volume due to master netting agreements	Potential netting volume due to financial collateral	Potential net amount
Derivative financial assets	80	–	80	29	–	51
Derivative financial liabilities	–168	–	–168	–29	–	–139

€ million Dec. 31, 2017	Gross presentation	Netting	Net presentation	Potential netting volume due to master netting agreements	Potential netting volume due to financial collateral	Potential net amount
Derivative financial assets	113	–	113	60	–	54
Derivative financial liabilities	–155	–	–155	–60	–	–96

The reserves for cash flow hedges and the cost of cash flow hedging of the Group applied to the following hedging instruments:

	Cost of hedging		Cash flow hedge		
€ million	Time value of options	Forward component of currency forwards	Intrinsic value of options	Spot component of currency forwards	Interest rate swaps
January 1, 2017	–		–	**–123**	**–68**
Adjustment due to mandatory retrospective adoption of IFRS 9[1]	3		–	–	–
January 1, 2017 (after adjustment)	**3**		**–**	**–123**	**–68**
Fair value adjustment (directly recognized in equity)	–5		5	85	–2
Reclassification to profit or loss	–		–	–1	13
Reclassification to assets	–		–	–	–
Tax effect	1		–2	–25	–4
December 31, 2017	**–1**		**3**	**–64**	**–60**
January 1, 2018	**–1**	**–**	**3**	**–64**	**–60**
Fair value adjustment (directly recognized in equity)	1	–48	–3	–68	–
Reclassification to profit or loss	–	5	–	38	14
Reclassification to assets	–	–	–	–	–
Tax effect	–	10	–	13	–1
December 31, 2018	**–**	**–33**	**1**	**–81**	**–47**

[1] Effect of the first-time application of IFRS 9, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

(38) Management of financial risks

Market fluctuations with respect to foreign exchange and interest rates represent significant profit and cash flow risks for the Group. The Group aggregates these Group-wide risks and steers them centrally, partly by using derivatives. The Group uses scenario analyses to estimate existing risks of foreign exchange and interest rate fluctuations. The Group is not subject to any material risk concentration from financial transactions.

The Group uses marketable forward exchange contracts, options and interest rate swaps as hedging instruments. The strategy to hedge interest rate and foreign exchange rate fluctuations arising from forecast transactions and transactions already recognized in the balance sheet is set by a risk committee, which meets on a regular basis. The use of derivatives is regulated by extensive guidelines and subject to constant risk controls by Group Treasury. Speculation is prohibited. A strict separation of functions between trading, settlement and control functions is ensured. Derivatives are only entered into with banks that have a good credit rating. Related default risks are continuously monitored.

The Report on Risks and Opportunities included in the combined management report provides further information on the management of financial risks.

FOREIGN EXCHANGE RISKS

Owing to its international business focus, the Group is exposed to transactional foreign exchange risks within the scope of both its business activities and financing activities. Foreign exchange risks are continuously analyzed and different hedging strategies used to limit or eliminate these risks. Foreign exchange risks from the following transactions are hedged through the use of forward exchange contracts and currency options:

- Forecast transactions in non-functional currency, the expected probability of which is very high for the next 36 months,
- Firm purchase commitments of the next 36 months in non-functional currency,
- Intragroup financing in non-functional currency as well as
- Receivables and liabilities against third parties in non-functional currency.

Forward exchange contracts are used to hedge foreign exchange risks arising from transactions already recognized in the balance sheet. Forecast transactions and firm purchase commitments in non-functional currency are hedged using forward exchange contracts and currency options which are due within the next 36 months.

The following table shows the net exposure and the effects of transactional exchange rate movements of the key currencies against the euro in relation to the net income and equity of the Group on the balance sheet date.

€ million Dec. 31, 2018		USD	CHF	CNY	TWD	JPY	KRW
Net exposure		**618**	**–274**	**741**	**153**	**132**	**163**
Exchange rate –10% (€ depreciation)	Consolidated income statement	–62	27	–74	–15	–13	–16
	Equity	–135	20	–9	–19	–11	–14
Exchange rate +10% (€ appreciation)	Consolidated income statement	62	–27	74	15	13	16
	Equity	110	–16	8	15	10	12

€ million Dec. 31, 2017		USD	CHF	CNY	TWD	JPY	KRW
Net exposure		**1,215**	**–184**	**449**	**135**	**75**	**115**
Exchange rate –10% (€ depreciation)	Consolidated income statement	–122	18	–45	–14	–8	–12
	Equity	–172	39	–44	–38	–19	–18
Exchange rate +10% (€ appreciation)	Consolidated income statement	122	–18	45	14	8	12
	Equity	147	–31	36	31	17	15

In this presentation, effects of cash flow hedges are taken into consideration in the equity of the Group. The net exposure of each of the aforementioned currencies consisted of the following components:

- Planned cash flows in the next 12 months in the respective currency as well as
- Derivatives to hedge these planned cash flows, usually at a hedging ratio of 30% – 70%.

Balance sheet items in the aforementioned currencies were economically hedged in full in both 2018 and 2017 by derivatives if they did not correspond to the functional currency of the respective company.

Accordingly, they do not affect the net exposure presented above. The impact of cash flow hedge accounting for forecasted transactions in foreign currency on the Group's net assets and results of operations was as follows for the major currencies:

€ million Dec. 31, 2018	USD	CHF	CNY	TWD	JPY	KRW
Notional amount	1,180	178	85	169	125	129
thereof: current	1,055	125	85	122	101	85
thereof: non-current	125	53	–	47	24	44
Fair value of the hedging instrument	–49	–2	–5	–8	–	–10
thereof: positive market value (asset)	–	2	–	–	3	–
thereof: negative market value (liability)	–49	–3	–5	–8	–3	–10
Maturity date	January 2019 – December 2020	January 2019 – December 2020	January 2019 – December 2019	January 2019 – December 2020	January 2019 – December 2020	January 2019 – January 2021
Hedge ratio[1]	1:1	1:1	1:1	1:1	1:1	1:1
Change in value of outstanding hedging instruments since January 1, 2018	–58	5	–3	–3	–6	–7
Change in value of hedged item used to determine hedge effectiveness since January 1, 2018	58	–5	3	3	6	7
Weighted average hedged rate for the year (including forward points)	1.22	1.12	8.48	36.68	126.74	1,397.39

[1] The hedging instruments and the corresponding hedged items were denominated in the same currency, therefore the hedge ratio was 1:1.

In addition to the previously described transactional foreign exchange risks, the Group was exposed to currency translation risks since many of the subsidiaries of Merck KGaA, Darmstadt, Germany, were located outside the eurozone and had functional currencies other than the reporting currency. Exchange differences resulting from translation of the assets and liabilities of these companies into euros, the reporting currency, are recognized in equity.

INTEREST RATE RISKS

The Group's net exposure to interest rate changes comprised the following:

€ million	**Dec. 31, 2018**	Dec. 31, 2017
Short-term or variable interest rate monetary deposits	2,196	684
Short-term or variable interest rate monetary borrowings	–2,465	–3,641
Net interest rate exposure	**–269**	**–2,957**

The effects of a parallel shift in the yield curve by +100 or –100 basis points on the consolidated income statement as well as on equity relative to all short-term or variable monetary deposits and monetary borrowings within the scope of IAS 32, except contingent considerations, are presented in the following table. In the event of a downward shift, the interest rate for instruments subject to a contractual interest rate floor of zero percent was limited accordingly.

€ million	2018		2017	
Change in market interest rate	**+100 basis points**	**–100 basis points**	**+100 basis points**	**–100 basis points**
Effects on consolidated income statement	6	–9	–26	16
Effects on equity	–	–	–	–

SHARE PRICE RISKS

The shares in publicly listed companies amounting to € 134 million (December 31, 2017: € 16 million) are generally exposed to a risk of fluctuations in fair value. A 10% change in the value of the stock market would impact equity by € 13 million (December 31, 2017: € 2 million). This change in value would be recognized in equity.

LIQUIDITY RISKS

The risk that the Group cannot meet its payment obligations resulting from financial liabilities, is limited by establishing the required financial flexibility and by Group-wide cash management. Information on issued bonds and other sources of financing can be found in Note (35) "Financial liabilities/capital management".

Liquidity risks are monitored and reported to management on a regular basis.

The following liquidity risk analysis presents the contractual cash flows such as repayments and interest on financial liabilities and derivative financial instruments with a negative fair value:

		Cash flows <1 year		**Cash flows 1–5 years**		**Cash flows >5 years**	
€ million Dec. 31, 2018	Carrying amount	Interest	Repayment	Interest	Repayment	Interest	Repayment
Subsequent measurement at amortized cost							
Bonds and commercial paper	7,286	208	984	458	4,430	85	1,899
Bank loans	620	17	369	2	250	–	–
Trade accounts payable	1,766	–	1,766	–	–	–	–
Liabilities to related parties	1,335	–	1,335	–	–	–	–
Other financial liabilities	522	–	508	–	13	–	
Loans from third parties and other financial liabilities	67	1	17	3	50	–	–
Subsequent measurement at fair value through profit or loss							
Contingent considerations	5	–	1	–	4	–	–
Derivatives without a hedging relationship	90	15	16	45	–	–	–
Derivatives with a hedging relationship	**78**	**–**	**58**	**–**	**20**	**–**	**–**
Refund liabilities	**472**	**–**	**472**	**–**	**–**	**–**	**–**
Finance lease liabilities	**4**	**–**	**2**	**–**	**2**	**–**	**–**
	12,244	**241**	**5.528**	**508**	**4,769**	**85**	**1,899**

€ million Dec. 31, 2017	Carrying amount	Cash flows <1 year		Cash flows 1–5 years		Cash flows >5 years	
		Interest	Repayment	Interest	Repayment	Interest	Repayment
Bonds and commercial paper	8,213	210	1,171	590	5,234	143	1,839
Bank loans	1,653	18	803	4	850	–	–
Trade accounts payable	2,195	–	2,195	–	–	–	–
Liabilities to related parties	1,352	–	1,352	–	–	–	–
Other financial liabilities	474	–	453	–	21	–	–
Loans from third parties and other financial liabilities	73	1	19	4	54	–	–
Liabilities from derivatives	155	15	52	59	18	–	–
Finance lease liabilities	4	–	1	–	2	–	–
	14,120	**243**	**6,046**	**657**	**6,179**	**143**	**1,839**

CREDIT RISKS

Credit risk for the Group means the risk of a financial loss if a customer or other contract partner is not able to meet its contractual payment obligations. The Group is generally exposed to credit risks from existing trade accounts receivable other debt instruments, derivatives and contract assets.

According to IFRS 9, there is a rebuttable presumption that the credit risk has increased significantly when contractual payments are more than 90 days past due. The Group therefore analyzes all financial assets that are more than 90 days past due and examines whether there is objective evidence of impairment requiring additional risk provisions.

If the financial asset is subject to a significant default risk, the impairment booked for the expected credit risks is increased accordingly. A default generally exists when the debtor cannot fully meet its liabilities. By contrast, a debtor's creditworthiness is assumed to be impaired if there are objective indications of the debtor being in financial difficulties, such as the disappearance of an active market for its products or impending insolvency.

The Group derecognizes an asset if the likelihood of receiving payments from the debtor in question is considered to be negligible. In such a case the Group does not expect any material payments from derecognized assets. The Group does, however, also use legal means to recognize the existing entitlement to payment where possible.

On the balance sheet date, the theoretical maximum default risk corresponded to the net carrying amounts less any compensation from credit insurance.

The following table shows impairments for financial assets and contract assets as well as gains from their release recognized in the consolidated income statement for fiscal year 2018:

	2018
Impairment losses	**–77**
of trade accounts receivable	–75
of debt instruments subsequently measured at amortized cost	–2
of debt instruments subsequently measured at fair value through other comprehensive income	–
Reversal of impairment losses	**105**
of trade accounts receivable	69
of debt instruments subsequently measured at amortized cost	35
of debt instruments subsequently measured at fair value through other comprehensive income	–
Net impairment losses on financial assets	**27**

The above-described impairments for trade accounts receivable applied entirely to receivables resulting from contracts with customers. Reversals of impairment losses on debt instruments subsequently measured at amortized cost mainly related to an other receivable from a final payment in connection with the generics business divested in 2007.

Credit risks from trade accounts receivable

The credit risk from trade accounts receivable is largely impacted by the specific circumstances of individual customers. The Group also takes into account additional factors such as the general default risk in the respective industry and country in which the customer operates.

The credit risk of customers is monitored using established credit management processes that take the individual customer risks into account. This is done in particular by analyzing the aging structure of trade accounts receivable. The Group continuously reviews and monitors open positions of all trading partners in the corresponding countries and takes risk-mitigating measures if necessary. If there is objective evidence that particular trade accounts receivable are fully or partially impaired, additional loss allowances are recognized to provide for expected credit defaults. The customer groups with comparable default risks to be taken into account are determined at the Group in accordance with the business sectors and location of the respective customers. Current macroeconomic expectations are also considered by taking into account country-specific ratings. For risk management purposes, the Group groups the existing trade accounts receivable based partly on the business sectors, as the customers' risk profiles within the respective business sector are regarded as comparable, and partly on credit ratings in the respective countries in which the Group operates and from which the receivables originate. The table below contains an overview of the credit risk by business sector and country rating as of December 31, 2018:

Dec. 31, 2018 € million	Healthcare	Life Science	Performance Materials	**Group**
External credit rating at least AA– (rating agency Standard & Poor's) or Aa3 (rating agency Moody's)	856	827	437	2,120
External credit rating at least BBB– (rating agency Standard & Poor's) or Baa3 (rating agency Moody's)	252	146	21	420
External credit rating lower than BBB– (rating agency Standard & Poor's) or Baa3 (rating agency Moody's)	427	36	2	465
Trade accounts receivable before impairment losses	**1,535**	**1,010**	**460**	**3,004**

Goods were generally sold under retention of title so that a reimbursement claim exists in the event of default. Other guarantees generally were not demanded. The scope of credit-insured receivables was immaterial for the Group.

Impairments based on expected credit losses for trade accounts receivable as of December 31, 2018, were as follows:

Dec. 31, 2018 € million	Not yet due	Overdue by 90 days	Overdue by 180 days	Overdue by 360 days	More than 360 days past due	**Total**
Expected loss rate	0.5%	0.8%	3.3%	34.8%	53.1%	
Trade accounts receivable before loss allowances	2,415	399	60	66	64	3,004
thereof: credit impaired	2	1	2	16	30	51
Loss allowances	**–12**	**–3**	**–2**	**–23**	**–34**	**–73**
thereof: credit impaired	–1	–	–	–14	–29	–44

As of January 1, 2018, the date of first-time application of the impairment rules amended through IFRS 9, impairments based on expected credit losses for trade accounts receivable were as follows:

Jan. 1, 2018 € million	Not yet due	Overdue by 90 days	Overdue by 180 days	Overdue by 360 days	More than 360 days past due	**Total**
Expected loss rate	0.9%	1.3%	6.0%	14.1%	93.3%	
Trade accounts receivable before loss allowances	2,408	402	61	45	360	3,277
thereof: credit impaired	–	4	7	12	336	359
Loss allowances	**–22**	**–5**	**–4**	**–6**	**–336**	**–373**
thereof: credit impaired	–	–1	–2	–6	–325	–334

The corresponding loss allowances in 2018 developed as follows:

	Loss allowances of trade accounts receivable
December 31, 2017 – IAS 39	**–367**
Adjustment on initial application of IFRS 9	–6
January 1, 2018 – IFRS 9	**–373**
Additions	–75
Utilizations	308
Reversals	69
Classification as held for sale or transfer to disposal group	4
Currency effects	–7
Change in scope of consolidation	1
December 31, 2018	**–73**

The Group utilized a recognized impairment loss of € 299 million in 2018 in connection with loss allowances established on trade accounts receivable from the Venezuelan subsidiary, as the probability of receiving payments was considered to be minimal. The Venezuelan subsidiary was deconsolidated in fiscal year 2016 due to the absence of the possibility of exercising control.

The maturity structure of the carrying amounts of trade accounts receivable as of December 31, 2017, was as follows:

€ million	Dec. 31, 2017
Neither past due nor impaired	2,391
Past due, but not impaired	
up to 3 months	392
up to 6 months	50
up to 12 months	32
up to 24 months	7
over 2 years	1
Impaired	51
Trade accounts receivable	**2,923**

The corresponding impairment in the previous year developed as follows:

€ million	2017
January 1	**–464**
Additions	–39
Reversals/utilizations	99
Currency translation and other changes	37
December 31	**–367**

In fiscal 2017, previously recognized impairments were reversed as a result of the improved solvency of customers, particularly in the Middle East.

SIGNIFICANT MANAGEMENT JUDGEMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – IMPAIRMENT OF TRADE ACCOUNTS RECEIVABLE AND CONTRACT ASSETS

In terms of the impairment of trade accounts receivable and of contract assets there is significant discretion and estimation uncertainty when it comes to

- the identification of customer groups with identical default risks,
- the identification of a substantial increase in the credit risk and
- the calculation of the expected credit losses.

If the impairment of trade accounts receivable and contract assets had been 10% higher in 2018, profit before income tax would have been € 8 million lower.

Credit risks from other financial assets

As investments in debt instruments either subsequently measured at amortized cost or at fair value through other comprehensive income were largely classified as low-risk investments, the expected credit loss in the next 12 months was used as the sole basis for calculating the impairment loss on these debt instruments. For financial assets with only a minimal default risk, the rules concerning the mandatory establishment of a risk provision for the expected credit loss over the full term were not observed at the time of addition or during subsequent measurement. It was therefore not assessed whether there had been a significant increase in the credit risk for such assets. The Group does not presume an increased credit risk as of the balance sheet date if the contract partner has an investment grade rating. If there were indications that the debtor's creditworthiness had worsened but that this was not yet reflected in its existing credit rating, the credit risk assessment was adjusted and the impairments established for expected credit losses were increased. In all other cases, no new risk assessment was undertaken as of the balance sheet date and the initially assumed risk profile was maintained.

Wherever the Group presumes a considerable increase in the default risk, the expected credit loss over the full term of the financial asset is taken into account.

The Group limits credit risks from other financial assets by concluding contracts only with contract partners whose creditworthiness is good. The credit risk from financial contracts is monitored daily on the basis of rating information as well as market information on credit default swap rates.

In the previous year, impairment losses were recognized for investments in companies and other non-current financial assets held for sale in a total amount of € 14 million. Positive and negative fair value adjustments recognized in equity offset each other in the previous year.

(39) Information on fair value measurement

The following table presents the carrying amounts and the fair values of the individual financial assets and liabilities as of December 31, 2018, for each individual financial instrument class pursuant to IFRS 9:

	Carrying amount			Fair value[1]			
€ million Dec. 31, 2018	Current	Non-current	**Total**	Fair value determined by official prices and quoted market values (Level 1)	Fair value determined using inputs observable in the market (Level 2)	Fair value determined using inputs unobservable in the market (Level 3)	**Total**
Financial assets							
Subsequent measurement at amortized cost							
Cash and cash equivalents	2,170	–	2,170				
Trade accounts receivable (excluding leasing receivables)	2,909	–	2,909				
Other debt instruments	296	26	322				
Subsequent measurement at fair value through other comprehensive income							
Equity instruments	–	274	274	17	118	140	274
Trade accounts receivable	21	–	21	–	–	21	21
Other debt instruments	8	4	12	12	–	–	12
Subsequent measurement at fair value through profit or loss							
Equity instruments	–	–	–	–	–	–	–
Contingent considerations	–	259	259	–	–	259	259
Other debt instruments	–	50	50	2	22	27	50
Derivatives without a hedging relationship	16	59	76	–	30	45	76
Derivatives with a hedging relationship	4	1	4	–	4	–	4
Finance lease receivables (measured in accordance with IAS 17)[2]	1	–	1				
Total	**5,425**	**673**	**6,098**	**30**	**174**	**492**	**696**
Financial liabilities							
Subsequent measurement at amortized cost							
Trade accounts payable	1,766	–	1,766				
Other financial liabilities	3,215	6,615	9,830	7,258	2,677	–	9,935
Subsequent measurement at fair value through profit or loss							
Contingent considerations	1	4	5	–	–	5	5
Derivatives without a hedging relationship	16	73	90	–	90	–	90
Derivatives with a hedging relationship	58	20	78	–	78	–	78
Refund liabilities	472	–	472				
Finance lease liabilities (measured in accordance with IAS 17)[2]	2	2	4				
Total	**5,530**	**6,714**	**12,244**	**7,258**	**2,845**	**5**	**10,108**

[1] The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.
[2] Measurements within the scope of IAS 17 are exempted from the requirements of IFRS 13 (IFRS 13.6(b)).

The following table presents the carrying amounts and the fair values for each individual class of financial instrument as of December 31, 2017, pursuant to IAS 39:

		Subsequent measurement according to IAS 39					
€ million Dec. 31, 2017	**Carrying amount**	Amortized cost	At cost	Fair value	Carrying amount according to IAS 17[2]	Non-financial items	**Fair value, Dec. 31, 2017[1]**
Assets							
Cash and cash equivalents	589	589	–	–	–	–	
Current financial assets	90	47	–	44	–	–	
Held for trading (non-derivatives)	–	–	–	–	–	–	–
Derivatives without a hedging relationship	9	–	–	9	–	–	9
Held to maturity	–	–	–	–	–	–	
Loans and receivables	47	47	–	–	–	–	
Available for sale	35	–	–	35	–	–	35
Derivatives with a hedging relationship	–	–	–	–	–	–	–
Trade accounts receivable	2,923	2,923	–	–	–	–	
Loans and receivables	2,923	2,923	–	–	–	–	
Other current and non-current assets	936	276	–	92	–	568	
Derivatives without a hedging relationship	46	–	–	46	–	–	46
Loans and receivables	276	276	–	–	–	–	
Derivatives with a hedging relationship	45	–	–	45	–	–	45
Non-financial items	568	–	–	–	–	568	
Non-current financial assets	444	12	4	429	–	–	
Derivatives without a hedging relationship	13	–	–	13	–	–	13
Held to maturity	–	–	–	–	–	–	
Loans and receivables	12	12	–	–	–	–	
Available for sale	420	–	4	416	–	–	416
Derivatives with a hedging relationship	–	–	–	–	–	–	–
Liabilities							
Current and non-current financial liabilities	10,823	10,707	–	113	4	–	
Derivatives without a hedging relationship	113	–	–	113	–	–	113
Other financial liabilities	10,707	10,707	–	–	–	–	11,074
Derivatives with a hedging relationship	–	–	–	–	–	–	–
Liabilities from finance leases	4	–	–	–	4	–	
Trade accounts payable	2,195	2,195	–	–	–	–	
Other financial liabilities	2,195	2,195	–	–	–	–	
Current and non-current other liabilities	2,529	1,059	–	43	–	1,427	
Derivatives without a hedging relationship	–	–	–	–	–	–	–
Other financial liabilities	1,059	1,059	–	–	–	–	
Derivatives with a hedging relationship	43	–	–	43	–	–	43
Non-financial items	1,427	–	–	–	–	1,427	

[1] The simplification option under IFRS 7.29(a) was used for disclosures of certain fair values.
[2] Measurement within the scope of IAS 17 are exempted from the requirements of IFRS 13 (IFRS 13.6(b)).

The determination of the fair values of financial assets and liabilities is presented in the following table:

DEC. 31, 2018

€ million

		Fair Value			
Fair value determined by official prices and quoted market values (Level 1)	**Financial instruments concerned**	Financial assets	Financial liabilities	**Description of the measurement technique**	**Main input factors used to determine fair values**
Equity instruments	Shares (equity investments in listed companies)	17			
Debt instruments (subsequent measurement through other comprehensive income)	Bonds	12		Derivation from active market	Quoted prices in an active market
Debt instruments (subsequent measurement through profit or loss)	Publicly-traded funds	2			
Other financial liabilities (subsequent measurement at amortized cost)	Bonds		7,258		
Total		**30**	**7,258**		
Fair value determined using input factors observable in the market (Level 2)					
Equity instruments	Shares (equity investments in listed companies)	118		Derivation from active market considering liquidity discount	Quoted prices in an active market and volatilities observable on the market
Debt instruments (subsequent measurement through profit or loss)	Convertible note with conversion right to shares in companies	22		Nominal value considering liquidity discount	Volatilities observable on the market
Derivatives (with or without a hedging relationship)	Forward exchange contracts and currency options	21	95	Use of recognized actuarial methods	Spot and forward rates observable on the market as well as exchange rate volatilities
	Interest rate swaps	14	73		Interest rate curves available on the market
Other financial liabilities (subsequent measurement at amortized cost)	Liabilities to banks and other loan liabilities		2,677	Discounting of future cash flows	Interest rates obervable on the market
Total		**174**	**2,845**		

DEC. 31, 2018

€ million

Fair value determined using input factors unobservable in the market (Level 3)	Financial instruments concerned	Fair Value: Financial assets	Fair Value: Financial liabilities	Description of the measurement technique	Main input factors used to determine fair values
Equity instruments	Equity interests in unlisted companies	10		Discounting of expected future cash flows	Expected cash flows from recent business planning, average cost of capital, expected long-term growth rate
		129		Derived from observable prices within the scope of equity refinancing sufficiently close to the balance sheet date	Observable prices derived from equity refinancing
		1		Cost-based determination	Acquisition cost
Trade accounts receivable	Trade accounts receivable that are intended for sale due to a factoring agreement	21		Nominal value less factoring fees	Nominal value of potentially sold trade accounts receivable, average fees for sales of trade accounts receivable
Derivatives (without hedging relationship)	Option on equity instruments in an unlisted company	45	–	Option pricing models	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
Contingent considerations	Contingent considerations from the sale and purchase of businesses or shares in corporations	259	5	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
Other debt instruments	Interests in unlisted funds	19		Taking into account the fair value of the companies in which the funds are invested	Net asset values of the fund interests
	Bond with embedded settlement option for equity in a unlisted company	7		Used of standard market valuation models	Market observable interest rates
Total		**492**	**5**		

DEC. 31, 2017

€ million

		Fair Value			
Fair value determined by official prices and quoted market values (Level 1)	**Financial instruments concerned**	Financial assets	Financial liabilities	**Description of the measurement technique**	**Main input factors used to determine fair values**
Classified as available for sale	Shares (equity investments in listed companies)	16		Derived from active market	Quoted prices in an active market
	Bonds, investment funds	35			
	Publicly-traded funds	2			
Classified as other liabilities	Bonds		7,719		
Total		**53**	**7,719**		
Fair value determined using input factors observable in the market (Level 2)					
Derivatives with and without a hedging relationship	Forward exchange contracts and currency options	54	70	Use of recognized actuarial methods	Spot and forward rates observable on the market and exchange rate volatilities
	Interest rate swaps	13	86		Interest rate curves available on the market
Classified as other Liabilities	Liabilities to banks and other loan liabilities		3,355	Discounting of future cash flows	Market observable interest rates
Total		**67**	**3,511**		

DEC. 31, 2017

€ million

Fair Value determined using input factors unobservable on the market (Level 3)	Financial instruments concerned	Fair Value: Financial assets	Fair Value: Financial liabilities	Description of the measurement technique	Main input factors used to determine fair values
Classified as available for sale/ classified as other liabilities	Equity investements in unlisted companies	6		Discounting of expected future cash flows	Expected cash flows from recent business planning, average cost of capital, expected long-term growth rate
		96		Derived from observable prices within the scope of equity refinancing sufficiently close to the balance sheet date	Observable prices derived from equity refinancing
	Contingent considerations from the sale and purchase of businesses or shares in corporations	277	3	Discounting of probability-weighted future milestone payments and license fees	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
	Interests in unlisted funds	18		Taking into account the fair value of the companies in which the funds are invested	Net asset values of the fund interests
Derivatives without a hedging relationship	Option on equity instruments in an unlisted company	46	–	Option pricing models	Sales planning, milestone payments, probabilities of regulatory and commercial events, discount rates
Total		**443**	**3**		

Counterparty credit risk was taken into consideration for all valuations of financial instruments. In the case of non-derivative financial instruments, such as other liabilities or interest-bearing securities, this was reflected using risk premiums on the discount rate, while discounts on market value (so-called credit valuation adjustments and debit valuation adjustments) were used for derivatives.

The planning periods used to determine the fair value of equity investments in unlisted companies ranged from two to eight years. Cash flows for periods in excess of this are included in the terminal value calculation using long-term growth rates of between 0.5% and 2.0% (December 31, 2017: 0.5%). The applied average cost of capital (after tax) was 7.0% on December 31, 2018 (December 31, 2017: 7.0%)

SIGNIFICANT MANAGEMENT JUDGMENTS AND SOURCES OF ESTIMATION UNCERTAINTY – CONTINGENT CONSIDERATIONS

The fair values of contingent considerations were calculated by weighting the expected future milestone payments and royalties using their probability of occurrence and discounting them. This calculation is subject to judgment to a high degree. The main parameters when determining contingent considerations represent

- the estimated probability of occurrence of the individual milestone events,
- the sales planning assumed to derive royalties and
- the discount rate used.

When determining the probability of occurrence of the individual milestone events in connection with the development of drug candidates, the focus was on empirically available probabilities of success of development programs in comparable phases of clinical development in the relevant therapeutic areas. To determine the sales planning, internal sales plans and sales plans of external industry services were used. The discount rate (after tax) of between 6.3% and 7.3% (December 31, 2017: 6.5% to 7.6%) was calculated using the weighted average cost of capital.

The most significant contingent consideration was the future purchase price claim from the disposal of the Biosimilars business. It was calculated by an external valuation expert on conclusion of the transaction in 2017. As of December 31, 2018, the carrying amount was € 196 million (December 31, 2017: € 228 million). If, in the context of determining the fair value of this contingent consideration at the date of transaction, the probability of approval as well as the discount factor of the three major development programs had been estimated to be lower or higher to the extent presented below, this would have led to the following changes in the measurement and the corresponding effects on the profit before income tax as of December 31, 2018:

		Change in probability of regulatory approval		
€ million		–10%	unchanged	10%
Change of discount rate	5.8%	–34	5	45
	unchanged (6.3%)	–38	0	38
	6.8%	–42	–5	32

A change in the main input parameters used for the measurement of the other contingent compensations would not have had a material impact on profit before income tax.

The changes in financial assets and liabilities for each of the individual categories of financial instruments allocated to Level 3 and measured at fair value were as follows:

		Financial assets						Financial liabilities
		Subsequent measurement at fair value through profit or loss				Subsequent measurement at fair value through other comprehensive income		Subsequent measurement at fair value through profit or loss
€ million		Equity instruments	Other debt instruments	Contingent considerations	Derivatives without a hedging relationship	Equity instruments	Trade accounts receivable	Contingent considerations
Net carrying amounts, December 31, 2017 (IAS 39)	**440**	**18**	**–**	**277**	**46**	**102**	**–**	**–3**
Adjustment on initial application of IFRS 9	7	–18	21	–	–	4	–	–
Net carrying amounts, January 1, 2018 (IFRS 9)	**447**	**–**	**21**	**277**	**46**	**106**	**–**	**–3**
Additions due to acquisitions/divestments/ conclusion of factoring agreements	105	–	15	8	–	33	49	–
Transfers into Level 3 out of Level 1/Level 2	–	–	–	–	–	–	–	–
Fair value changes								
Gains (+)/losses (–) recognized in profit or loss	–7	–	2	–7	–1		–	–1
thereof: other operating result	–31	–	–1	–29	–		–	–1
thereof: attributable to assets/liabilities held as of the balance sheet date	–37	–	–1	–36	–		–	–1
thereof: financial result	24	–	3	22	–1		–	–
thereof: attributable to assets/liabilities held as of the balance sheet date	24	–	3	22	–1		–	–
Gains (+)/losses (–) recognized in other comprehensive income	30					30	–	
Currency translation	1	–	1	–	–	–	–	–
Disposals due to divestments/ payments received	–80	–	–4	–20	–	–29	–28	–
Transfers out of Level 3 into Level 1/Level 2	–9	–	–	–	–	–9	–	–
Other	–	–	–8	–	–	8	–	–
Net carrying amounts, December 31, 2018 (IFRS 9)	**487**	**–**	**27**	**259**	**45**	**140**	**21**	**–5**

Additions during the reporting period comprised particularly acquisitions of equity investments by Merck Ventures B.V., Amsterdam, Netherlands, a subsidiary of Merck KGaA, Darmstadt, Germany, trade accounts receivable that are designated to be sold on account of a factoring agreement as well as bonds with a conversion right for shares in unlisted companies. Disposals during the reporting period related particularly to divestments of equity investments by Merck Ventures B.V., Amsterdam, Netherlands, a subsidiary of Merck KGaA, Darmstadt, Germany, as well as payments received in connection with the contingent consideration from the sale of the Biosimilars business. Transfers from Level 3 to Level 1 comprised the now listed equity investment Translate Bio Inc., United States. The gains and losses from Level 3 assets recognized in other comprehensive income were reported in the consolidated statement of comprehensive income under the item "fair value adjustments".

		Financial assets			Financial liabilities	
€ million	**Total**	Available-for-sale financial assets	thereof: contingent considerations	Derivatives without a hedging relationship	Other liabilities	thereof: contingent considerations
Net carrying amounts, January 1, 2017 (IAS 39)	**74**	**75**	**50**	**–**	**–1**	**–1**
Additions as result of acquisitions/divestments	302	258	228	46	– 2	– 2
Transfers to Level 3 from previous measurement at cost/Level 1/Level 2	68	68	–	–	–	–
Fair value changes						
Gains (+)/losses (–) recognized in profit or loss	– 6	– 6	–	–	–	–
thereof: other operating result	– 9	– 9	– 4	–	–	–
thereof: attributable to assets/liabilities held as of the balance sheet date	– 9	– 9	– 4	–	–	–
thereof: financial result	3	3	3	–	–	–
thereof: attributable to assets/liabilities held as of the balance sheet date	3	3	3	–	–	–
Gains (+)/losses (–) recognized in other comprehensive income	5	5	–1	–	–	–
Currency translation	– 2	– 2	–	–	–	–
Disposals due to divestments	–1	–1	–	–	–	–
Transfers out of Level 3 into Level 1/Level 2	–	–	–	–	–	–
Net carrying amounts, December 31, 2017 (IAS 39)	**440**	**397**	**277**	**46**	**–3**	**–3**

The following equity instruments measured at fair value through other comprehensive income were disposed of in fiscal year 2018:

2018 € million Equity instrument[1]	Reasons for the disposal	Fair value at the date of disposal	The cumulative gain (+) or loss (–) on disposal included in other comprehensive income	Transfers of the cumulative gain (+) or loss (–) within group equity in retained earnings
M Ventures portfolio companies	Portfolio adjustments and acquisitions	40	32	32
Cascadian Therapeutics, Inc., United States	Acquired by Seattle Genetics, Inc., United States	–	–17	–17
Nature's Best Health Products Ltd., United Kingdom	Sale of Consumer Health business to Procter & Gamble Company, United States	–	–	–

[1] Disposals due to liquidations are not included.

The M Ventures portfolio companies that were disposed of are Prexton Therapeutics SA, Switzerland, ObsEva SA, Switzerland, and F-Star Gamma Limited, United Kingdom.

(40) Other financial obligations

Other financial obligations comprised the following:

€ million	Dec. 31, 2018	Dec. 31, 2017
Acquisition of intangible assets and due to collaboration agreements	2,763	3,328
Acquisition of property, plant and equipment	144	151
Operating lease	577	530
Long-term purchase commitments	150	236
Remaining other financial obligations	52	63
Other financial obligations	**3,686**	**4,308**

Obligations to acquire intangible assets existed in particular owing to contingent considerations within the scope of in-licensing and research and development collaborations. In these agreements the Group has entered into an obligation to make milestone payments once specific targets have been reached. In the not very likely event that all contract partners achieve all milestones, the Group would be obligated to pay up to € 1,548 million (December 31, 2017: € 1,968 million) for the acquisition of intangible assets. The table above does not contain other financial obligations from possible future sales-based license fees and milestone payments.

Moreover, within the scope of collaboration agreements, individual research and development or commercialization budgets were contractually set, upon the basis of which collaboration partners can commit the Group to make payments in the amount of up to € 1,215 million (2017: € 1,360 million)

The expected maturities of these obligations were as follows:

€ million	Dec. 31, 2018	Dec. 31, 2017
Obligations to acquire intangible assets and from collaboration agreements		
within one year	266	247
in 1–5 years	1,255	1,572
more than 5 years	1,242	1,509
	2,763	**3,328**

Other financial obligations were recognized at nominal value.

The maturities of liabilities from lease agreements were as follows:

€ million Dec. 31, 2018	Within 1 year	1–5 years	More than 5 years	Total
Present value of future payments from finance leases	2	2	–	4
Interest component of finance leases	–	–	–	–
Future finance lease payments	**2**	**2**	**–**	**4**
Future operating lease payments	**131**	**308**	**138**	**577**

€ million Dec. 31, 2017	Within 1 year	1–5 years	More than 5 years	Total
Present value of future payments from finance leases	1	2	–	4
Interest component of finance leases	–	–	–	–
Future finance lease payments	**1**	**3**	**–**	**4**
Future operating lease payments	**137**	**287**	**106**	**530**

Operating leasing agreements related mainly to leasing arrangements to lease real estate, vehicles as well as operating and office equipment. The payments resulting from operating leasing agreements amounted to € 153 million (2017: € 146 million) and were recorded as an expense in the reporting period.

(41) Net cash flows from financing activities

The change in financial debt was as follows:

€ million	Jan. 1, 2018	Cash inflows	Repayments	Changes in scope of consolidation	Currency translation	Fair value changes	Other	Dec. 31, 2018
Bonds	7,375	–	–323	–	121	–	–	7,173
thereof: current	335	–	–323	–	–12	–	869	869
thereof: non-current	7,040	–	–	–	133	–	–869	6,304
Liabilities to related parties	765	375	–319	–	–	–	–	821
Other current and non-current financial liabilities[1]	2,687	32	–1,821	–	–2	5	–	902
Financial liabilities[1]	**10,827**	**407**	**–2,463**	**–**	**119**	**5**	**–**	**8,896**

[1] Values effective January 1, 2018, have been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

€ million	Jan. 1, 2017	Cash inflows	Repayments	Changes in scope of consolidation	Currency translation	Fair value changes	Other	Dec. 31, 2017
Bonds	8,731	–	–932	–	–425	–	–	7,375
thereof: current	937	–	–932	–	–25	–	354	335
thereof: non-current	7,794	–	–	–	–400	–	–354	7,040
Liabilities to related parties	729	349	–314	–	–	–	–	765
Other current and non-current financial liabilities	3,136	147	–546	–	–38	–16	–	2,683
Financial liabilities	**12,597**	**497**	**–1,792**	**–**	**–463**	**–16**	**–**	**10,823**

"Other changes" relate to the reclassification of bonds owing to a change from long-term to short-term.

In 2017, the repayment of other current and non-current financial debt mainly related to the repayment of liabilities to finance the acquisition of the Sigma-Aldrich Corporation, United States. The repayment of the remaining current and non-current financial debt in the consolidated cash flow statement includes cash changes in assets from derivatives that are not contained in the changes noted above.

The amount of undrawn borrowing facilities that could be tapped for future operating activities and to meet obligations is disclosed in Note (35) "Financial liabilities/capital management".

Other Disclosures

(42) Related-party disclosures

Related parties in respect of the Group are E. Merck KG, Darmstadt, Germany, Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, and E. Merck Beteiligungen KG, Darmstadt, Germany. Furthermore, direct or indirect subsidiaries of Merck KGaA, Darmstadt, Germany, associates of the Group, jointly controlled companies where the Group is involved, as well as pension funds that are classified as defined benefit plans in accordance with IAS 19 are also related parties within the meaning of IAS 24. Members of the Executive Board and the Supervisory Board of Merck KGaA, Darmstadt, Germany, the Executive Board and the Board of Partners of E. Merck KG, Darmstadt, Germany, as well as close members of their families are also related parties, as are companies controlled by this group of persons.

As of December 31, 2018, there were liabilities by Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck KGaA, Darmstadt, Germany, and Merck & Cie, Altdorf, Switzerland, to E. Merck KG, Darmstadt, Germany, in the amount of € 1,331.6 million (December 31, 2017: € 1,349.2 million). The balances result mainly from mutual profit transfers between Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany, as well as the profit transfer by Merck & Cie, Altdorf, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany. These included financial liabilities of € 820.8 million (December 31, 2017: € 764.8 million), which were subject to standard market interest rates. As of December 31, 2017, Merck KGaA, Darmstadt, Germany, had receivables from E. Merck Beteiligungen KG, Darmstadt, Germany, in the amount of € 140.9 million and Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, had receivables from Merck Pensionstreuhandverein e.V., Darmstadt, Germany, a related party of Merck KGaA, Darmstadt, Germany, in the amount of € 0.1 million. They included receivables of € 0.1 million that were subject to standard market interest rates. Neither collateral nor guarantees existed for any of the balances either in favor or to the disadvantage of the Group.

From January to December 2018, Merck KGaA, Darmstadt, Germany, performed services for E. Merck KG, Darmstadt, Germany, with a value of € 1.0 million (2017: € 0.9 million) and for E. Merck Beteiligungen KG, Darmstadt, Germany, with a value of € 0.3 million (2017: € 0.1 million); in the previous year, Merck KGaA, Darmstadt, Germany, performed services for Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, with a value of € 0.2 million. During the same period, E. Merck KG, Darmstadt, Germany, performed services for Merck KGaA, Darmstadt, Germany, with a value of € 0.5 million (2017: € 0.5 million).

As of December 31, 2018, there were no receivables or liabilities from the Venezuelan entities deconsolidated as of February 29, 2016 (December 31, 2017: receivables with a carrying amount of € 22.7 million after impairment losses and liabilities with a carrying amount of € 21.5 million).

As of December 31, 2018, there were receivables of € 12.0 million (December 31, 2017: € 8.3 million) and liabilities of € 10.1 million (December 31, 2017: € 9.1 million) vis-à-vis non-consolidated subsidiaries. From January to December 2018, the Group generated revenues of € 0.1 million (December 31, 2017: € 0.1 million) with these companies. During the same period, expenses amounting to € 0.3 million (December 31, 2017: € 0.8 million) were incurred as a result of transactions with these companies.

Between January and December 2018, sales of € 0.7 million (2017: € 0.6 million) from supplies of goods resulted from transactions with Altmann-Analytik GmbH & Co. KG, Munich, which is controlled by a member of the Supervisory Board of Merck KGaA, Darmstadt, Germany, who also served as a member of the Board of Partners of E. Merck KG, Darmstadt, Germany, until January 27, 2019. As of December 31, 2018, there were receivables of € 0.1 million vis-à-vis this company (December 31, 2017: € 0.1 million).

Information on pension funds that are classified as defined benefit plans in accordance with IAS 19 can be found in Note (25) "Provisions for pensions and other post-employment benefits".

Information on Executive Board and Supervisory Board compensation can be found in Note (43) "Executive Board and Supervisory Board compensation". Activities above and beyond those set forth in Note (43) such as, for example, the provision of services or the granting of loans, between companies of the Group and members of the Executive Board or the Supervisory Board of Merck KGaA, Darmstadt, Germany, the Executive Board or the Board of Partners of E. Merck KG, Darmstadt, Germany, or members of their immediate families took place neither in 2018 nor 2017.

(43) Executive Board and Supervisory Board compensation

The compensation of the Executive Board of Merck KGaA, Darmstadt, Germany, is basically paid by the general partner, E. Merck KG, Darmstadt, Germany. Furthermore, companies included in these consolidated financial statements recorded expenses for the period from January to December 2018 in the amount of € 3.2 million (2017: € 3.5 million) for services provided by members of the Executive Board of Merck KGaA, Darmstadt, Germany, at those companies.

For the period from January to December 2018, fixed salaries of € 5.9 million (2017: € 6.0 million), variable compensation of € 17.2 million (2017: € 16.3 million), and additional benefits of € 0.4 million (2017: € 0.3 million) were recorded for members of the Executive Board of Merck KGaA, Darmstadt, Germany, by E. Merck KG, Darmstadt, Germany, and by companies included in these consolidated financial statements. Furthermore, additions to provisions for the Long-Term Incentive Plan for members of the Executive Board of Merck KGaA, Darmstadt, Germany, resulted in expense of € 15.9 million from (2017: gains of € 1.8 million from the release of provisions), and additions to the pension provisions for members

of the Executive Board of Merck KGaA, Darmstadt, Germany, included current service costs of € 3.1 million (2017: € 3.2 million) and, in 2017, past service costs of € 0.9 million.

The compensation of the Supervisory Board amounting to € 869.0 thousand (2017: € 868.3 thousand) consisted of a fixed portion of € 822.5 thousand (2017: € 822.5 thousand) and meeting attendance compensation of € 46.5 thousand (2017: € 45.8 thousand).

Further individualized information and details can be found in the Compensation Report on pages 168 et seq.

(44) Auditor's fees

The costs of the auditors (KPMG) of the financial statements of the Group consisted of the following:

	2018		2017	
€ million	Group	thereof: KPMG AG Wirtschaftsprüfungsgesellschaft, Germany	Group	thereof: KPMG AG Wirtschaftsprüfungsgesellschaft, Germany
Audits of financial statements	10.0	3.5	8.5	2.4
Other audit-related services	0.4	0.2	0.3	0.2
Tax consultancy services	0.9	0.4	0.6	0.4
Other services	–	–	1.0	0.9
	11.3	**4.1**	**10.4**	**3.9**

Other audit-related services pertain to various statutory or contractually agreed audits. Tax consultancy services encompass services in connection with the preparation of tax returns for employees delegated abroad.

(45) Corporate governance

The Statement of Compliance in accordance with section 161 of the German Stock Corporation Act (Aktiengesetz) was published in the corporate governance section of the website www.emdgroup.com/investors → Corporate governance in March 2018 and thus made permanently available.

(46) Companies opting for exemption under section 264 (3) HGB or section 264b HGB

The following companies, which have been consolidated in these financial statements, opted for exemption:

- Allergopharma GmbH & Co. KG, Reinbek
- Allergopharma Verwaltungs GmbH, Darmstadt
- Biochrom GmbH, Berlin
- Chemitra GmbH, Darmstadt
- Litec-LLL GmbH, Greifswald
- Merck 12. Allgemeine Beteiligungs-GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck 16. Allgemeine Beteiligungs-GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck 20. Allgemeine Beteiligungs-GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Accounting Solutions & Services Europe GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Chemicals GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Export GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Healthcare KGaA, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Life Science Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Life Science GmbH, Eppelheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Patent GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Performance Materials Germany GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Real Estate GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Serono GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany

(47) Information on preparation and approval

The Executive Board of Merck KGaA, Darmstadt, Germany, prepared the consolidated financial statements on February 14, 2019, and approved them for forwarding to the Supervisory Board. The Supervisory Board has the responsibility to examine the consolidated financial statements and to declare whether it approves them.

(48) Subsequent events

On February 5, 2019, the Group signed an agreement with a subsidiary of GlaxoSmithKline plc, United Kingdom, (GSK) to co-develop and co-commercialize the immuno-oncology drug candidate M7824. A bifunctional fusion protein, M7824 is currently an investigational candidate for several types of cancer. Of particular note is a Phase II study to investigate M7824 as a first-line treatment in patients with PD-L1-expressing advanced non-small cell lung cancer (NSCLC).

After receipt of the required anti-trust approvals, the Group will receive an upfront payment of € 300 million from GSK and, depending on data from the lung cancer trial program, is eligible to receive potential payments totaling as much as € 500 million for development milestones. In addition, the Group can receive future payments as high as € 2.9 billion for the achievement of certain milestones related to approval and commercialization. The Group expects that part of the upfront payment in 2019 will be recognized as other operating income.

The two companies will jointly develop and commercialize M7824. In case of regulatory approval, the Group will realize the net sales in the United States and GSK in all other countries. The collaboration partners will evenly split the net result from net sales less defined expense components.

Subsequent to the balance sheet date, no further events of special importance occurred that could have a material impact on the net assets, financial position and results of operations.

Accounting and Measurement Policies

(49) Effects from new accounting standards and other presentation and measurement changes

FIRST-TIME APPLICATION OF IAS 29 "FINANCIAL REPORTING IN HYPERINFLATIONARY ECONOMIES" IN ARGENTINA

During the financial year under review, Argentina was classified as a hyperinflationary economy in accordance with IAS 29. Therefore, the respective non-monetary items disclosed in the consolidated balance sheet as of January 1, 2018, were no longer carried at historical cost, but on the basis of current costs, adjusted for the inflationary effects in previous periods. In accordance with IAS 21 "Effects of Changes in Foreign Exchange Rates", financial statement figures from previous years reported in non-hyperinflationary reporting currencies have not been adjusted. Further information can be found in Note (52) "Currency translation".

CHANGES TO ACCOUNTING AND MEASUREMENT PRINCIPLES APPLICABLE TO INTEREST AND PENALTIES RELATED TO INCOME TAXES

IAS 12 "Income Taxes" shall be applied to interest and penalties related to income taxes only if these items are based on profit before tax. In all other cases, such items are within the scope of application of IAS 37 "Provisions, Contingent Liabilities and Contingent Assets". Therefore, all obligations in connection with interest and penalties related to income taxes that are within the scope of application of IAS 37 are disclosed separately under the "other provisions" item in the consolidated balance sheet. This applies in particular to interest payables which are related to income tax obligations. Adjustments of figures pertaining to previous years are disclosed in the column "Reclassification of interest and penalties related to income taxes", in the section "Effects of changed accounting and measurement policies on the consolidated balance sheet as of December 31, 2017, and January 1, 2018". Further information can be found in Note (26) "Other provisions". There were no changes in the disclosure of income and expenses from interest and penalties in connection with income taxes, given that these items were previously not disclosed within income taxes.

CHANGES TO ACCOUNTING AND MEASUREMENT PRINCIPLES RESULTING FROM IFRS 9 "FINANCIAL INSTRUMENTS"

IFRS 9 sets forth new rules for classification and measurement of financial instruments and the impairment of financial assets as well as for hedge accounting. The modified retrospective method was used for the adoption of IFRS 9 at the Group, with the exception of the provisions for hedge accounting. In the case of hedging relationships where the Group used options as hedging instruments, the first-time application of IFRS 9 was made retrospectively, as required, by disclosing comparative information for prior periods (see "Adjustments of prior periods" in this Note). In the case of hedging relationships where the Group used forward contracts as hedging instruments, the new IFRS 9 rules were applied for the first time using the prospective method.

Classification and measurement

According to IFRS 9, the classification and measurement of financial assets are determined by the business model of the company and the characteristics of the cash flows of the respective financial asset. Upon initial recognition, a financial asset is designated either as "at amortized cost", "at fair value through other comprehensive income" or "at fair value through profit or loss".

For equity instruments held as of January 1, 2018, that are not held for trading, the Group has uniformly exercised the option of recognizing future changes in fair value in other comprehensive income in the consolidated statement of comprehensive income, and thus retaining them in consolidated equity upon disposal of the financial instrument.

The first-time application of IFRS 9 did not lead to any material changes in the disclosure of financial liabilities.

Impairments

The first-time application of IFRS 9 resulted in the application of a new impairment model which takes into account expected credit losses already at initial recognition of a financial asset. This accounting change leads to an earlier recognition of impairment losses for financial assets. The following financial assets are affected by the new impairment model:

- Trade accounts receivable
- Contract assets
- Other debt instruments measured at amortized cost
- Debt instruments measured at fair value through other comprehensive income

The Group uses the simplified impairment model for trade accounts receivable and contract assets pursuant to which any credit losses expected to occur over the entire lifetime of the relevant financial assets are taken into account. Further information can be found in Note (60) "Financial assets".

Hedge accounting

The Group applied the hedge accounting provisions of IFRS 9 effective January 1, 2018, and did not opt for the option to continue to apply IAS 39. The existing hedging relationships were continued, even after the first-time application of IFRS 9.

The adjustments relevant to the Group arising from the first-time application of the IFRS 9 provisions regarding hedge accounting are presented below:

- In the case of hedging relationships where the Group uses options as hedging instruments, only the intrinsic value of options has been designated as the hedging instrument since the first-time application of IFRS 9. Changes in the fair value of the time value component of options that are used for hedge accounting have to be recognized in other comprehensive income and in a new reserve for hedging costs within equity. The subsequent accounting of these amounts depends on the type of the hedged transaction. The table presented under "Adjustments of prior periods" shows the effects on the affected financial statement components arising from the retrospective application of the hedging approach in accordance with IFRS 9.
- In the case of hedging relationships where the Group uses forward contracts as hedging instruments, only the spot element is designated as a hedging instrument. Changes in the fair value of the forward element in forward contracts are initially recognized in a new reserve for hedging costs within equity. The subsequent accounting of these amounts depends on the type of the hedged transaction. These amendments did not have any impact on the consolidated balance sheet as of January 1, 2018.

The following reclassifications and measurement effects upon first-time application of IFRS 9 resulted from the change in the classification and measurement of financial assets as well as the amended impairment requirements:

RECONCILIATION OF FINANCIAL ASSETS FROM IAS 39 TO IFRS 9 AS OF JANUARY 1, 2018

€ million

	Measurement category		
Consolidated balance sheet item	IAS 39	IFRS 9	Explanation
Cash and cash equivalents	Cash and cash equivalents	Subsequent measurement at amortized cost	
Trade accounts receivable	Loans and receivables	Subsequent measurement at amortized cost	→ a
Current financial assets	Loans and receivables	Subsequent measurement at amortized cost	
	Available-for-sale financial assets	Subsequent measurement at fair value through other comprehensive income (debt instruments)	→ b
	Derivatives without a hedging relationship	Derivatives without a hedging relationship	
Other current financial assets	Loans and receivables	Subsequent measurement at amortized cost	→ a
	Derivatives with a hedging relationship	Derivatives with a hedging relationship	
Non-current financial assets	Loans and receivables	Subsequent measurement at amortized cost	
	Derivatives without a hedging relationship	Derivatives without a hedging relationship	
	Available-for-sale financial assets	Subsequent measurement at fair value through profit or loss (debt instruments)	→ c+d
		Subsequent measurement at fair value through other comprehensive income (debt instruments)	→ e
Other non-current financial assets	Loans and receivables	Subsequent measurement at amortized cost	
	Derivatives without a hedging relationship	Derivatives without a hedging relationship	
	Derivatives with a hedging relationship	Derivatives with a hedging relationship	
Financial assets			
Adjustments from the first-time application of IFRS 9			

			Retained earnings		Gains/losses recognized in equity	
Carrying amount in accordance with IAS 39 Dec. 31, 2017	Remeasurement due to the application of the impairment model	**Carrying amount in accordance with IFRS 9 Jan. 1, 2018**	Retained earnings/ net retained profit effect Jan. 1, 2018	Fair value reserve for equity instrustuments Jan. 1, 2018	Available-for-sale financial assets Jan 1, 2018	Fair value reserve for debt instruments Jan. 1, 2018
589		**589**	–	–	–	–
2,923	–15	**2,908**	–13	–	–	–
47		**47**	–	–	–	–
35		**35**	–	–	1	–1
9		**9**	–	–	–	–
247	–1	**246**	–1	–	–	–
30		**30**	–	–	–	–
12		**12**	–	–	–	–
13		**13**	–	–	–	–
420		**297**	8	–	–8	–
		123	29	–6	–23	–
29		**29**	–	–	–	–
46		**46**	–	–	–	–
15		**15**	–	–	–	–
4,415	**–16**	**4,399**				
			23	**–6**	**–31**	**–1**

The first-time application of IFRS 9 led to the following transition effects:

a) As of January 1, 2018, the first-time application of IFRS 9 led to an increase in impairment losses from expected credit risks of financial assets in the amount of € 16 million (before taking deferred taxes into account). This increase related mainly to trade accounts receivable.
b) Debt instruments in the amount of € 35 million, which represented available-for-sale debt instruments under IAS 39, were designated as measured at "fair value through other comprehensive income" in accordance with IFRS 9. As of January 1, 2018, this reclassification led to a transfer within gains/losses recognized in equity from available-for-sale financial assets to the fair value reserve for debt instruments in the amount of € –1 million.
c) Pursuant to IFRS 9, financial assets from contingent considerations with a carrying amount of € 277 million were designated as debt instruments "measured at fair value through profit or loss". As of January 1, 2018, this reclassification led to a transfer within gains/losses recognized in equity (due to market value fluctuations) from available-for-sale financial assets to retained earnings in the amount of € –1 million.
d) Financial assets from closed investment funds in the amount of € 18 million were designated as "measured at fair value through profit or loss" in accordance with IFRS 9, given their cash flows were not solely payments of principal and interest. As of January 1, 2018, this reclassification led to a transfer within gains/losses recognized in equity (due to market value fluctuations) from available-for-sale financial assets to retained earnings in the amount of € 9 million.
e) Equity instruments with a carrying amount of € 123 million have been recognized at fair value through other comprehensive income in the consolidated statement of comprehensive income. As of January 1, 2018, the first-time application of IFRS 9 resulted in a reclassification, in the amount of € 23 million, from gains/losses recognized in equity (due to available-for-sale financial assets) to equity instruments measured through other comprehensive income. Within retained earnings, an additional amount of € 29 million was reclassified from retained earnings/net retained profit to equity instruments measured through other comprehensive income due to impairment losses recognized through profit or loss in the past.

CHANGES TO ACCOUNTING AND MEASUREMENT PRINCIPLES RESULTING FROM IFRS 15 "REVENUE FROM CONTRACTS WITH CUSTOMERS"

IFRS 15 defines comprehensive principles for revenue recognition as well as for the provision of information about the nature, amount, timing and uncertainty of revenue from contracts with customers. Since the Group generates approximately 95% of its revenues from contracts on the sale of goods that usually have a simple structure and normally do not constitute long-term contracts, the first-time application of IFRS 15 only had minor effects on the Group's assets, liabilities, financial position, and financial performance.

Within the context of the introduction of IFRS 15, the Group made use of the option to apply the modified first-time application method and thus recognized the cumulative adjustments in retained earnings as of January 1, 2018. Comparative information for prior periods was not disclosed under IFRS 15. The changes to the accounting and measurement principles as well as the resulting adjustment effects from the first-time application of IFRS 15 and the impact on equity as of January 1, 2018, or the consolidated income statement, were as follows:

- Timing of transfer of control: In the case of specific supplies of goods, the transfer of control and thus the timing of revenue recognition in accordance with IFRS 15 occurred later than the transfer of risks and rewards within the meaning of IAS 18. As of January 1, 2018, inventories and contract liabilities for the supply of goods were recognized for which the related revenues were already recognized in 2017 in accordance with IAS 18. However, these revenues did not meet the criteria for revenue recognition under IFRS 15 as of the date of first-time application. As of January 1, 2018, this led to a reduction in retained earnings in the amount of € 20 million (before tax). The new rules did not have a material impact on the consolidated income statement for fiscal 2018.
- Out-licensing of intellectual property: With the application of IFRS 15, out-licensing intellectual property led, in some cases, to earlier revenue recognition as compared with IAS 18 if the out-licensed intellectual property meets the right-to-use criteria (recognition of revenue at a point in time), rather than right-to-access criteria (recognition over a period of time) and the consideration is not paid in the form of sales- or usage-based royalties. As of January 1, 2018, contract liabilities for licenses were derecognized which would have led to a recognition of revenue at a point in time (at the inception of the license) on the basis of an assessment pursuant to IFRS 15. Accordingly, this led to an increase in retained earnings in the amount of € 17 million (before tax) as of the date of transition. In fiscal 2018, these new rules resulted in a decrease in net sales and in other operating income in the low single-digit million euro range.

- Long-term supply contracts with minimum purchase quantities (take-or-pay contracts): Occasionally, contracts with customers provide for minimum purchase quantities. In such cases, in accordance with IFRS 15, the expected transaction price attributable to the minimum purchase quantity had to be allocated to the individual supplies. However, under IAS 18, revenue was recognized in the amount of the invoiced selling price for the individual supplies. A contract asset was recognized as of January 1, 2018. This led to a corresponding increase in retained earnings by € 4 million (before tax). The impact of these new rules on the consolidated income statement for fiscal 2018 was negligible.
- Multiple-element contracts: Revenues from multiple-element contracts are recognized when the respective contract component is delivered or rendered. In the Life Science business sector, there were multiple-element contracts with service components to a minor extent. In future, the transaction price will have to be allocated in some cases in a different manner than under IAS 18. This led to a slight increase in retained earnings as of January 1, 2018. The impact on the consolidated income statement for fiscal 2018 was negligible.

Besides the adjustment effects described above, the first-time application of IFRS 15 had the following presentation effects on the consolidated balance sheet as of January 1, 2018:

- Sales deductions from refunds related to contracts with customers were reclassified from trade accounts payable into the separate item “Refund liabilities” in the consolidated balance sheet, effective January 1, 2018. Therefore, trade accounts payable declined by € 431 million.
- As of January 1, 2018, discounts that customers were expected to apply when making payments were recognized in the consolidated balance sheet as reductions of trade accounts receivable. This led to a slight reduction in trade accounts payable and trade accounts receivable.
- The presentation of customer refund claims was adjusted according to IFRS 15; since January 1, 2018, assets resulting from expected product returns were presented within other current assets, provided that resale of the returned products was deemed possible. Effective January 1, 2018, this led to a slight increase in trade accounts payable and other current assets.

Moreover, the new rules of IFRS 15 in the following areas were of no relevance – or only very minor relevance – for the Group:

- variable consideration
- revenue recognition over time for long-term service contracts and customer-specific construction contracts
- consignment arrangements
- collaboration agreements
- costs of obtaining or fulfilling a contract
- principal-agent relationships
- bill-and-hold arrangements
- financing components
- barter transactions
- repurchase agreements
- separate performance obligations from transportation or other logistic services

The following table shows the consolidated income statement in the reporting period had IAS 18 been applied on an ongoing basis:

	2018		
€ million	**IFRS 15 (as reported)**	Reconciliation to IAS 18	IAS 18
Net sales	**14,836**	**–6**	**14,830**
Cost of sales	–5,382	3	–5,379
Gross profit	**9,454**	**–3**	**9,451**
Other operating income	627	1	628
Other income and expenses/financial result	–8,621	–	–8,621
Profit before income tax	**1,461**	**–2**	**1,459**
Income tax	–368	–1	–369
Profit after tax from continuing operations	**1,093**	**–3**	**1,090**
Profit after tax from discontinued operation	**2,303**	**2**	**2,305**
Profit after tax	**3,396**	**–1**	**3,395**

EFFECTS OF CHANGED ACCOUNTING AND MEASUREMENT POLICIES ON RESERVES AS OF DECEMBER 31, 2017, AND JANUARY 1, 2018

The following table shows the effects of the first-time application of IAS 29, IFRS 9 and IFRS 15 on reserves as of December 31, 2017, and January 1, 2018, respectively.

€ million	
December 31, 2017 (as reported)	**12,357**
IFRS 9 (after income tax)	**1**
Hedge accounting (mandatory retrospective adoption)	1
December 31, 2017 (restated)/January 1, 2018 (before adjustments)	**12,358**
IFRS 9 (before income tax)	**16**
Reclassification of financial assets	32
Expected credit loss on trade accounts receivable and other debt instruments	–16
Income tax effect IFRS 9	**2**
IFRS 15 (before income tax)	**2**
Timing of transfer of control from the sale of goods	– 20
Out-licensing of intellectual property	17
Take-or-pay contracts	4
Multiple-element arrangements	1
Income tax effect IFRS 15	**–2**
IAS 29 (after income tax)	**4**
Hyperinflation in Argentina	4
January 1, 2018 (restated)	**12,379**

EFFECTS OF CHANGED ACCOUNTING AND MEASUREMENT POLICIES ON THE CONSOLIDATED BALANCE SHEET AS OF DECEMBER 31, 2017, AND JANUARY 1, 2018

The following table shows the effects of the aforementioned changes to the accounting and measurement principles on the consolidated balance sheet.

		IFRS 9	IAS 12/IAS 37	
€ million	**Dec. 31, 2017 (as reported)**	Reclassification (mandatory retrospective adoption)	Reclassification of interest and penalties related to income taxes	**Dec. 31, 2017 (restated)/ January 1, 2018 (before adjustments)**
Non-current assets				
Goodwill	13,582	–	–	13,582
Other intangible assets	8,317	–	–	8,317
Property, plant and equipment	4,512	–	–	4,512
Non-current financial assets	444	–	–	444
Other non-current assets	205	–	–	205
Deferred tax assets	1,106	–	–	1,106
	28,166	–	–	**28,166**
Current assets				
Inventories	2,632	–	–	2,632
Trade accounts receivable	2,923	–	–	2,923
Current financial assets	90	–	–	90
Other current assets	731	–	–	731
Income tax receivables	490	–	–	490
Cash and cash equivalents	589	–	–	589
Assets held for sale	–	–	–	–
	7,455	**–**	**–**	**7,455**
Total assets	**35,621**	**–**	**–**	**35,621**
Total equity				
Equity capital	565	–	–	565
Reserves	12,357	1	–	12,358
Gains/losses recognized in equity	1,082	–1	–	1,081
Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany	**14,003**	**–**	**–**	**14,003**
Non-controlling interests	63	–	–	63
	14,066	**–**	**–**	**14,066**
Non-current liabilities				
Provisions for pensions and other post-employment benefits	2,257	–	–	2,257
Other non-current provisions	788	–	–	788
Non-current financial liabilities	8,033	–	–	8,033
Other non-current liabilities	354	–	–	354
Deferred tax liabilities	1,489	–	–	1,489
	12,919	**–**	**–**	**12,919**
Current liabilities				
Current provisions	414	–	43	457
Current financial liabilities	2,790	–	–	2,790
Trade accounts payable	2,195	–	–	2,195
Refund liabilities		–	–	
Income tax liabilities	1,059	–	–43	1,016
Other current liabilities	2,175	–	–	2,175
Liabilities directly related to assets held for sale	–	–	–	–
	8,635	**–**	**–**	**8,635**
Total equity and liabilities	**35,621**	**–**	**–**	**35,621**

IFRS 9		IFRS 15		IAS 29	
Reclassification	Remeasurement	Reclassification	Remeasurement	Remeasurement	**Jan. 1, 2018 (after adjustments)**
–	–	–	–	1	13,582
–	–	–	–	–	8,317
–	–	–	–	2	4,514
–	–	–	–	–	444
–	–	–	–	–	205
–	1	–	–2	–	1,105
–	**1**	**–**	**–2**	**2**	**28,167**
–	–	–	5	2	2,639
–	–15	–4	–	–	2,904
–	–	–	–	–	90
	–1	1	4	–	735
–	–	–	–	–	490
–	–	–	–	–	589
–	–	–	–	–	–
–	**–16**	**–3**	**9**	**2**	**7,447**
–	**–15**	**–3**	**7**	**5**	**35,614**
–	–	–	–	–	565
32	–15	–	–	4	12,379
–32		–	–	–	1,049
–	**–15**	**–**	**–**	**4**	**13,992**
–	–	–	–	–	63
–	**–15**	**–**	**–**	**4**	**14,055**
–	–	–	–	–	2,257
–	–	–	–	–	788
3	–	–	–	–	8,036
–3	–	–	–17	–	334
–	–	–	–	1	1,489
–	**–**	**–**	**–17**	**1**	**12,903**
–	–	–		–	457
–	–	–		–	2,790
–	–	–434		–	1,761
–	–	431		–	431
–	–	–		–	1,016
–	–	–	25	–	2,200
–	–	–	–	–	–
–	**–**	**–3**	**25**	**–**	**8,657**
–	**–15**	**–3**	**7**	**5**	**35,614**

ADJUSTMENTS OF PREVIOUS PERIODS

	2017			
€ million	as reported	IFRS 9 adjustment	IFRS 5 adjustment	adjusted
Consolidated Income Statement				
Net sales	**15,327**	**–**	**–809**	**14,517**
Cost of sales	–5,320	–	249	–5,071
Gross profit	**10,007**	**–**	**–560**	**9,446**
Marketing and selling expenses	–4,702	–	353	–4,349
Administration expenses	–930	–	31	–899
Research and development costs	–2,140	–	32	–2,108
Other operating income	1,227	–	–14	1,212
Other operating expenses	–937	–	56	–880
Operating result (EBIT)[1]	**2,525**	**–**	**–102**	**2,423**
Financial result	–300	5	1	–294
Profit before income tax	**2,224**	**5**	**–101**	**2,129**
Income tax	386	–1	43	428
Profit after tax from continuing operations	**2,610**	**4**	**–57**	**2,557**
Profit after tax from discontinued operation	**–**	**–**	**57**	**57**
Profit after tax	**2,610**	**4**	**–**	**2,615**
thereof: attributable to shareholders of Merck KGaA, Darmstadt, Germany (net income)	2,600	4	–	2,605
thereof: attributable to non-controlling interests	10	–	–	10
Earnings per share in € (basic/diluted)				
– attributable to continuing operations	5.98	0.01	–0.12	5.87
– attributable to discontinued operation	–	–	0.12	0.12
Consolidated Statement of Comprehensive Income				
Profit after tax	**2,610**	**4**	**–**	**2,615**
Items of other comprehensive income that may be reclassified to profit or loss in subsequent periods:				
Cost of cash flow hedge reserve				
Fair value adjustments	–	–5	–	–5
Tax effect	–	1	–	1
Other comprehensive income	**–1,843**	**–4**	**–**	**–1,847**
Comprehensive income	**767**	**–**	**–**	**767**
Consolidated Cash Flow Statement				
Profit after tax	**2,610**	**4**	**–**	**2,615**
Other non-cash income and expenses	–3	–4	–	–7
Net cash flows from operating activities	**2,696**	**–**	**–**	**2,696**

[1] Not defined by International Financial Reporting Standards (IFRSs).

Group € million	2017 as reported	IFRS 5 adjustment	 adjusted
Reconciliation of EBIT[1] to EBITDA pre[1]			
Operating result (EBIT)[1]	**2,525**	**–102**	**2,423**
Depreciation/amortization/impairment losses/reversals of impairments	1,758	–17	1,741
EBITDA[1]	**4,282**	**–118**	**4,164**
Restructuring expenses	84	–23	61
Integration expenses/IT expenses	189	–1	188
Gains (+)/losses (–) on the divestment of businesses	–310	–	–310
Acquisition-related adjustments	63	–	63
Other adjustments	106	–26	81
EBITDA pre[1]	**4,414**	**–168**	**4,246**
Business free cash flow[1]			
EBITDA pre[1]	4,414	–168	4,246
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–1,047	35	–1,012
Changes in inventories	–23	5	–18
Changes in trade accounts receivable as well as receivables from royalties and licenses	–24	2	–22
Elimination first-time consolidation of BioControl Systems	–2	–	–2
Business free cash flow[1]	**3,318**	**–125**	**3,193**

[1] Not defined by International Financial Reporting Standards (IFRSs).

Healthcare € million	2017 as reported	IFRS 5 adjustment	 adjusted
Financial performance			
Net sales	**6,999**	**–809**	**6,190**
Cost of sales	–1,587	248	–1,340
Gross profit	**5,412**	**–562**	**4,850**
Marketing and selling expenses	–2,722	349	–2,373
Administration expenses	–299	28	–271
Research and development costs	–1,632	32	–1,600
Other operating income and expenses	688	43	731
Operating result (EBIT)[1]	**1,447**	**–111**	**1,337**
Depreciation/amortization/impairment losses/reversals of impairments	708	–17	691
EBITDA[1]	**2,155**	**–127**	**2,028**
Restructuring expenses	40	–23	17
Integration expenses/IT expenses	28	–	27
Gains (+)/losses (–) on the divestment of businesses	–316	–	–316
Acquisition-related adjustments	–	–	–
Other adjustments	42	–26	16
EBITDA pre[1]	**1,949**	**–177**	**1,773**
Business free cash flow[1]			
EBITDA pre[1]	1,949	–177	1,773
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–411	35	–375
Changes in inventories	–39	5	–34
Changes in trade accounts receivable as well as receivables from royalties and licenses	–51	2	–49
Business Free Cash Flow[1]	**1,448**	**–134**	**1,314**

[1] Not defined by International Financial Reporting Standards (IFRSs).

(50) Measurement policies

The main assets and liabilities disclosed in the consolidated balance sheet are measured as follows:

Balance sheet item	Measurement principle
Assets	
Goodwill	Amortized cost (subsequent measurement: impairment-only approach)
Other intangible assets	
With finite useful life	Amortized cost
With indefinite useful life or not yet available for use	Amortized cost (subsequent measurement: impairment-only approach)
Property, plant and equipment	Amortized cost
Financial assets (current/non-current)[1]	
Equity instruments	Fair value
Debt instruments	Amortized cost or fair value, depending on the business model (see Note (60) "Financial assets").
Derivative assets (financial transactions)	Fair value
Other assets (current/non-current)	
Other receivables (financial instruments)[1]	Amortized cost
Derivative assets (operative)[1]	Fair value
Non-financial items	Amortized cost
Deferred tax assets	Undiscounted measurement based on tax rates that are expected to apply to the period when the asset is realized or the liability is settled
Inventories	Lower of cost and net realizable value
Trade accounts receivable (without lease receivables)[1]	Amortized cost
Lease receivables	According to IAS 17 (see Note (59) "Leasing")
Income tax receivables	Expected tax refunds based on tax rates that have been enacted or substantively enacted by the end of the reporting period
Cash and cash equivalents[1]	Amortized cost
Assets held for sale	Lower of carrying amount and fair value less costs to sell

[1] As from January 1, 2018, in accordance with IFRS 9; see Note (49) “Effects from new accounting standards and other presentation and measurement changes”.

Balance sheet item	Measurement principle
Equity and liabilities	
Provisions for pensions and other post-employment benefits	Projected unit credit method
Other provisions (current/non-current)	Present value of the expenditures expected to be required to settle the obligation
Financial liabilities (current/non-current)	
Bonds and commercial paper	Amortized cost
Bank loans	Amortized cost
Liabilities to related parties	Amortized cost
Loans from third parties and other financial liabilities	Amortized cost
Liabilities from derivatives (financial transactions)[1]	Fair value
Finance lease liabilities	Amortized cost
Other liabilities (current/non-current)	
Liabilities from derivatives (operative)[1]	Fair value
Liabilities from non-income related taxes	Settlement amount
Other liabilities	Settlement amount
Deferred tax liabilities	Undiscounted measurement based on tax rates that are expected to apply to the period when the asset is realized or the liability is settled
Trade accounts payable	Amortized cost
Refund liabilities	Expected reimbursement amount
Income tax liabilities	Expected tax payments based on tax rates that have been enacted or substantively enacted by the end of the reporting period
Liabilities directy related to assets held for sale	Fair value

[1] As from January 1, 2018, in accordance with IFRS 9; see Note (49) "Effects from new accounting standards and other presentation and measurement changes".

(51) Consolidation methods

The consolidated financial statements are based on the single-entity financial statements of the consolidated companies as of the balance sheet date, which were prepared applying consistent accounting policies in accordance with IFRSs.

Acquisitions were accounted for using the purchase method in accordance with IFRS 3. In cases where a company was not acquired in full, non-controlling interests were measured using the fair value of the proportionate share of net assets. The option to measure non-controlling interests at fair value on the date of their acquisition (full goodwill method) was not utilized.

When additional shares in non-controlling interests are acquired, the purchase price amount that exceeds the carrying amount of this interest was offset directly in equity.

IFRS 11 was applied for joint arrangements. A joint arrangement exists when, on the basis of a contractual arrangement, the Group and third parties jointly control business activities. Joint control means that decisions about the relevant activities require unanimous consent. Joint arrangements are either joint operations or joint ventures. Revenues and expenses as well as assets and liabilities from joint operations were included in the consolidated financial statements in accordance with the Group's rights and obligations. By contrast, interests in joint ventures as well as in material associates over which the Group has significant influence were recognized in accordance with IAS 28 using the equity method of accounting.

Intragroup sales, expenses and income, as well as all receivables and payables between the consolidated companies, are eliminated. The effects of intragroup deliveries reported under non-current assets and inventories are adjusted by eliminating any intragroup profits. In accordance with IAS 12, deferred taxes are applied to these consolidation measures.

(52) Currency translation

The functional currency concept applies to the translation of financial statements of consolidated companies prepared in foreign currencies. The subsidiaries of the Group generally conduct their operations independently. The functional currency of these companies is normally the respective local currency. Assets and liabilities are measured at the closing rate, and income and expenses are measured at weighted average annual rates in euros, the reporting currency. Any currency translation differences arising during consolidation of Group companies are recognized in equity. If Group companies are deconsolidated, existing currency differences are reversed and reclassified to profit or loss.

When the financial statements of consolidated companies are prepared, business transactions that are conducted in currencies other than the functional currency are disclosed using the current exchange rate on the date of the transaction. Foreign currency monetary items (cash and cash equivalents, receivables and payables) in the year-end financial statements of the consolidated companies prepared in the functional currency are translated at the respective closing rates. Exchange differences from the translation of monetary items are recognized in the income statement with the exception of net investments in a foreign operation.

Currency translation was based on the following key exchange rates:

	Average annual rate		Closing rate	
€ 1 =	**2018**	2017	**Dec. 31, 2018**	Dec. 31, 2017
Chinese renminbi (CNY)	7.815	7.621	7.869	7.791
Japanese yen (JPY)	130.372	126.921	126.131	134.669
Swiss franc (CHF)	1.153	1.112	1.128	1.168
South Korean won (KRW)	1,294.331	1,275.143	1,271.164	1,275.923
Taiwan dollar (TWD)	35.544	34.398	34.958	35.538
U.S. dollar (USD)	1.181	1.130	1.144	1.195

Since July 2018, Argentina's economy has been classified as hyperinflationary in accordance with IAS 29 "Financial Reporting in Hyperinflationary Economies". Accordingly, the Group's business activities in Argentina were no longer disclosed at historical cost, but were restated retrospectively for the entire reporting year, adjusted for inflation. For this purpose, the Group used a dedicated index combining the wholesale index IPIM (Índice de precios internos al por mayor) and the consumer price index IPC (Índice de precios al consumidor). As of the balance sheet date, the Group's dedicated index stood at 2,462.1 (January 1, 2018: 1,656.6).

(53) Recognition of net sales and other income

Depending on the business sector, the Group uses various distribution channels to provide its products. In the Healthcare business sector, pharmaceutical prescription products are often sold to specialized wholesalers and distributors, and to a lesser extent directly to pharmacies, physicians or hospitals. In the Life Science and Performance Materials business sectors, products are largely sold to business customers, and to a lesser extent to distributors.

Net sales and other income are recognized when (or as) the customer obtains control of the asset. In the case of product sales, the customer usually obtains control as soon as delivery is made, given that the customer is generally not able to obtain any benefits from the asset before that point in time. To a lesser extent, the Group generates net sales from the sale of goods based on bill-and-hold arrangements. In these cases, net sales are recognized before the goods are delivered to the customer, i.e. as soon as the Group has invoiced the respective products and the additional criteria laid out in IFRS 15. B81 are fulfilled. In the case of sales of hardware and equipment in the Life Science business sector, the revenue recognition criteria are only met after installation has been successfully completed – to the extent that the installation requires specialized knowledge, does not represent a clear ancillary service and the relevant equipment can only be used by the customer once successfully set up.

In addition to revenue from the sale of goods, net sales also include commission income, profit-sharing participations, revenue from services, and – in the Life Science business sector – license income, but the volume involved is insignificant.

For service contracts, and customer-specific equipment construction contracts, revenue is recognized over time, based on the progress towards complete satisfaction of the performance obligation, provided that the Group has an enforceable right to payment for performance completed to date. The progress is mostly determined according to the cost-to-cost method, and the milestones achieved as at the reporting date.

In the Healthcare and Life Science business sectors, a limited number of contracts provide for the out-licensing of intellectual property. In the Healthcare business sector, out-licensing agreements are usually not part of ordinary activities, meaning that the corresponding income is not presented within net sales, but within other operating income. If the license represents a separate performance obligation, it must be determined whether a right-to-use asset (recognition of revenue at a point in time), or an access right (recognition over a period of time), is transferred to the customer. Irrespective of the classification of licenses, sales- or usage-based royalties are recognized only after the customer makes the corresponding disposals, or uses the corresponding intellectual property.

Net sales from contracts comprising several separate performance obligations (particularly sales of goods in combination with services) are recognized when the respective obligation has been fulfilled. Therefore, the transaction price is allocated beforehand to each performance obligation identified in the contract on a relative standalone selling price basis. To a limited extent, there are multiple-element contracts in the Life Science business sector.

Dividend income is recognized when the right of dividend payment is established, when it is considered probable that the economic benefit attributable to the dividend payment will flow to the Group, and when the dividend payment can be measured reliably.

Net sales are recognized net of sales-related taxes and sales deductions. When net sales are recognized, estimated amounts are taken into account for sales deductions, for example rebates, discounts and returns. Payments to customers are generally recognized as sales deductions, unless the payments are made for distinct goods or services provided by the customer, provided that their value does not exceed the fair value of the goods or services received by the Group.

Sales deductions, such as discounts provided on the invoice as price-reducing items, which will likely be applied by customers when making the respective payments, are recognized in the consolidated balance sheet as reductions of trade accounts receivable. Expected refunds, such as bonus payments, reimbursements for returns, or rebates from health plans and programs, are recognized in the separate item "refund liabilities" in the consolidated balance sheet (see Note (30) "refund liabilities").

Given that the Group generates the large majority of its revenue via sales transactions with simple structures, the company usually has an enforceable right to payment after the performance obligation has been fulfilled. The payment targets contractually agreed between Group and its customers usually range between 30 and 60 days. For some service contracts, the company receives the contractually agreed consideration before the service is delivered; in such cases, the consideration received is presented as a contract liability in the consolidated balance sheet until revenue is recognized. A contract asset is recognized for an over-time realization of sales of services and customer-specific equipment/hardware if the Group does not have an unconditional right to payment until complete fulfillment of the contractual services.

The Group uses the following practical expedients of IFRS 15:

- The promised amount of consideration is not adjusted for the effects of a significant financing component if the period between the fulfillment of a performance obligation and the payment by the customer amounts to up to one year.
- Expected revenue from contracts with customers is not disclosed for contracts with a term of up to one year.

Please refer to the Annual Report 2017 for further information on the accounting and measurement principles applied in the previous year with regard to the recognition of net sales and other income.

(54) Collaboration agreements, in-licensing and out-licensing in the Healthcare business sector

In the Healthcare business sector, the Group regularly enters into collaboration agreements, as well as in-licensing and out-licensing contracts, in particular with research institutions, pharmaceutical and biotechnology companies. In the majority of cases, the Group acquires rights to the intellectual property of the respective contract parties against the provision of upfront payments, regulatory or commercial milestone payments, or license fees. The portion of the consideration paid by the Group to acquire intellectual property is recognized as an intangible asset. If additional service is acquired from the contract party – besides intellectual property – an appropriate portion of the consideration is allocated to research and development costs in line with the service performance of the contract party.

In individual cases, the Group enters into collaboration agreements with other pharmaceutical and biotechnology companies whereby both contract parties develop drug candidates on a collaborative basis; in case of regulatory approval, such drugs will be commercialized by both contract parties. As a general rule, such collaboration agreements comprise the granting of rights to intellectual property as well as additional goods or services promised by the Group, such as the provision of development activities or production services. For these activities and services, the Group usually receives consideration from its contract parties, such as upfront payments, or regulatory and commercial milestone payments and license fees (see Note (63) "Contingent consideration"). Furthermore, specific income and expense items are commonly carried collectively amongst the contract parties. When entering into this kind of collaboration agreements, the Group must determine whether the individual promised goods or services are separate performance obligations, or whether they instead must be combined with other performance obligations. Given that the collaboration partner is usually not able to obtain any benefit from the license alone, or from the license in combination with other readily available resources, and considering, moreover, that the individual promised goods or services are invar-

iably not distinct in the context of the contract, the performance obligations are often integrated into bundles, income from which is recognized in this case in other operating income during the period where the material development activities are provided.

Furthermore, collaboration agreements in the pharmaceutical area typically allocate the revenue generated in specific markets, or with specific products, to individual collaboration partners; simultaneously, specific income and expense items are carried by the collaboration partners according to predefined allocation ratios. The Group recognizes the revenue from the sale of products to third-party customers, if it is the principal within the meaning of IFRS 15. Expenses resulting from payments made to collaboration partners in connection with profit-sharing agreements are recognized in other operating expenses. Reimbursements of research and developments costs made between the collaboration partners are recognized in research and development costs. The Group's most important collaboration agreement is the strategic alliance with Pfizer Inc., United States, in the immuno-oncology area (see Note (6) "Collaboration agreements of material significance").

(55) Research and development costs

Research and development costs comprise the costs of research and development departments, the expenses incurred as a result of research and development collaborations as well as the costs of clinical trials in the Healthcare business sector (both before and after approval is granted).

The costs of research cannot be capitalized and are expensed in full in the period in which they are incurred. As internally generated intangible assets, it is necessary to capitalize development expenses if the cost of the internally generated intangible asset can be reliably determined and the asset can be expected to lead to future economic benefits. The condition for this is that the necessary resources are available for the development of the asset, technical feasibility of the asset is given, its completion and use are intended, and marketability is given. Owing to the high risks up to the time that pharmaceutical products are approved, these criteria are not met in the Healthcare business sector regarding the development of drug candidates. Costs incurred after regulatory approval were insignificant and were therefore not recognized as intangible assets. In the Life Science and Performance Materials business sectors, development expenses are capitalized as soon as the aforementioned criteria have been met. Provided the relevant criteria set forth in IAS 38 are fulfilled, software development costs are capitalized.

Reimbursements for R&D are offset against research and development costs.

(56) Goodwill

Goodwill is recognized on the acquisition date in the course of business combinations. Goodwill is measured at cost, and is defined as the excess amount of the purchase price paid for the company shares over the value of the acquired portion of net assets. Net assets are defined as the net balance of the fair values of the acquired identifiable assets, and the assumed liabilities and contingent liabilities.

Goodwill is allocated to cash-generating units or groups of cash-generating units and tested for impairment either annually or if there are indications of impairment. The carrying amounts of the cash-generating units or groups of cash-generating units are compared with their recoverable amounts and impairment losses are recognized where the recoverable amount is lower than the carrying amount.

(57) Other intangible assets

Acquired intangible assets are capitalized at cost. Self-developed intangible assets are only capitalized if the requirements specified by IAS 38 have been met. Intangible assets acquired in the course of business combinations are recognized at fair value on the acquisition date. If the development of intangible assets takes a substantial period of time, the directly attributable borrowing costs incurred up until completion are capitalized as part of the costs.

INTANGIBLE ASSETS WITH INDEFINITE USEFUL LIVES AND INTANGIBLE ASSETS NOT YET AVAILABLE FOR USE

Intangible assets with indefinite useful lives and intangible assets not yet available for use are not amortized; however they are tested for impairment when a triggering event arises or at least once a year. Here, the respective carrying amounts are compared with the recoverable amount and impairments are recognized as required. Impairment losses recognized on indefinite-life intangible assets and intangible assets not yet available for use are reversed if the original reasons for impairment no longer apply.

The marketing authorizations, patents, licenses and similar rights, and other items not yet available for use primarily relate to rights that the Group acquired for active ingredients, products or technologies that are still in development stages. Amortization begins when the product reaches market approval, and is charged on a straight-line basis over the shorter of the patent or contract term and the estimated useful life.

INTANGIBLE ASSETS WITH FINITE USEFUL LIVES

Intangible assets with a finite useful life are amortized using the straight-line method. The useful lives of customer relationships, brand names and trademarks as well as marketing authorizations, acquired patents, licenses and similar rights, and software are between three and 24 years. Amortization of intangible assets and software is allocated to the functional costs in the consolidated income statement. An impairment test is performed if there are indications of impairment. Impairment losses are determined using the same methodology as for indefinite-life intangible assets. Impairment losses are reversed if the original reasons for impairment no longer apply.

(58) Property, plant and equipment

Property, plant and equipment is measured at cost less depreciation and impairments plus reversals of impairments. The component approach is applied here in accordance with IAS 16. Subsequent costs are only capitalized if it is probable that future economic benefits will arise for the Group and the cost of the asset can be measured reliably. The cost of self-constructed property, plant and equipment is calculated on the basis of the directly attributable unit costs and an appropriate share of overheads. If the construction of property, plant and equipment takes a substantial period of time, the attributable borrowing costs incurred up until completion are capitalized as part of the costs. In accordance with IAS 20, costs are reduced by the amount of government grants in those cases where government grants or subsidies have been paid for the acquisition or manufacture of assets (grants related to assets). Grants related to expenses which no longer offset future expenses are recognized in profit or loss. Property, plant and equipment is depreciated using the straight-line method over the useful life of the asset concerned. Depreciation of property, plant and equipment is based on the following useful lives:

USEFUL LIFE OF PROPERTY, PLANT AND EQUIPMENT

	Useful life
Production buildings	maximum of 33 years
Administration buildings	maximum of 40 years
Plant and machinery	6 to 25 years
Operating and office equipment; other facilities	3 to 10 years

The useful lives of the assets are reviewed regularly and adjusted if necessary. If indications of a decline in value exist, an impairment test is performed. If the reasons for an impairment loss no longer exist, a reversal of the impairment loss recognized in prior periods is recognized.

(59) Leasing

Where non-current assets are leased and economic ownership lies with the Group (finance lease), the asset is recognized at the present value of the minimum lease payments or the lower fair value in accordance with IAS 17 and depreciated over its useful life. The corresponding payment obligations from future lease payments are recognized as liabilities. If an operating lease is concerned, the associated expenses are recognized in the period in which they are incurred.

(60) Financial assets

CLASSIFICATION

Since January 1, 2018, the classification and measurement of financial assets are determined by the business model of the company and the characteristics of the cash flows of the respective financial asset in accordance with IFRS 9. Upon initial recognition, a financial asset is designated either as “at amortized cost”, as “at fair value through other comprehensive income” or as “at fair value through profit or loss”.

Financial assets are recognized as at the settlement date. Debt instruments are reclassified only if the business model used to manage such assets has changed. Financial assets with embedded derivatives are considered as one item, provided that the respective cash flows are solely payments of principal and interest.

MEASUREMENT

At initial recognition, the Group recognizes financial assets at fair value, plus any transaction costs directly attributable to the acquisition of such assets – provided the financial assets are subsequently not measured at fair value through profit or loss. However, trade accounts receivable without significant financing components are exempted from this general rule and measured at their transaction price. Transaction costs of assets measured at fair value through profit or loss are recognized as expenses in the consolidated income statement. Trade accounts receivable that are potentially designated to be sold on account of a factoring agreement are measured at fair value through other comprehensive income. Provided that the trade accounts receivable are sold, the factoring fees previously recognized directly in equity are recycled through the operating result upon derecognition of the trade accounts receivable sold.

Debt instruments

The following table provides details on the measurement effects of debt instruments on the consolidated income statement:

Category	Asset type	Impairment losses/reversals of impairment losses	Net gain (or loss) on disposal/value adjustments	Foreign currency gains or losses	Interest income or expenses
Subsequent measurement at amortized cost	Operative	Impairment losses, and reversals of impairment losses on financial assets (net)	Other operating income or other operating expenses	Other operating income or other operating expenses	Financial result (applying the effective interest method)
	Financial	Financial result	Financial result	Financial result	
Subsequent measurement at fair value through other comprehensive income	Operative	Impairment losses, and reversals of impairment losses on financial assets (net)	• Results recognized directly in equity (value adjustments) • Recycling of the cumulative results previously recognized directly in equity through the operating result (derecognition) when asset is disposed	Other operating income or other operating expenses	Financial result (applying the effective interest method)
	Financial	Financial result	• Results recognized directly in equity (value adjustments) • Recycling of the cumulative results previously recognized directly in equity through the operating result (derecognition) when asset is disposed	Financial result	
Subsequent measurement at fair value through profit or loss	Operative		Other operating income or other operating expenses	Other operating income or other operating expenses	Financial result (applying the effective interest method)
	Financial		Financial result	Financial result	

Depending on the category of debt instrument, at initial recognition the Group recognizes either the credit losses expected to occur over the entire lifetime or the 12-month expected credit losses. Except debt instruments with subsequent measurement through profit or loss, the impairment model of IFRS 9 is applied to all debt instruments.

The Group uses the simplified impairment model for trade accounts receivable and contract assets pursuant to which any credit losses expected to occur over the entire lifetime of an asset are taken into account. In order to measure expected credit risks, the assets are grouped on the basis of the existing credit risk structure and the respective maturity structure. The customer groups with comparable default risks to be taken into account are determined at the Group in accordance with the business sectors and location of the respective customers. The default rates used in the simplified impairment model are derived on the basis of historical experience and current macroeconomic expectations by taking into account country-specific ratings. These country ratings are aggregated to three separate rating groups. In this context, historical default rates generally also represent the best approximation for future expected defaults to the extent that a country's rating remains unchanged. Accordingly, when a country's rating changes, the historical default rates of the rating group to which the respective country has been re-allocated have to be applied, rather than the historical default rates of the previous rating group. Further information on the impairment of financial assets can be found in Note (38) "Management of financial risks".

Provided that the Group expects default risk to be low, the impairments of all other debt instruments are limited to the 12-month expected credit losses. If the default risk has increased significantly since initial recognition, impairments are increased to the amount of credit losses expected to occur over the entire lifetime of the respective asset. The Group considers default risk to be low if the risk of non-performance is remote and the contract party is able to fulfill its payment obligations at short notice at any time. The probabilities used to establish 12-month expected credit losses, or lifetime expected credit losses, are based on historical default rates, taking current credit ratings into consideration.

Equity instruments

Equity instruments are subsequently measured at fair value.

For equity instruments not held for trading, the Group has uniformly exercised the option of recognizing future changes in fair value in other comprehensive income in the consolidated statement of comprehensive income and thus to retain them in consolidated equity upon disposal of the financial instrument.

Changes in the fair value of equity instruments held for trading are recognized through profit or loss (other operating income/expenses).

Dividend income from equity instruments of both categories is recognized in the consolidated income statement in other operating income. Impairments and impairment reversals of equity instruments are disclosed together with other fair value changes.

DERECOGNITION

The Group derecognizes financial assets if there is no reasonable expectation that the contract party will fulfill its contractual obligations. In this context, the Group takes individual discretionary decisions in order to evaluate whether contract fulfillment can be reasonably expected.

ACCOUNTING AND MEASUREMENT PRINCIPLES APPLIED IN THE PREVIOUS YEAR (IAS 39)

For further information on the accounting and measurement principles applied in the previous year (IAS 39 "Financial instruments: recognition and measurement"), please refer to the Annual Report 2017.

(61) Financial liabilities

OTHER FINANCIAL LIABILITIES

Except for contingent consideration, which only occurs in the context of business combinations in accordance with IFRS 3, and derivatives with negative market values, all financial liabilities are subsequently measured at amortized cost using the effective rate method. The Group primarily assigns financial liabilities such as issued bonds and bank loans, trade payables, and non-derivative current and non-current liabilities to this category.

LIABILITIES SUBSEQUENTLY MEASURED AT FAIR VALUE THROUGH PROFIT OR LOSS

Contingent consideration, as well as derivatives with negative market values, are subsequently measured at fair value. Value changes are recognized through profit or loss.

(62) Derivatives and hedge accounting

The Group applied the hedge accounting provisions of IFRS 9 effective January 1, 2018, and did not opt for the option to continue to apply IAS 39. The existing hedging relationships were continued, even after the first-time application of IFRS 9.

The Group uses derivatives solely to economically hedge recognized assets or liabilities and forecast transactions. The Group applied the hedge accounting rules exclusively to forecast cash flow hedges. Hedging transactions were entered into for highly probable forecast transactions in foreign currencies. Cash flow hedge accounting for forecasted transactions in foreign currency will lead to the hedged item being recognized at a fixed exchange rate on a net basis – instead of being recognized at the spot exchange rate at the transaction date.

Depending on the nature of the hedged item, changes in the fair values of derivatives used for hedging purposes are recognized in the consolidated income statement either in the operating result or in the financial result.

The Group currently only uses derivatives as hedging instruments. The hedging relationship must be effective at all times, i.e. the change in fair value of the hedging instrument almost fully offsets changes in the fair value of the hedged item. The Group uses the dollar offset method as well as regression analyses to measure hedge effectiveness. Hedging ineffectiveness may occur when the forecast cash flows are made/received, or if hedged items are dissolved. Derivatives that do not or no longer meet the documentation or effectiveness requirements for hedge accounting, whose hedged item no longer exists, or for which hedge accounting rules are not applied are classified as "financial assets and liabilities at fair value through profit or loss".

In the case of hedging relationships where the Group uses options as hedging instruments, only the intrinsic value of options has been designated as the hedging instrument since the first-time application of IFRS 9. Changes in the fair value of the time value component of options that are used for hedge accounting have to be recognized in other comprehensive income and in a new reserve for cost of hedging within equity. The subsequent accounting of these amounts depends on the type of the hedged transaction.

In the case of hedging relationships where the Group uses forward contracts as hedging instruments, only the spot element is designated as the hedging instrument. Changes in the fair value of the forward element in forward contracts are initially recognized in a new reserve for hedging costs within equity. The subsequent accounting of these amounts depends on the type of the hedged transaction.

Reclassifications of cash flow hedge reserve to profit or loss are recognized in the operating result, while reclassifications of the cost of cash flow hedge reserve are recognized in the financial result.

(63) Contingent consideration

For contingent consideration that was contractually agreed with the acquirer or seller within the context of the disposal or the acquisition of businesses within the meaning of IFRS 3, the fair value of the claims or obligations as at the transaction date is recognized as a financial asset or financial liability. The subsequent measurement is at fair value through profit or loss. Contingent consideration in connection with the purchase of individual assets outside of business combinations is recognized as a financial liability only when the consideration is contingent upon future events that are beyond the Group's control. In cases where the payment of contingent consideration is within the Group's control, the liability is recognized only as from the date when a non-contingent obligation arises. Contingent consideration linked to the purchase of individual assets primarily relates to future milestone payments in connection with in-licensed intellectual property in the Healthcare business sector.

Changes in the fair value of financial assets and financial liabilities from contingent consideration are recognized as other operating income or other operating expenses, except for changes due to interest rate fluctuations and the effect from unwinding discounts. Interest rate effects from unwinding of discounts as well as changes due to interest rate fluctuations are recognized in financial income or financial expenses.

(64) Other non-financial assets and liabilities

Other non-financial assets are carried at amortized cost. Impairments are recognized for any credit risks. Long-term non-interest bearing and low-interest receivables and liabilities are carried at their present value. Other non-financial liabilities are carried at their repayment amount

(65) Deferred taxes

Deferred tax assets and liabilities result from temporary differences between the carrying amount of an asset or liability in the IFRSs and tax balance sheets of consolidated companies as well as from consolidation activities, insofar as the reversal of these differences will occur in the future.

Deferred taxes are recognized through profit or loss, except when they relate to items recognized in equity; in the latter case, deferred taxes are recognized either in gains/losses recognized in equity, or in consolidated equity.

Deferred tax assets resulting from deductible temporary differences, tax credits as well as tax loss (and interest) carryforwards, are recognized if it is considered probable that taxable profit will be available in the future to apply such tax assets. Deferred tax liabilities are recognized for temporary differences subject to tax in the future. Our calculations are based on the expected prevailing tax rates in the respective countries as at the date the tax will be due. As a rule, our tax projections are based on the statutory regulations applicable, or endorsed, at the balance sheet date. Deferred tax assets and liabilities are offset, provided they relate to the same tax authority, and provided that the Group has an enforceable right to offset tax. Material effects on deferred tax assets and liabilities resulting from changes of tax rates, or amendments of tax laws, are usually recognized in the period in which the legislative procedure is completed. As a rule, these effects are recognized through profit or loss. In case of deferred tax items recognized in equity, such effects are recognized either in the consolidated statement of comprehensive income (gains/losses recognized in equity), or in consolidated equity.

Deferred tax liabilities are recognized for projected dividend payments of subsidiaries. If no dividend payments are projected in the foreseeable future, no deferred tax liability is recognized for the difference between proportional equity in line with IFRSs and the investment value determined for tax purposes.

(66) Inventories

Inventories are carried at the lower of cost or net realizable value. When determining cost, the "first-in, first-out" (FIFO) and weighted average cost formulas are used. In addition to directly attributable unit costs, manufacturing costs also include overheads attributable to the production process, which are determined on the basis of normal capacity utilization of the production facilities.

Inventories are written down if the net realizable value is lower than the acquisition or manufacturing cost carried in the balance sheet.

Since inventories are for the most part not manufactured within the scope of long-term production processes, the manufacturing costs do not include any borrowing costs.

Inventory prepayments are recognized under other current assets.

(67) Provisions for pensions and other post-employment benefits

Provisions for pensions and other post-employment benefits are recognized in accordance with IAS 19. The obligations under defined benefit plans are measured using the projected unit credit method. Under the projected unit credit method, dynamic parameters are taken into account in calculating the expected benefit payments after an insured event occurs; these payments are spread over the entire period of service of the participating employees. Annual actuarial opinions are prepared for this purpose. Actuarial gains and losses resulting from changes in actuarial assumptions and/or experience adjustments (the effects of differences between the previous actuarial assumptions and what has actually occurred) are recognized immediately in equity as soon as they are incurred, taking deferred taxes into account. Consequently, the consolidated balance sheet provides – after deduction of the plan assets – the full scope of the obligations while avoiding the fluctuations in expenses that can result especially when the calculation parameters change. The actuarial gains and losses recognized in the respective reporting period are disclosed separately in the consolidated statement of comprehensive income.

(68) Other provisions and contingent liabilities

Provisions are recognized if it is more likely than not that an outflow of resources will be required to settle the obligation and the amount of the obligation can be measured reliably. The carrying amount of other provisions takes into account the amounts required to cover future payment obligations, recognizable risks and uncertain obligations of the Group to third parties.

Measurement of other provisions is based on the settlement amount with the highest probability or, if a large number of similar cases exist with respect to the provision being measured, it is based on the expected value of the settlement amounts. Long-term provisions are discounted and carried at their present value as of the balance sheet date if the discount rate effect is material. To the extent that reimbursement claims exist as defined in IAS 37, they are recognized as an asset – separately from provisions – if their realization is virtually certain and the asset recognition criteria have been met. Restructuring provisions are recognized after detailed restructuring plans have been established and disclosed.

Contingent liabilities comprise not only possible obligations arising from past events and whose existence is subject to the occurrence of uncertain future events, but also present obligations arising from past events where an outflow of resources embodying economic benefits is not probable or where the amount of the obligation cannot be measured reliably. Contingent liabilities that were not assumed within the context of a business combination are not recognized in the consolidated balance sheet. Unless the possibility of an outflow of resources embodying economic benefits is remote, information on the relevant contingent liabilities is disclosed in the notes. In this context, the present value of the future settlement amount is used as the basis for measurement. The settlement amount is determined in accordance with the rules set out in IAS 37 and is based on the best estimate.

(69) Share-based compensation programs

Provisions have been set up for obligations from long-term variable compensation programs (Long-Term Incentive Plan of the Group). These share-based compensation programs with cash settlement are aligned not only with target achievement based on key performance indicators, but above all with the long-term performance of shares of Merck KGaA, Darmstadt, Germany. Certain executives and employees could be eligible to receive a certain number of virtual shares – Share Units of Merck KGaA, Darmstadt, Germany (MSUs) – at the end of a three-year performance cycle. The number of MSUs that could be received depends on the individual grant defined for the respective person and the average closing price of shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 of the respective performance cycle (reference price). In order for members of top management to receive payment for the 2016 tranche, they must personally own an investment in shares of Merck KGaA, Darmstadt, Germany, dependent on their respective fixed annual compensation. For the 2017 and 2018 tranches, an obligatory personal investment is not a precondition to receive payments. Since 2017, the personal investment for top management is defined in a separate Share Ownership Guideline (SOG). When the three-year performance cycle ends, the number of MSUs to then be granted is determined based on the development of defined key performance indicators (KPIs).

For the 2016 tranche, these are on the one hand the performance of the share price of Merck KGaA, Darmstadt, Germany, compared to the performance of the DAX® with a weighting of 70%, and on the other hand the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 30%.

As of fiscal 2017, the program conditions were modified. For the 2017 and 2018 tranches, the performance of the share price of Merck KGaA, Darmstadt, Germany, relative to the performance of the DAX® is considered with a weighting of 50%, and the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 25%. The development of organic sales growth as a proportion of a defined target value with a weighting of 25% is a new key performance indicator now taken into account.

Depending on the development of the KPIs, at the end of the respective performance cycle the eligible participants are granted between 0% and 150% of the MSUs they could be eligible to receive. Based on the MSUs granted, the eligible participants receive a cash payment at a specified point in time in the year after the three-year performance cycle has ended. The value of a granted MSU, which is relevant for payment, corresponds to the average closing price of shares of Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 after the performance cycle. Whereas the payout for the 2016 tranche is limited to two times the reference price, the payout for the 2017 and 2018 tranches is limited to two and a half times the individual grant.

The fair value of the obligations is recalculated by an external expert using a Monte Carlo simulation based on the previously described KPIs on each balance sheet date. The expected volatilities are based on the implicit volatility of shares of Merck KGaA, Darmstadt, Germany, and the DAX® in accordance with the remaining term of the respective tranche. The dividend payments incorporated into the valuation model are based on medium-term dividend expectations. Changes of the intrinsic value of share-based compensation programs are allocated to the respective functional costs according to the causation principle. Fair value changes are recognized in financial income or financial expenses.

The Executive Board members have their own Long-Term Incentive Plan, the conditions of which largely correspond to the Long-Term Incentive Plan described here. A description of the plan for the Executive Board can be found in the compensation report, which is part of the Statement on Corporate Governance.

On the occasion of the 350th anniversary of the company in 2018, every employee in Germany was granted shares of Merck KGaA, Darmstadt, Germany, worth € 350. For the granted shares of Merck KGaA, Darmstadt, Germany, the required shares were purchased on the stock market by a third party on behalf of the Group and then transferred to the eligible employees.

List of Shareholdings

(70) List of Shareholdings

The shareholdings of Merck KGaA, Darmstadt, Germany, as of December 31, 2018, are presented below, and a list of the fair values for equity instruments subsequently measured at fair value through other comprehensive income.

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
I. Fully consolidated companies				
Germany				
Germany	Merck KGaA, Darmstadt, Germany	Darmstadt	Parent Company	
Germany	AB Allgemeine Pensions GmbH & Co. KG	Zossen	100.00	100.00
Germany	Allergopharma GmbH & Co. KG	Reinbek	100.00	
Germany	Allergopharma Verwaltungs GmbH	Darmstadt	100.00	100.00
Germany	Biochrom GmbH	Berlin	100.00	
Germany	Chemitra GmbH	Darmstadt	100.00	100.00
Germany	Emedia Export Company mbH	Gernsheim	100.00	
Germany	Litec-LLL GmbH	Greifswald	100.00	100.00
Germany	Merck 12. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck 13. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 15. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 16. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 20. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck 21. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Accounting Solutions & Services Europe GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Chemicals GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck China Chemicals Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Consumer Health Holding Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Export GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Germany	Merck Financial Services GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Financial Trading GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	100.00
Germany	Merck Healthcare Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Healthcare KGaA, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	100.00
Germany	Merck International GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Internationale Beteiligungen GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Life Science Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Life Science GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Eppelheim	100.00	100.00
Germany	Merck Life Science Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Patent GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Performance Materials Germany GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Performance Materials GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Wiesbaden	100.00	
Germany	Merck Performance Materials Holding GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Real Estate GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Schuchardt OHG, a subsidiary of Merck KGaA, Darmstadt, Germany	Hohenbrunn	100.00	100.00
Germany	Merck Serono GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Vierte Allgemeine Beteiligungsgesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Gernsheim	100.00	
Germany	Merck Wohnungs- und Grundstücksverwaltungsgesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Millipart GmbH	Gernsheim	100.00	
Germany	Sigma-Aldrich Biochemie GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Chemie GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Chemie Holding GmbH	Taufkirchen	100.00	
Germany	Sigma-Aldrich Grundstücks GmbH & Co. KG	Steinheim	100.00	
Germany	Sigma-Aldrich Logistik GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Produktions GmbH	Steinheim	100.00	
Germany	Sigma-Aldrich Verwaltungs GmbH	Steinheim	100.00	100.00

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Other European countries				
Austria	Allergopharma Vertriebsgesellschaft m.b.H.	Vienna	100.00	
Austria	Merck Chemicals and Life Science GesmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Vienna	100.00	
Austria	Merck Gesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Vienna	100.00	
Austria	Sigma-Aldrich Handels GmbH	Vienna	100.00	
Belgium	Merck Chemicals N.V./S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Merck N.V.-S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Overijse	100.00	
Belgium	Sigma-Aldrich BVBA/SPRL	Overijse	100.00	
Bulgaria	Merck Bulgaria EAD, a subsidiary of Merck KGaA, Darmstadt, Germany	Sofia	100.00	
Croatia	Merck d.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Zagreb	100.00	
Czech Republic	Merck spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Prague	100.00	
Czech Republic	Sigma-Aldrich spol. s r.o.	Prague	100.00	
Denmark	Merck A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Merck Life Science A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Soborg	100.00	
Denmark	Sigma-Aldrich Denmark ApS	Soborg	100.00	
Denmark	Survac ApS	Frederiksberg	100.00	100.00
Estonia	Merck Serono OÜ, a subsidiary of Merck KGaA, Darmstadt, Germany	Tallinn	100.00	
Finland	Merck Life Science OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
Finland	Merck OY, a subsidiary of Merck KGaA, Darmstadt, Germany	Espoo	100.00	
Finland	Sigma-Aldrich Finland OY	Espoo	100.00	
France	Gonnon S.A.S.	Lyon	100.00	
France	Merck Biodevelopment S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Chimie S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Fontenay s/Bois	100.00	
France	Merck Performance Materials S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Trosly-Breuil	100.00	
France	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	99.84	
France	Merck Santé S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Merck Serono S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	100.00	
France	Millipore S.A.S.	Molsheim	100.00	
France	Sigma-Aldrich Chimie S.a.r.l.	Saint Quentin Fallavier	100.00	
France	Sigma-Aldrich Chimie SNC	Saint Quentin Fallavier	100.00	
France	Sigma-Aldrich Holding S.a.r.l.	Saint Quentin Fallavier	100.00	
Greece	Merck A.E., a subsidiary of Merck KGaA, Darmstadt, Germany	Maroussi, Athens	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Hungary	Merck Kft., a subsidiary of Merck KGaA, Darmstadt, Germany	Budapest	100.00	
Hungary	Sigma-Aldrich Kft.	Budapest	100.00	
Ireland	Merck Finance Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	
Ireland	Merck Millipore Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Carrigtwohill	100.00	
Ireland	Merck Serono (Ireland) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Dublin	100.00	
Ireland	Millipore Cork Unlimited Company	Carrigtwohill	100.00	
Ireland	Shrawdine Limited	Arklow	100.00	
Ireland	Sigma-Aldrich Ireland Ltd.	Arklow	100.00	
Ireland	Silverberry Limited	Arklow	100.00	
Italy	Allergopharma S.p.A.	Rome	100.00	
Italy	Istituto di Ricerche Biomediche Antoine Marxer RBM S.p.A.	Colleretto Giacosa	100.00	
Italy	Merck S.p.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Milan	100.00	
Italy	Merck Serono S.p.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rome	99.74	
Italy	Sigma-Aldrich S.r.l.	Milan	100.00	
Latvia	Merck Serono SIA, a subsidiary of Merck KGaA, Darmstadt, Germany	Riga	100.00	
Lithuania	Merck Serono, UAB, a subsidiary of Merck KGaA, Darmstadt, Germany	Vilnius	100.00	
Luxembourg	AZ Electronic Materials S.a.r.l.	Luxembourg	100.00	
Luxembourg	Mats Finance S.a.r.l.	Luxembourg	100.00	
Luxembourg	Merck Chemicals Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finance S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Finanz S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Holding S.a.r.l., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Invest SCS, a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	
Luxembourg	Merck Re S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Luxembourg	100.00	100.00
Luxembourg	Millilux S.a.r.l.	Luxembourg	100.00	
Luxembourg	Millipore International Holdings, S.a.r.l.	Luxembourg	100.00	
Luxembourg	Ridgefield Acquisition S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich Global S.a.r.l.	Luxembourg	100.00	
Luxembourg	Sigma-Aldrich S.a.r.l.	Luxembourg	100.00	
Malta	Merck Capital Holding Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	
Malta	Merck Capital Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pietà	100.00	
Netherlands	BioControl Systems B.V.	Nieuwerkerk Ad Ijssel	100.00	
Netherlands	Merck B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Schiphol-Rijk	100.00	
Netherlands	Merck Chemicals B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam Zuidoost	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Netherlands	Merck Holding Netherlands B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Schiphol-Rijk	100.00	
Netherlands	Merck Ventures B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00	
Netherlands	Merck Window Technologies B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Veldhoven	100.00	100.00
Netherlands	Serono Tri Holdings B.V.	Schiphol-Rijk	100.00	
Netherlands	Sigma-Aldrich B.V.	Zwijndrecht	100.00	
Netherlands	Sigma-Aldrich Chemie N.V.	Zwijndrecht	100.00	
Norway	Merck Life Science AS, a subsidiary of Merck KGaA, Darmstadt, Germany	Oslo	100.00	
Norway	Sigma-Aldrich Norway AS	Oslo	100.00	
Poland	Merck Business Solutions Europe Sp.z.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Wroclaw	100.00	
Poland	Merck Sp.z.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Warsaw	100.00	
Poland	Sigma-Aldrich Sp.z.o.o.	Poznan	100.00	
Portugal	Laquifa Laboratorios S.A.	Algés	100.00	
Portugal	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Algés	100.00	
Romania	Merck Romania S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Bucharest	100.00	
Russia	Merck LLC, a subsidiary of Merck KGaA, Darmstadt, Germany	Moscow	100.00	
Russia	Sigma-Aldrich Rus LLC	Moscow	100.00	
Serbia	Merck d.o.o. Beograd., a subsidiary of Merck KGaA, Darmstadt, Germany	Belgrade	100.00	
Slovakia	Merck spol. s r.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Bratislava	100.00	
Slovakia	Sigma-Aldrich, spol. s r.o.	Bratislava	100.00	
Slovenia	Merck d.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Ljubljana	100.00	
Spain	Merck Chemicals and Life Science S.A.U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Merck, S. L. U., a subsidiary of Merck KGaA, Darmstadt, Germany	Madrid	100.00	
Spain	Sigma-Aldrich Quimica S.L.	Madrid	100.00	
Sweden	Merck AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Merck Chemicals and Life Science AB, a subsidiary of Merck KGaA, Darmstadt, Germany	Solna	100.00	
Sweden	Sigma-Aldrich Sweden AB	Stockholm	100.00	
Switzerland	Allergopharma AG	Therwil	100.00	
Switzerland	Ares Trading SA	Aubonne	100.00	
Switzerland	Merck & Cie., a subsidiary of Merck KGaA, Darmstadt, Germany	Altdorf	51.63	51.63
Switzerland	Merck (Schweiz) AG, a subsidiary of Merck KGaA, Darmstadt, Germany	Zug	100.00	
Switzerland	Merck Performance Materials (Suisse) SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Coinsins	100.00	
Switzerland	Merck Serono SA, a subsidiary of Merck KGaA, Darmstadt, Germany	Coinsins	100.00	
Switzerland	SeroMer Holding SA	Coinsins	100.00	
Switzerland	Sigma-Aldrich (Switzerland) Holding AG	Buchs	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Switzerland	Sigma-Aldrich Chemie GmbH	Buchs	100.00	
Switzerland	Sigma-Aldrich International GmbH	St. Gallen	100.00	
Switzerland	Sigma-Aldrich Production GmbH	Buchs	100.00	
Turkey	Merck Ilac Ecza ve Kimya Ticaret AS., a subsidiary of Merck KGaA, Darmstadt, Germany	Istanbul	100.00	
United Kingdom	Aldrich Chemical Co. Ltd.	Gillingham	100.00	
United Kingdom	AZ Electronic Materials (UK) Ltd.	Feltham	100.00	
United Kingdom	BioControl Systems Limited	London	100.00	
United Kingdom	BioReliance Limited	Aberdeen	100.00	
United Kingdom	BioReliance U.K. Acquisition Limited	London	100.00	
United Kingdom	Epichem Group Limited	Gillingham	100.00	
United Kingdom	Merck Chemicals Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Gillingham	100.00	
United Kingdom	Merck Holding Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Investments Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Performance Materials Services UK Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Serono Europe Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	London	100.00	
United Kingdom	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Millipore (U.K.) Ltd.	Feltham	100.00	
United Kingdom	Millipore UK Holdings LLP	Feltham	100.00	
United Kingdom	SAFC Biosciences Limited	Gillingham	100.00	
United Kingdom	SAFC Hitech Limited	Gillingham	100.00	
United Kingdom	Sigma-Aldrich Company Limited	Gillingham	100.00	
United Kingdom	Sigma-Aldrich Financial Services Limited	Gillingham	100.00	
United Kingdom	Sigma-Aldrich Holdings Ltd.	Gillingham	100.00	
United Kingdom	Sigma-Genosys Limited	Gillingham	100.00	
North America				
Canada	EMD Chemicals Canada Inc.	Toronto	100.00	
Canada	EMD Crop BioScience Canada Inc.	Toronto	100.00	
Canada	EMD Inc.	Mississauga	100.00	
Canada	Millipore (Canada) Ltd.	Toronto	100.00	
Canada	Natrix Separations, Inc.	Burlington	100.00	
Canada	Sigma-Aldrich Canada Co.	Oakville	100.00	
United States	Aldrich Chemical Co. LLC	Milwaukee	100.00	
United States	Aldrich Chemical Foreign Holding LLC	St. Louis	100.00	
United States	Aldrich-APL, LLC	Urbana	100.00	
United States	Allergopharma USA, Inc.	Alexandria	100.00	
United States	BioControl Systems, Inc.	Wilmington	100.00	
United States	BioReliance Corporation	Rockville	100.00	
United States	Cell Marque Corporation	Rocklin	100.00	
United States	Cerilliant Corporation	Round Rock	100.00	
United States	EMD Accounting Solutions & Services America, Inc.	Rockland	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
United States	EMD Digital Inc.	Burlington	100.00	
United States	EMD Finance LLC	Wilmington	100.00	
United States	EMD Holding Corp.	Rockland	100.00	
United States	EMD Millipore Corporation	Burlington	100.00	
United States	EMD Performance Materials Corp.	Philadelphia	100.00	
United States	EMD Serono Holding, Inc.	Rockland	100.00	
United States	EMD Serono Research & Development Institute, Inc.	Billerica	100.00	
United States	EMD Serono, Inc.	Rockland	100.00	
United States	Grzybowski Scientific Inventions Ltd.	Evanston	100.00	
United States	Millipore Asia Ltd.	Wilmington	100.00	
United States	Millipore UK Holdings I, LLC	Wilmington	100.00	
United States	Millipore UK Holdings II, LLC	Wilmington	100.00	
United States	Ormet Circuits, Inc.	San Diego	100.00	
United States	Research Organics, LLC	Cleveland	100.00	
United States	SAFC Biosciences, Inc.	Lenexa	100.00	
United States	SAFC Carlsbad, Inc.	Carlsbad	100.00	
United States	SAFC, Inc.	Madison	100.00	
United States	Serono Laboratories, Inc.	Rockland	100.00	
United States	Sigma Chemical Foreign Holding LLC	St. Louis	100.00	
United States	Sigma Redevelopment Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Co. LLC	St. Louis	100.00	
United States	Sigma-Aldrich Corporation	St. Louis	100.00	
United States	Sigma-Aldrich Foreign Holding Co.	St. Louis	100.00	
United States	Sigma-Aldrich Manufacturing LLC	St. Louis	100.00	
United States	Sigma-Aldrich Missouri Insurance Company	St. Louis	100.00	
United States	Sigma-Aldrich Research Biochemicals, Inc.	Natick	100.00	
United States	Sigma-Aldrich RTC, Inc.	Laramie	100.00	
United States	Sigma-Aldrich, Inc.	Milwaukee	100.00	
United States	Sigma-Genosys of Texas LLC	The Woodlands	100.00	
United States	Supelco, Inc.	Bellefonte	100.00	
Asia-Pacific (APAC)				
Australia	Merck Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bayswater	100.00	
Australia	Merck Serono Australia Pty. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Sydney	100.00	
Australia	Proligo Australia Pty. Ltd.	Castle Hill	100.00	
Australia	SAFC Biosciences Pty. Ltd.	Castle Hill	100.00	
Australia	Sigma-Aldrich Oceania Pty. Ltd.	Castle Hill	100.00	
Australia	Sigma-Aldrich Pty. Ltd.	Castle Hill	100.00	
China	Beijing Skywing Technology Co., Ltd.	Beijing	100.00	
China	Merck Chemicals (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Display Materials (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Electronic Materials (Suzhou) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Suzhou	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
China	Merck Holding (China) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Life Science Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Life Science Technologies (Nantong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Management Consulting (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	
China	Merck Performance Materials Hong Kong Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical (HK) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Pharmaceutical Distribution (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Pharmaceutical Manufacturing (Jiangsu) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nantong	100.00	
China	Merck Serono (Beijing) Pharmaceutical Distribution Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	
China	Merck Serono (Beijing) Pharmaceutical R&D Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	
China	Merck Serono Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Beijing	100.00	
China	SAFC Hitech (Shanghai) Co., Ltd.	Shanghai	100.00	
China	Sigma-Aldrich (Shanghai) Trading Co., Ltd.	Shanghai	100.00	
China	Sigma-Aldrich (Wuxi) Life Science & Technology Co., Ltd.	Wuxi	100.00	
India	Merck Life Science Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Merck Performance Materials Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Merck Specialities Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Sigma-Aldrich Chemicals Private Limited	Bangalore	100.00	
Indonesia	P.T. Merck Chemicals and Life Sciences, a subsidiary of Merck KGaA, Darmstadt, Germany	Jakarta	100.00	
Indonesia	P.T. Merck Tbk., a subsidiary of Merck KGaA, Darmstadt, Germany	Jakarta	86.65	
Japan	BioReliance K.K.	Tokyo	100.00	
Japan	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Serono Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Sigma-Aldrich Japan G.K.	Tokyo	100.00	
Malaysia	Merck Sdn Bhd, a subsidiary of Merck KGaA, Darmstadt, Germany	Petaling Jaya	100.00	
Malaysia	Sigma-Aldrich (M) Sdn Bhd	Kuala Lumpur	100.00	
New Zealand	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Palmerston North	100.00	
New Zealand	Sigma-Aldrich New Zealand Co.	Christchurch	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Philippines	Merck Business Solutions Asia Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Bonifacio Global City	99.99	
Philippines	Merck Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Bonifacio Global City	100.00	
Singapore	Merck Performance Materials Pte. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Singapore	100.00	
Singapore	Merck Pte. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Singapore	100.00	
Singapore	Sigma-Aldrich Pte. Ltd.	Singapore	100.00	
South Korea	Merck Electronic Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Seoul	100.00	
South Korea	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Seoul	100.00	
South Korea	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Pyeongtaek-shi	100.00	
South Korea	Sigma-Aldrich Korea Ltd.	Yongin City	100.00	
Taiwan	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	Merck Performance Materials Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Taipei	100.00	
Taiwan	SAFC Hitech Taiwan Co. Ltd.	Kaohsiung	100.00	
Thailand	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Bangkok	45.11	
Vietnam	Merck Vietnam Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Ho Chi Minh City	100.00	
Latin America				
Argentina	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Buenos Aires	100.00	
Argentina	Sigma-Aldrich de Argentina S.r.l.	Buenos Aires	100.00	
Brazil	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rio de Janeiro	100.00	
Brazil	Sigma-Aldrich Brasil Ltda.	São Paulo	100.00	
Chile	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Santiago de Chile	100.00	
Chile	Sigma-Aldrich Quimica Ltda.	Santiago de Chile	100.00	
Colombia	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Bogota	100.00	
Ecuador	Merck C.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Quito	100.00	
Guatemala	Merck, S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Guatemala City	100.00	
Mexico	Merck Biopharma Distribution S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Merck, S.A. de C.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Mexico City	100.00	
Mexico	Sigma-Aldrich Quimica, S. de R.L. de C.V.	Toluca	100.00	
Panama	Mesofarma Corporation	Panama City	100.00	
Peru	Merck Peruana S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Lima	100.00	
Uruguay	ARES Trading Uruguay S.A.	Montevideo	100.00	
Middle East and Africa (MEA)				
Egypt	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Cairo	100.00	
Israel	Inter-Lab Ltd.	Yavne	100.00	
Israel	InterPharm Laboratories Ltd.	Yavne	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Israel	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Herzliya Pituach	100.00	
Israel	PMatX Ltd.	Yavne	90.00	
Israel	QLight Nanotech Ltd.	Jerusalem	100.00	
Israel	Sigma-Aldrich Israel Ltd.	Rehovot	100.00	
Kenya	Merck Healthcare and Life Science Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Nairobi	100.00	
South Africa	Merck (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Halfway House	100.00	
South Africa	Sigma-Aldrich (Pty) Ltd.	Kempton Park	100.00	
Tunisia	Merck Promotion SARL, a subsidiary of Merck KGaA, Darmstadt, Germany	Tunis	100.00	
Tunisia	Merck SARL, a subsidiary of Merck KGaA, Darmstadt, Germany	Tunis	100.00	
United Arab Emirates	Merck Serono Middle East FZ-Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Dubai	100.00	

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value (€ million)
II. Companies not consolidated due to secondary importance					
Germany					
Germany	AB Pensionsverwaltung GmbH	Zossen	100.00	100.00	< 0.5
Germany	Merck 24. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 25. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 26. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 27. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 28. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 29. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 30. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 31. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 36. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 37. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 38. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value (€ million)
Germany	Merck 39. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 40. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck 41. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Germany	Merck Foundation gGmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00	< 0.5
Other European countries					
Greece	Sigma-Aldrich (OM) Ltd.	Athens	100.00		< 0.5
Ireland	SAFC Arklow Ltd.	Arklow	100.00		< 0.5
Netherlands	Merck Europe B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Amsterdam	100.00		< 0.5
Russia	Chemical Trade Limited LLC	Moscow	100.00		< 0.5
Russia	MedChem Limited	Moscow	100.00		< 0.5
Russia	SAF-LAB LLC	Moscow	100.00		< 0.5
Switzerland	iOnctura SA	Plan-les-Ouates	73.60		A)
United Kingdom	B-Line Systems Limited	Gillingham	100.00		< 0.5
United Kingdom	Bristol Organics Ltd.	Gillingham	100.00		< 0.5
United Kingdom	Fluka Chemicals Ltd.	Gillingham	100.00		< 0.5
United Kingdom	Merck Cross Border Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		< 0.5
United Kingdom	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		< 0.5
United Kingdom	Merck Pension Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00		< 0.5
United Kingdom	Sigma Chemical Co. Ltd.	Gillingham	100.00		< 0.5
United Kingdom	Sigma Entity One Limited	Gillingham	100.00		< 0.5
United Kingdom	UFC Ltd.	Gillingham	100.00		< 0.5
United Kingdom	Ultrafine Limited	Gillingham	100.00		< 0.5
United Kingdom	Webnest Ltd.	Gillingham	100.00		< 0.5
United Kingdom	Wessex Biochemicals Ltd.	Gillingham	100.00		A)
North America					
United States	Fluka Chemical Corp.	St. Louis	100.00		< 0.5
United States	TocopheRx, Inc.	Burlington	62.83		A)
Asia-Pacific (APAC)					
Australien	Biochrom Australia Pty. Ltd.	Bayswater	100.00		< 0.5
China	Merck Innovation Hub (Guangdong) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Guangzhou	100.00		< 0.5
Latin America					
Dominican Republic	Merck Dominicana, S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Santo Domingo	100.00		< 0.5

A) These are affiliates in the portfolio of M Ventures. The fair value of the M Ventures portfolio on December 31, 2018, amounted to € 145 million.

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value (€ million)
Middle East and Africa (MEA)					
Morocco	Merck Maroc S.A.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Casablanca	100.00		< 0.5
Nigeria	Merck Pharmaceutical and Life Sciences Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Lagos	100.00		< 0.5
III. Non-controlled companies majority-owned					
Latin America					
Venezuela	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Caracas	100.00		< 0.5
Venezuela	Representaciones MEPRO S.A.	Caracas	100.00		< 0.5
IV. Associates not included at equity due to secondary importance					
Other European countries					
Netherlands	Calypso Biotech B.V.	Amsterdam	38.81		A)
Switzerland	Asceneuron SA	Lausanne	25.35		A)
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11		2
Switzerland	Vaximm AG	Basel	22.06		A)
North America					
United States	Prolog Healthy Living Fund, L.P.	St. Louis	38.32		B)
United States	Prolog Healthy Living Fund II, L.P.	St. Louis	50.58		B)
Middle East and Africa (MEA)					
Israel	Neviah Genomics Ltd.	Yavne	69.00	7.75	A)
V. Other equity investments					
Germany					
Germany	Alcan Systems GmbH	Darmstadt	< 20.00		A)
Germany	Azelis Deutschland Kosmetik GmbH	Moers	< 20.00	< 20.00	2
Germany	InfraServ GmbH & Co. Wiesbaden KG	Wiesbaden	< 20.00		2
Germany	Inuru GmbH	Berlin	< 20.00		< 0.5
Germany	IOmx Therapeutics AG	Martinsried	< 20.00		A)
Germany	pharma mall Gesellschaft für Electronic Commerce mbH	Sankt Augustin	< 20.00		1
Germany	PharmLog Pharma Logistik GmbH	Bönen	< 20.00	< 20.00	3
Germany	PrintCity GmbH & Co. KG	Neuried	< 20.00	< 20.00	< 0.5

A) These are affiliates in the portfolio of M Ventures. The fair value of the M Ventures portfolio on December 31, 2018, amounted to € 145 million.
B) These are closed funds that are classified as debt within the meaning of IFRS 9.

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value (€ million)
Other European countries					
Austria	f-star Biotechnologische Forschungs- und Entwicklungsgesellschaft mbH	Vienna	< 20.00		A)
Belgium	ReWind Therapeutics N.V.	Leuven-Heverlee	< 20.00		A)
Finland	Abacus Diagnostica OY	Turku	< 20.00		< 0.5
Finland	Forendo Pharma OY	Turku	< 20.00		A)
France	Aveni S.A.S.	Massy	< 20.00		A)
France	DNA Script S.A.S.	Paris	< 20.00		A)
Netherlands	Mosa Meat B.V.	Maastricht	< 20.00		A)
Netherlands	SynAffix B.V.	Nijmegen	< 20.00		A)
Sweden	Galecto Biotech AB	Lund	< 20.00		A)
Switzerland	Inthera Bioscience AG	Schlieren	23.28		A)
Switzerland	ObsEva SA	Cologny	< 20.00		A)
United Kingdom	Artios Pharma Limited	London	< 20.00		A)
United Kingdom	Canbex Therapeutics Ltd.	London	< 20.00		A)
United Kingdom	F-Star Alpha Limited	Cambridge	< 20.00		A)
United Kingdom	F-Star Beta Limited	Cambridge	< 20.00		A)
United Kingdom	F-Star Delta Limited	Cambridge	< 20.00		A)
United Kingdom	Macrophage Pharma Limited	Windsor	< 20.00		A)
United Kingdom	Peratech HoldCo Limited	Brompton-on-Swale	< 20.00		A)
United Kingdom	Storm Therapeutics Limited	London	< 20.00		A)
North America					
United States	Akili Interactive Labs, Inc.	Boston	< 20.00		A)
United States	Allozyne, Inc.	Seattle	< 20.00		< 0.5
United States	ApoGen Biotechnologies, Inc.	Seattle	< 20.00		A)
United States	Biolinq Inc.	San Diego	< 20.00		A)
United States	Bird Rock Bio, Inc.	La Jolla	< 20.00		A)
United States	CLEARink Displays, Inc.	Fremont	< 20.00		A)
United States	Indi Molecular, Inc.	Culver City	< 20.00		A)
United States	Intrexon Corporation	Germantown	< 20.00		118
United States	Kraig Biocraft Laboratories, Inc.	Ann Arbor	< 20.00		< 0.5
United States	Lumiode, Inc.	New York	< 20.00		A)
United States	Progyny, Inc.	Menlo Park	< 20.00		A)
United States	Raze Therapeutics, Inc.	Cambridge	< 20.00		A)
United States	Ribometrix Inc.	Durham	< 20.00		A)
United States	Tioga Pharmaceuticals, Inc.	San Diego	< 20.00	< 20.00	< 0.5
United States	Translate Bio, Inc.	Cambridge	< 20.00		A)

A) These are affiliates in the portfolio of M Ventures. The fair value of the M Ventures portfolio on December 31, 2018, amounted to € 145 million.

Country	Company	Registered office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)	Fair value (€ million)
Asia-Pacific (APAC)					
Australia	Immutep Limited	Sydney	< 20.00		< 0.5
Middle East and Africa (MEA)					
Algeria	Novapharm Production SARL	Wilaya de Tipiza	20.00		< 0.5
Israel	ARTSaVIT Ltd.	Yavne	< 20.00		A)
Israel	Explore Bio 1 Ltd.	Yavne	20.00		A)
Israel	Explore Bio 3 Ltd.	Yavne	22.50		A)
Israel	MediSafe Project Ltd.	Haifa	< 20.00		A)
Israel	Metabomed Ltd.	Yavne	< 20.00		A)
Israel	Pantheon Biosciences Ltd.	Yavne	< 20.00		A)
Israel	Wiliot Ltd.	Caesarea	< 20.00		A)

A) These are affiliates in the portfolio of M Ventures. The fair value of the M Ventures portfolio on December 31, 2018, amounted to € 145 million.

Darmstadt, February 14, 2019

Stefan Oschmann

Udit Batra

Kai Beckmann

Belén Garijo

Marcus Kuhnert

Responsibility Statement

To the best of our knowledge, and in accordance with the applicable reporting principles, the consolidated financial statements of the Group give a true and fair view of the assets, liabilities, financial position and profit or loss of the Group, and the combined management report includes a fair review of the development and performance of the business and the position of the Group, together with a description of the material opportunities and risks associated with the expected development of the Group.

Darmstadt, February 14, 2019

Stefan Oschmann

Udit Batra

Kai Beckmann

Belén Garijo

Marcus Kuhnert

Independent Auditor's Report

To MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany

Report on the Audit of the Consolidated Financial Statements and of the Combined Management Report

Opinions

We have audited the consolidated financial statements of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, and its subsidiaries (the Group), which comprise the consolidated balance sheet as of December 31, 2018, the consolidated income statement, the consolidated statement of comprehensive income, consolidated statement of changes in net equity and consolidated cash flow statement for the financial year from January 1, 2018, to December 31, 2018, and notes to the consolidated financial statements, including a summary of significant accounting policies. In addition, we have audited the combined management report of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, for the financial year from January 1, 2018, to December 31, 2018.

In our opinion, on the basis of the knowledge obtained in the audit,

- the accompanying consolidated financial statements comply, in all material respects, with the IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB [Handelsgesetzbuch: German Commercial Code] and, in compliance with these requirements, give a true and fair view of the assets, liabilities, and financial position of the Group as of December 31, 2018, and of its financial performance for the financial year from January 1, 2018, to December 31, 2018, and
- the accompanying combined management report as a whole provides an appropriate view of the Group's position. In all material respects, this combined management report is consistent with the consolidated financial statements, complies with German legal requirements and appropriately presents the opportunities and risks of future development.

Pursuant to Section 322 (3) sentence 1 HGB, we declare that our audit has not led to any reservations relating to the legal compliance of the consolidated financial statements and of the combined management report.

Basis for the Opinions

We conducted our audit of the consolidated financial statements and of the combined management report in accordance with Section 317 HGB and EU Audit Regulation No 537/2014 (referred to subsequently as "EU Audit Regulation") and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Our responsibilities under those requirements and principles are further described in the "Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report" section of our auditor's report. We are independent of the group entities in accordance with the requirements of European law and German commercial and professional law, and we have fulfilled our other German professional responsibilities in accordance with these requirements. In addition, in accordance with Article 10 (2)(f) of the EU Audit Regulation, we declare that we have not provided non-audit services prohibited under Article 5 (1) of the EU Audit Regulation. We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our opinions on the consolidated financial statements and on the combined management report.

Key Audit Matters in the Audit of the Consolidated Financial Statements

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements for the financial year from January 1, 2018, to December 31, 2018. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, we do not provide a separate opinion on these matters.

MEASUREMENT OF DISPOSAL GAIN RECORDED FROM THE SALE OF THE CONSUMER HEALTH BUSINESS

Explanatory notes on the sale of Consumer Health business activities can be found in note 5 of the notes to the consolidated financial statements.

The financial statement risk

On April 19, 2018, the Group entered into a contract with The Procter & Gamble Company, United States (Procter & Gamble), regarding the sale of the Consumer Health business. The sale of the business activities was completed on December 1, 2018.

In return for the sale of global Consumer Health business to Procter & Gamble, the Group received sale proceeds amounting to EUR 3.4 billion before certain subsequent purchase price adjustments. The disposal gain recorded from the transaction, which was determined by deducting the transferred net assets including goodwill from the total purchase price, amounted to EUR 2.6 billion before taxes.

In order to determine the total purchase price, it was necessary, among other things, to estimate the expected amount of purchase price adjustments that are expected to be ultimately determined in the first half of 2019 based on the amounts of operating assets and liabilities transferred.

To determine the amount of net assets transferred, it was necessary

- to assess whether, given that a series of production, supply and service arrangements were concluded along with a sales agreement, a disposal of the Consumer Health business activities was realized at the date of sale, and
- to identify the assets and liabilities transferred to P&G as part of the sales transaction and it was necessary to determine the proportional value of goodwill that was disposed of as part of the sale.

In light of the complexity involved in identifying the disposal group and the need for estimates, there is a risk for the consolidated financial statements that the gain on disposal may not have been determined appropriately.

Our audit approach

We first gained an understanding of the economic substance of the agreements by reading the sales, production, supply and service agreements that were concluded with Procter & Gamble. We then assessed whether a de-recognition for accounting treatment of the Consumer Health business was appropriate on the date when the sale was completed, notwithstanding the fact that certain supply and performance obligations continue to be in effect going forward.

Based on this understanding, we

- verified the calculations performed by the Company to determine the total purchase price by agreeing the amounts to the purchase agreement. In doing so, we assessed whether the amount of the purchase price adjustments expected to be ultimately determined in the first half of 2019, including adjustments for transferred operating assets and liabilities, was estimated with sufficient accuracy,
- performed tests of details based on specific items sampling to verify whether the assets (including goodwill) and liabilities to be transferred pursuant to the provisions of the purchase agreement were completely identified with accurate carrying amounts as of the time of the sale,
- referred to the information obtained through analytical procedures as part of our audit to assess whether the transferred assets (including goodwill) and liabilities were completely and accurately identified.

Our conclusions

The values used in the calculation of the disposal gain recorded from the sale of the global Consumer Health business to Procter & Gamble were determined appropriately and the gain on disposal was accurately determined.

RECOGNITION AND MEASUREMENT OF INCOME TAX LIABILITIES AND DEFERRED TAX LIABILITIES

Explanatory notes on the recognition and measurement of income tax liabilities and deferred tax liabilities can be found in notes 14, 26 and 27 of the notes to the consolidated financial statements.

The financial statement risk
As of December 31, 2018, the balance sheet of the Company includes current income tax liabilities in the amount of EUR 1,176 million and deferred tax liabilities of EUR 1,288 million.

The Group operates in different jurisdictions with different legal systems. The application of local regulations on income tax, tax incentives and transfer pricing rules is complex. The recognition and measurement of income tax liabilities require the Group to exercise judgment in assessing tax matters and to make estimates regarding uncertain tax positions.

The measurement of income tax liabilities as well as the assessment of unrecognized contingent tax liabilities are subject to judgment and estimation uncertainty. Among others, this relates to intra-group business transfers, legal disputes attributable to the determination of earnings under tax law, and transfer pricing adjustments. The Group routinely engages external experts to support its own risk assessment with expert opinions from tax specialists.

There is a risk for the financial statements that income tax liabilities and deferred tax liabilities are not fully recognized or not appropriately measured.

Our audit approach
We involved our own specialists in international tax law into the audit team in order to evaluate the Group's assessment of tax risks and the related opinions of external experts engaged by the Group.

We obtained an understanding of existing tax risks through inquiry of management of the affected group companies and employees of the tax department. We assessed the competence, capabilities and objectivity of the external experts and evaluated their expert opinions.

In addition, we analyzed correspondence with the relevant tax authorities and assessed the assumptions underlying the determination of income tax liabilities based on our knowledge and experience of how the relevant legal requirements are currently applied by the tax authorities and courts. We have scrutinized the Group's approach regarding the recognition and measurement of deferred tax liabilities, based on laws and regulations enacted as of the reporting date, and performed recalculations.

Our conclusions
The valuation model and assumptions underlying the recognition and measurement of income tax liabilities are reasonable. The approach regarding the recognition and measurement of deferred tax liabilities is adequate.

IMPAIRMENT TESTING OF GOODWILL

Explanatory notes on the impairment tests can be found in note 19 of the notes to the consolidated financial statements.

The financial statement risk
Due to the acquisition of Sigma-Aldrich Corporation, United States, in November 2015, goodwill, in particular for the cash-generating unit Life Science, increased significantly. In aggregate, goodwill amounts to EUR 13,764 million and thus represents 37% of the Group's total assets as of December 31, 2018, with EUR 10,896 million of this attributable to Life Science.

Goodwill is to be tested for impairment at least once a year, and may need to be tested ad hoc if necessary. In performing the goodwill impairment test, the Group primarily determines the value in use by means of a discounted cash flow method. The valuation model used to determine the value in use is complex and the result of this valuation are highly dependent on the projection of future net cash flows (taking into account future revenue growth, profit margins, exchange rates and long-term growth rates) and the discount factor used, and therefore is subject to significant estimation uncertainty.

There is a risk for the financial statements that an existing goodwill impairment loss was not recognized as of the reporting date. In addition, there is a risk that the related disclosures in the notes to the consolidated financial statements are not complete and appropriate.

Our audit approach
Using our own sensitivity analyses, we assessed the extent to which the goodwill of each cash generating unit would still be sufficiently covered by the respective values in use if assumptions and parameters underlying the calculations were to change in a manner that is deemed possible. On the basis of these analyses, our audit particularly focused on the cash-generating unit Life Science.

We reconciled the expected net cash flows underlying the value in use calculations with the current medium-term plan approved by management. To assess the assumptions used in preparing the medium-term plan, we obtained an understanding of the planning process through discussions with company representatives, including corporate management and representatives from the corporate divisions and the research and development department, we assessed the plausibility and consistency of the explanations received with the projections, and we compared the assumptions used with the expectations of external analysts and sources.

As part of our audit of the discount factor, we analyzed the peer group used. With regard to other assumptions and parameters (e.g. risk-free interest rate, beta factor, market risk premium), we compared those assumptions and parameters with our own assumptions and publicly available data to assess whether these were appropriate and whether they were within the range of external recommendations, to the extent available. In addition, we verified the calculation model used to determine the discount factor.

We assessed the appropriateness of the valuation model used. To ensure arithmetical accuracy, we used a risk-based audit approach to recalculate the Company's calculations on a sample basis.

In addition, we assessed whether the Company's disclosures regarding the goodwill impairment test in the notes to the consolidated financial statements are complete and appropriate.

Our conclusions
The calculation method used for the goodwill impairment test is appropriate and in line with the applicable valuation principles. Overall, the assumptions and parameters used by management are balanced. The disclosures in the notes to the consolidated financial statements are complete and properly depict the judgment associated with the subsequent measurement of goodwill.

MEASUREMENT OF PROVISIONS FOR PATENT DISPUTES

Explanatory notes on the provisions for patent disputes can be found in note 26 of the notes to the consolidated financial statements.

The financial statement risk
As of December 31, 2018, provisions for legal disputes amount to EUR 551 million, which among others include provisions for patent disputes.

If the outflow of ressources embodying economic benefits is probable the amount of the provisions for patent disputes is determined based on the best estimate of the expenditure required to settle the dispute. Consequently, the measurement of related provisions is based on estimates and judgment of external lawyers and management.

There is a risk for the financial statements that the provisions for patent disputes were not measured appropriately as of the balance sheet date. There is also a risk that the notes to the consolidated financial statements do not contain the required disclosures on the key assumptions.

Our audit approach
As supporting evidence for the estimated expenditure required to settle the patent disputes, we obtained written confirmations from external legal counsel engaged by the Group to obtain an understanding of the current status of the pending legal proceedings, reviewed correspondence with the plaintiffs and relevant courts and other authorities, and also assessed underlying documents and minutes. In this context we also interviewed the Company's in-house patent counsel, employees in the Group's controlling and accounting departments, and verified the plausibility and consistency of the explanations obtained with the determination of the best estimate of the expenditure required to settle the disputes.

To ensure arithmetical accuracy of the valuation model used, we used a risk-based audit approach to recalculate the Company's calculations on a sample basis.

In addition, we assessed whether the Company's explanations on the measurement of provisions for patent disputes in the notes to the consolidated financial statements include appropriate and complete disclosures on the key assumptions.

Our conclusions
The assumptions for the measurement of the provisions for patent law disputes are appropriate. The disclosures in the notes to the consolidated financial statements appropriately illustrate the key assumptions.

Other Information

Management is responsible for the other information. The other information comprises the annual report, with the exception of the audited consolidated financial statements and combined management report and our auditor's report.

Our opinions on the consolidated financial statements and on the combined management report do not cover the other information, and consequently we do not express an opinion or any other form of assurance conclusion thereon.

In connection with our audit, our responsibility is to read the other information and, in so doing, to consider whether the other information

- is materially inconsistent with the consolidated financial statements, with the combined management report or our knowledge obtained in the audit, or
- otherwise appears to be materially misstated.

Responsibilities of Management and the Supervisory Board for the Consolidated Financial Statements and the Combined Management Report

Management is responsible for the preparation of the consolidated financial statements that comply, in all material respects, with IFRSs as adopted by the EU, and the additional requirements of German commercial law pursuant to Section 315e (1) HGB and that the consolidated financial statements, in compliance with these requirements, give a true and fair view of the assets, liabilities, financial position, and financial performance of the Group. In addition, management is responsible for such internal control as they have determined necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern. They also have the responsibility for disclosing, as applicable, matters related to going concern. In addition, they are responsible for financial reporting based on the going concern basis of accounting unless there is an intention to liquidate the Group or to cease operations, or there is no realistic alternative but to do so.

Furthermore, management is responsible for the preparation of the combined management report that, as a whole, provides an appropriate view of the Group's position and is, in all material respects, consistent with the consolidated financial statements, complies with German legal requirements, and appropriately presents the opportunities and risks of future development. In addition, management is responsible for such arrangements and measures (systems) as they have considered necessary to enable the preparation of a combined management report that is in accordance with the applicable German legal requirements, and to be able to provide sufficient appropriate evidence for the assertions in the combined management report.

The Supervisory Board is responsible for overseeing the Group's financial reporting process for the preparation of the consolidated financial statements and of the combined management report.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements and of the Combined Management Report

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatements, whether due to fraud or error, and whether the combined management report as a whole provides an appropriate view of the Group's position and, in all material respects, is consistent with the consolidated financial statements and the knowledge obtained in the audit, complies with the German legal requirements and appropriately presents the opportunities and risks of future development, as well as to issue an auditor's report that includes our opinions on the consolidated financial statements and on the combined management report.

Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Section 317 HGB and the EU Audit Regulation and in compliance with German Generally Accepted Standards for Financial Statement Audits promulgated by the Institut der Wirtschaftsprüfer (IDW) will always detect a material misstatement. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements and this combined management report.

We exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatements of the consolidated financial statements and of the combined management report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinions. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls.

- Obtain an understanding of internal control relevant to the audit of the consolidated financial statements and of arrangements and measures (systems) relevant to the audit of the combined management report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of these systems.
- Evaluate the appropriateness of accounting policies used by management and the reasonableness of estimates made by management and related disclosures.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in the auditor's report to the related disclosures in the consolidated financial statements and in the combined management report or, if such disclosures are inadequate, to modify our respective opinions. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to be able to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements present the underlying transactions and events in a manner that the consolidated financial statements give a true and fair view of the assets, liabilities, financial position and financial performance of the Group in compliance with IFRSs as adopted by the EU and the additional requirements of German commercial law pursuant to Section 315e (1) HGB.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express opinions on the consolidated financial statements and on the combined management report. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our opinions.
- Evaluate the consistency of the combined management report with the consolidated financial statements, its conformity with [German] law, and the view of the Group's position it provides.
- Perform audit procedures on the prospective information presented by management in the combined management report. On the basis of sufficient appropriate audit evidence we evaluate, in particular, the significant assumptions used by management as a basis for the prospective information, and evaluate the proper derivation of the prospective information from these assumptions. We do not express a separate opinion on the prospective information and on the assumptions used as a basis. There is a substantial unavoidable risk that future events will differ materially from the prospective information.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with the relevant independence requirements, and communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, the related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter.

Other Legal and Regulatory Requirements

Further Information pursuant to Article 10 of the EU Audit Regulation

We were elected as group auditor at the annual general meeting on April 27, 2018. We were engaged by the Supervisory Board on June 25, 2018. We have been the group auditor of MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, without interruption since the financial year 1995.

We declare that the opinions expressed in this auditor's report are consistent with the additional report to the Supervisory Board pursuant to Article 11 of the EU Audit Regulation (long-form audit report).

German Public Auditor Responsible for the Engagement

The German Public Auditor responsible for the engagement is Bodo Rackwitz.

Frankfurt am Main, February 15, 2019
KPMG AG
Wirtschaftsprüfungsgesellschaft
[Original German version signed by:]

Braun
Wirtschaftsprüfer
[German Public Auditor]

Rackwitz
Wirtschaftsprüfer
[German Public Auditor]

Business Development 2014 – 2018

This overview may include historically adjusted values in order to ensure comparability with 2018.

€ million					
Results of operations					
Net sales					
Operating result (EBIT)[2]					
Margin (% of net sales)[2]					
EBITDA[2]					
Margin (% of net sales)[2]					
Adjustments[2]					
EBITDA pre[2]					
Margin (% of net sales)[2]					
Profit before income tax					
Profit after tax					
Earnings per share (in €)					
Assets and liabilities					
Total equity and liabilities					
Non-current assets					
of which:					
Goodwill					
Other intangible assets					
Property, plant and equipment					
Current assets					
of which:					
Inventories					
Trade accounts receivable					
Cash and cash equivalents					
Equity					
Financial liabilities					
Non-current					
Current					
Liquidity					
Investments in intangible assets[3]					
Investments in property, plant and equipment[3]					
Business free cash flow[2]					
Net financial debt[2]					
Other key data					
Equity ratio (in %)[2]					
Research and development costs					
Dividend per share (in €)					
Employees (number as of December 31)					

[1] Fiscal 2017 has been adjusted, see Note (49) "Effects from new accounting standards and other presentation and measurement changes" in the Notes to the Consolidated Financial Statements.
[2] Not defined by International Financial Reporting Standards (IFRSs).
[3] According to the consolidated cash flow statement.
[4] Proposal on the appropriation of profits for 2018.

2014	2015	2016	2017[1]	**2018**	change in %
11,363	12,845	15,024	14,517	14,836	2.2%
1,762	1,843	2,481	2,423	1,727	–28.7%
15.5%	14.3%	16.5%	16.7%	11.6%	
3,123	3,354	4,415	4,164	3,528	–15.3%
27.5%	26.1%	29.4%	28.7%	23.8%	
–265	–276	–75	–82	–272	> 100.0%
3,388	3,630	4,490	4,246	3,800	–10.5%
29.8%	28.3%	29.9%	29.3%	25.6%	
1,557	1,487	2,154	2,129	1,461	–31.4%
1,165	1,124	1,633	2,615	3,396	29.9%
2.66	2.56	3.75	5.99	7.76	29.5%
26,010	38,081	38,258	35,621	36,888	3.6%
15,530	30,737	30,589	28,166	27,652	–1.8%
5,694	14,492	15,015	13,582	13,764	1.3%
5,702	10,930	9,980	8,317	7,237	–13.0%
2,990	4,008	4,231	4,512	4,811	6.6%
10,480	7,344	7,670	7,455	9,236	23.9%
1,660	2,610	2,609	2,632	2,764	5.0%
2,220	2,738	2,889	2,923	2,931	0.3%
2,879	832	939	589	2,170	> 100.0%
11,801	12,855	14,050	14,066	17,233	22.5%
5,637	13,713	12,597	10,823	8,896	–17.8%
3,561	9,616	8,809	8,033	6,681	–16.8%
2,076	4,097	3,788	2,790	2,215	–20.6%
143	179	132	392	106	–72.9%
481	514	716	919	910	–0.9%
2,605	2,766	3,318	3,193	2,508	–21.4%
559	12,654	11,513	10,144	6,701	–33.9%
45.4%	33.8%	36.7%	39.5%	46.7%	
1,704	1,709	1,976	2,108	2,225	5.6%
1.00	1.05	1.20	1.25	1,25[4]	–
39,639	49,613	50,348	52,880	51,713	–2.2%

Information and Service

The Annual Report for 2018 was published in German and English. A fully navigable online version of the report along with the consolidated financial statements is available on the Web at www.emdgroup.com/en/annualreport/2018/. It has been optimized for mobile devices.

More information about our company can be found on the Web at www.emdgroup.com and in the brochure “Who we are”, which you may read or download at emdgroup.com/who-we-are.

You can order all publications from Group Communications, Merck KGaA, 64271 Darmstadt, Germany, service@emdgroup.com.

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PHOTOS
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FINANCIAL CALENDAR
for 2019

March
3/7/2019
Annual Press Conference

August
8/8/2019
Half-yearly Financial Report

April
4/26/2019
Annual General Meeting

November
11/14/2019
Quarterly Statement Q3

May
5/14/2019
Quarterly Statement Q1