Merck KGaA
Darmstadt, Germany

INFINITELY CURIOUS

Annual Report 2016

DISCLAIMER

For nearly 350 years, curious people at our company have been bringing ideas to life. As a global science and technology company, a passion for research and discovery is our most valuable resource. With our three business sectors, namely Healthcare, Life Science and Performance Materials, we improve the quality of life of patients, increase the success of our customers, and offer solutions for diverse challenges. Curiosity is and remains our strongest driving force for future-oriented innovations.

“Curiosity fuels business development and enables companies like ours to remain competitive. In my opinion, we should even dare to be more curious. We need curiosity in order to understand technical progress and to shape our future actively and responsibly.”

Stefan Oschmann,
Chairman of the Executive Board and CEO

Group
Key figures

GROUP

Key figures

€ million	2016	2015	Change € million	Change in %
Net sales	15,024	12,845	2,179	17.0%
Operating result (EBIT)[1]	2,481	1,843	637	34.6%
Margin (in % of net sales)[1]	16.5%	14.3%		
EBITDA[1]	4,415	3,354	1,061	31.6%
Margin (in % of net sales)[1]	29.4%	26.1%		
EBITDA pre exceptionals[1]	4,490	3,630	861	23.7%
Margin (in % of net sales)[1]	29.9%	28.3%		
Profit after tax	1,633	1,124	509	45.3%
Earnings per share (€)	3.75	2.56	1.19	46.5%
Earnings per share pre exceptionals (€)[1]	6.21	4.87	1.34	27.5%
Business free cash flow[1]	3,318	2,766	552	20.0%

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

GROUP

Net sales

€ million

GROUP

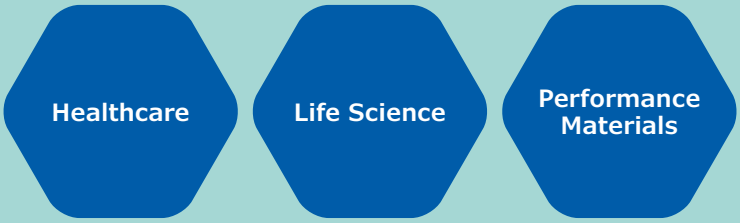
EBITDA pre exceptionals

€ million

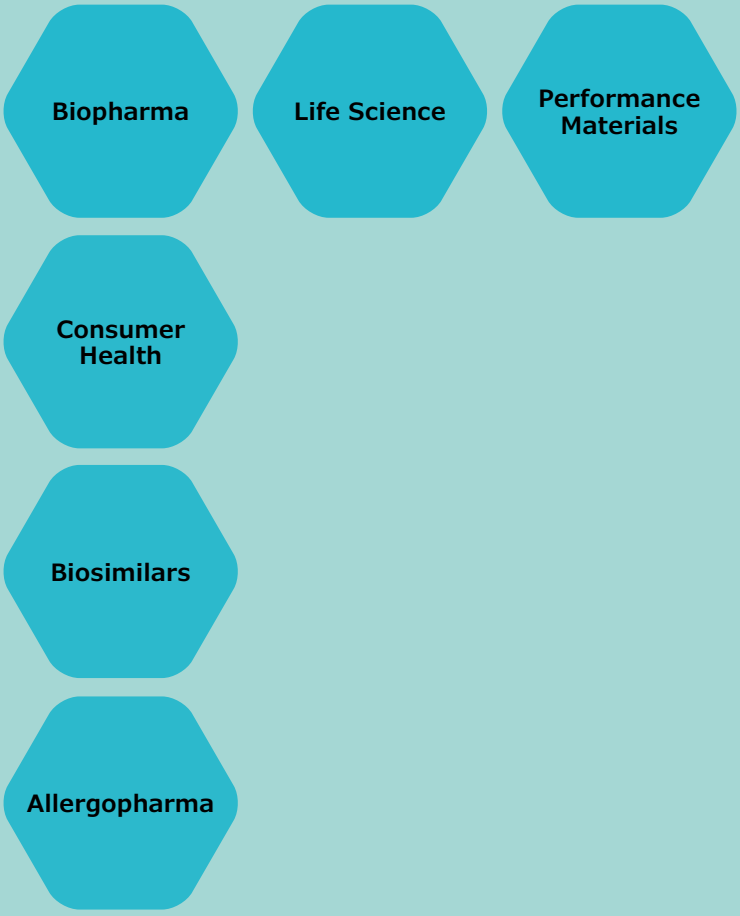
Group
Business sectors
and businesses

Merck KGaA
Darmstadt, Germany

Business sectors



Businesses



January 28

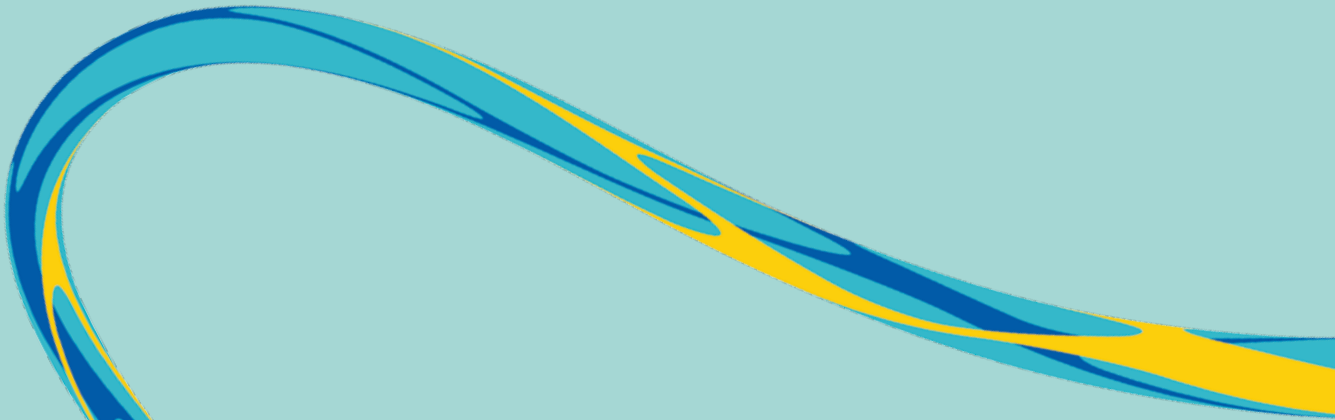
Accelerator further expanded
We established a new Accelerator program in Nairobi with a focus on digital health. At the same time, the application period for the second edition of the program at the Innovation Center in Darmstadt was kicked off. This represents a milestone for the our Accelerator on its journey to becoming a global platform. At both locations, start-ups from the fields of healthcare, life science and performance materials will receive extensive support.

April 29

New Executive Board Chairman
Stefan Oschmann took over as Chairman of the Executive Board. We owe our thanks to his predecessor Karl-Ludwig Kley, who held office since 2007, for fundamentally and successfully transforming our company into a stronger, more profitable and more innovative company. Likewise, we thank Bernd Reckmann, who also retired from the Executive Board and was succeeded by Udit Batra and Walter Galinat.

July 19

US$ 115 million for a new Life Science hub in the United States
We announced plans to build a new campus in Burlington, Massachusetts that will serve as a major hub for the North American Life Science business. As a premier global customer destination, the new campus will also house an M Lab™ Collaboration Center – a state-of-the-art, shared, exploratory environment where our scientists and engineers can work together with customers to help solve their toughest life science challenges.



September 7

New OLED materials production plant in Darmstadt
By 2018, we aim to become one of the leading suppliers of materials for organic light-emitting diodes (OLEDs). For this purpose, a new production plant was inaugurated at the Darmstadt site after a construction period of 14 months. This has enabled a five-fold increase in our production capacity for OLED materials used in modern displays and lighting systems. The plant is one of the largest single investments our company has made at the Darmstadt site in recent years.

September 13

Start of the "WE100®" movement
We are at the threshold of an era in which people will reach the age of 100 and more – while enjoying good health. This is not just the new purpose of our Consumer Health business, but also relates to society as a whole. It is why we have launched the "WE100®" movement, within the context of which partnerships will be established with public and private organizations and concrete actions will be coordinated around the theme of living 100 healthy years.

September 21

Construction of a state-of-the-art packaging center in Darmstadt
We plan to invest more than € 50 million in a new packaging center of excellence at our pharmaceutical manufacturing site in Darmstadt. The focus will be on our Glucophage®, Concor® and Euthyrox® brands in order to meet increasing patient needs in the areas of diabetes, cardiovascular diseases and thyroid disorders. Operations are scheduled to begin in mid-2018.

October 11

We publish our first international curiosity study
A curious person is more likely to bring an idea to life at work – 85% of employees in Germany, the United States and China agree with this statement. This is one of the many findings of our first global curiosity study, for which we investigated the importance of curiosity at the workplace and surveyed more than 3,000 full-time employees.

October 19

500 millionth praziquantel tablet donated
An estimated 260 million people worldwide suffer from the insidious tropical disease schistosomiasis. The infection rate is especially high among children and the consequences are particularly serious. Schistosomiasis stunts growth, causes learning disabilities, and leads to anemia. As part of our social responsibility, we have been supporting the World Health Organization (WHO) since 2007 in combating the disease. Our praziquantel tablets are the most effective treatment to date and is well tolerated.

October 28

“Science” magazine recognizes us a top employer

According to a survey by the international scientific publication “Science”, we rank 11th among the top 20 employers in the global biopharmaceutical industry. This is not only the third year in a row that we have been included in the top employer list, it also marks an improvement from 17th place in 2015. We achieved particularly good scores for the criteria: ‘employees treated with respect’, ‘work culture values aligned’ and ‘has loyal employees’.

November 14

Fourth place in the 2016 Access to Medicine Index

We also moved up the ranks in the Access to Medicine Index, from sixth to fourth place. The Access to Medicine Foundation recognized our access-related targets that are aligned with the United Nations Sustainable Development Goals. In terms of capacity-building and in intellectual property management transparency, we were the leading company in the index.

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* The management report of Merck KGaA, Darmstadt, Germany, has been combined with the Group management report and published in both our 2016 Annual Report and our Annual Financial Statements. The authoritative German versions of the annual financial statements and the combined management report of the Group and Merck KGaA, Darmstadt, Germany, for 2016 have been filed with the electronic German Federal Gazette and are available on the website of the German company register.

CURIOUS SPECIES

Would you have thought that

What really is curiosity? In the following interview, Stefan Oschmann, our Chairman of the Executive Board and CEO, explains what the most productive human trait means to him.

68% of employees in companies that promote curiosity are particularly creative?

"We wanted to find out more about the causes, background and degrees of curiosity."

Stefan Oschmann,
Chairman of the Executive Board and CEO

The four measurable dimensions of

curiosity

Inquisitiveness

A knack for asking questions and analyzing ideas

Creativity

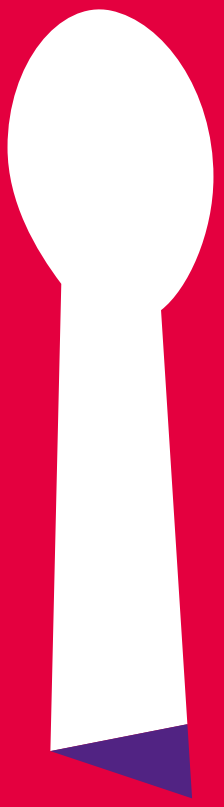
The willingness to try new approaches

Openness

A preference for a variety of experiences and perspectives

Distress tolerance

The ability to approach the new and unfamiliar with courage instead of fear



Personality profile of employees at organizations that encourage curiosity

in %

Employees who rate their organization as very encouraging or extremely encouraging of curiosity score above-average in all curiosity dimensions.

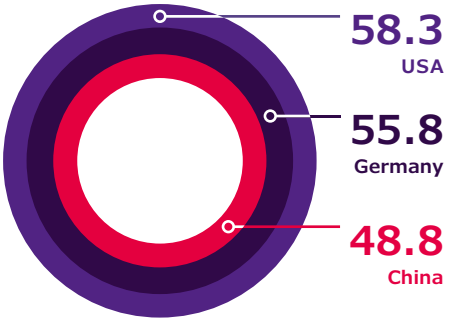
More information about the four dimensions of curiosity is available here: curiosity.emdgroup.com/stories/ingredients-of-curiosity

At work, a curious person is more likely to…

in %

Employee distress tolerance

on a scale of 1 to 100



“The desire to learn and discover inspires us; it's the driver of technological progress.”

Mr. Oschmann, are you a curious person?

Curiosity has driven me my entire life. That’s also why I really like being at our company. After all, curiosity has a long tradition in this company. Over a period of nearly 350 years, curious people have transformed a pharmacy into a global science and technology company that now has more than 50,000 employees. The curiosity of our employees still drives us today. They fuel our businesses in Healthcare, Life Science and Performance Materials, thus safeguarding our competitiveness.

You recently launched a global curiosity campaign. Why?

Curiosity has always helped people to make important advances. The desire to learn and discover inspires us; it’s the driver of technological progress – from the stone tools used by cavemen to the wheel, the compass, letterpress printing and the microscope, all the way to the digital innovations of today. We need curiosity and a passion for discovery more than ever before, especially since we face tremendous global challenges. Megatrends such as a growing world population, the aging of many societies and climate change call for innovative solutions. And that’s where we want to contribute.

What is at the heart of the curiosity initiative?

A key element is our broad study, which we used to find out more about the causes, background and degrees of curiosity. We surveyed 3,000 employees from the United States, Germany and China, many of whom were not employees of our company. To define the rather abstract concept of curiosity, we worked closely with U.S. curiosity expert Professor Todd Kashdan to derive four concrete, measurable dimensions: inquisitiveness, creativity, openness, and distress tolerance.

Why is distress tolerance important?

When it comes to how we understand curiosity, it’s not just about thinking outside the box, being open to new things and wanting to realize ideas. It’s also about people’s perseverance and willingness to take risks. That’s because all new things involve uncertainty, complexity and resistance. Yet people who tolerate distress well tend to see this as an incentive – to satisfy their curiosity they stick to a topic and overcome obstacles.

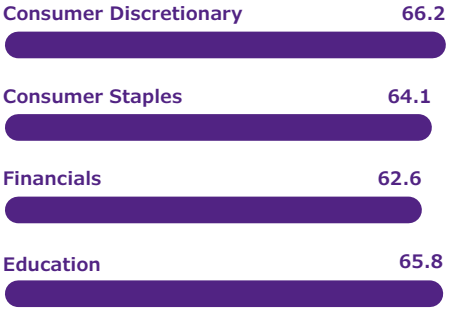
What were the main findings of the curiosity study?

I find it notable that nearly all those surveyed consider curiosity to be fundamental to coming up with new ideas and

said that their organization is
“not at all encouraging of curiosity”.

Employee openness by sector

on a scale of 1 to 100



“Open exchanges, company-wide transparency, promoting and recognizing inventiveness, and a passion for discovery – all of these are important aspects of our company culture.”

solutions in the workplace. However, only one in five employees think they are curious themselves. Just because most employees do not describe themselves as curious does not necessarily mean that they’re not. They simply do not exhibit this quality as strongly outwardly. This might be related to the fact that in daily work at some companies, curiosity is a quality that is neither recognized nor promoted. The majority of those surveyed believe that curiosity is more important to them personally than it is to their employer. Many people do not feel comfortable asking more questions at work. Yet our study shows that employees who can deploy their curiosity have higher job satisfaction levels. Decision-making authority is another important aspect. Curious employees more often hold management positions.

Are there generational differences, is curiosity age-dependent?

Hardly. Generation Y employees, meaning those born after 1981, achieve somewhat higher scores when it comes to inquisitiveness, openness and creativity, but they show lower distress tolerance. It is suspected that older employees rely on their long-standing experience and thus feel more secure. They are more willing to take risks and stand up for innovative projects, also when these meet with resistance.

How do you make your employees more curious?

Our innovations don’t fall from the sky. We need a work environment that promotes creativity and allows our employees to pursue things they are curious about. For example, we want to enable our employees to see the company as a safe haven where they enjoy trust and have the freedom to develop and shape new ideas. These days, managers should no longer give orders and check up on their people, but mainly motivate, support and appreciate them instead. Open exchange, company-wide transparency, promoting and recognizing inventiveness, and a passion for discovery – all of these are important aspects of our company culture. A very good example of how we promote curiosity is our Innovation Center in Darmstadt. We offer employees and external start-ups keen about innovation a contemporary atmosphere in which they can let their creativity run free. And I am certain that such approaches will resonate strongly throughout the entire company. That’s because they prove that being open and curious is not only fun, but also leads to new solutions, products and business models that offer our customers and our company tangible benefits.

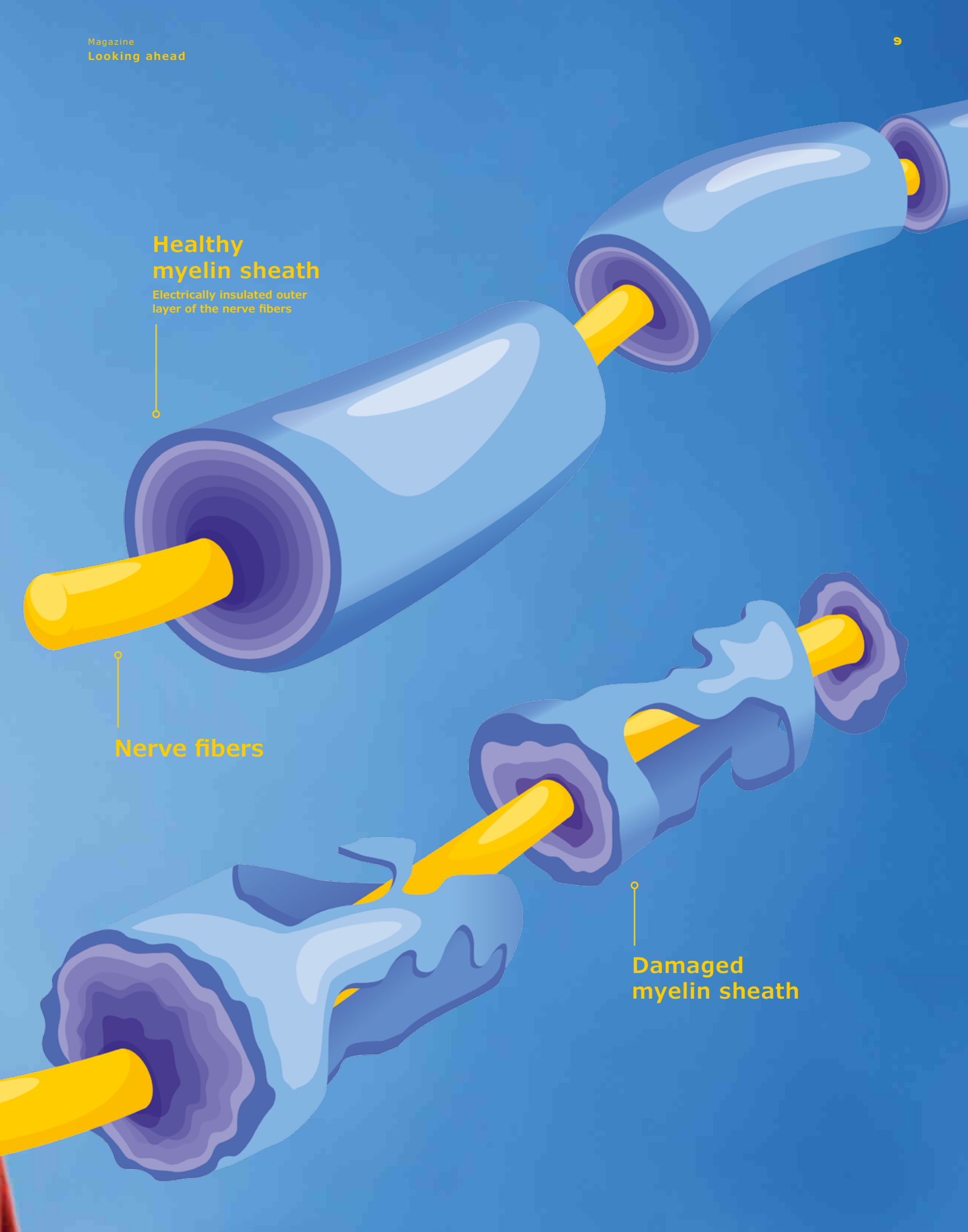
Curiosity Study 2016

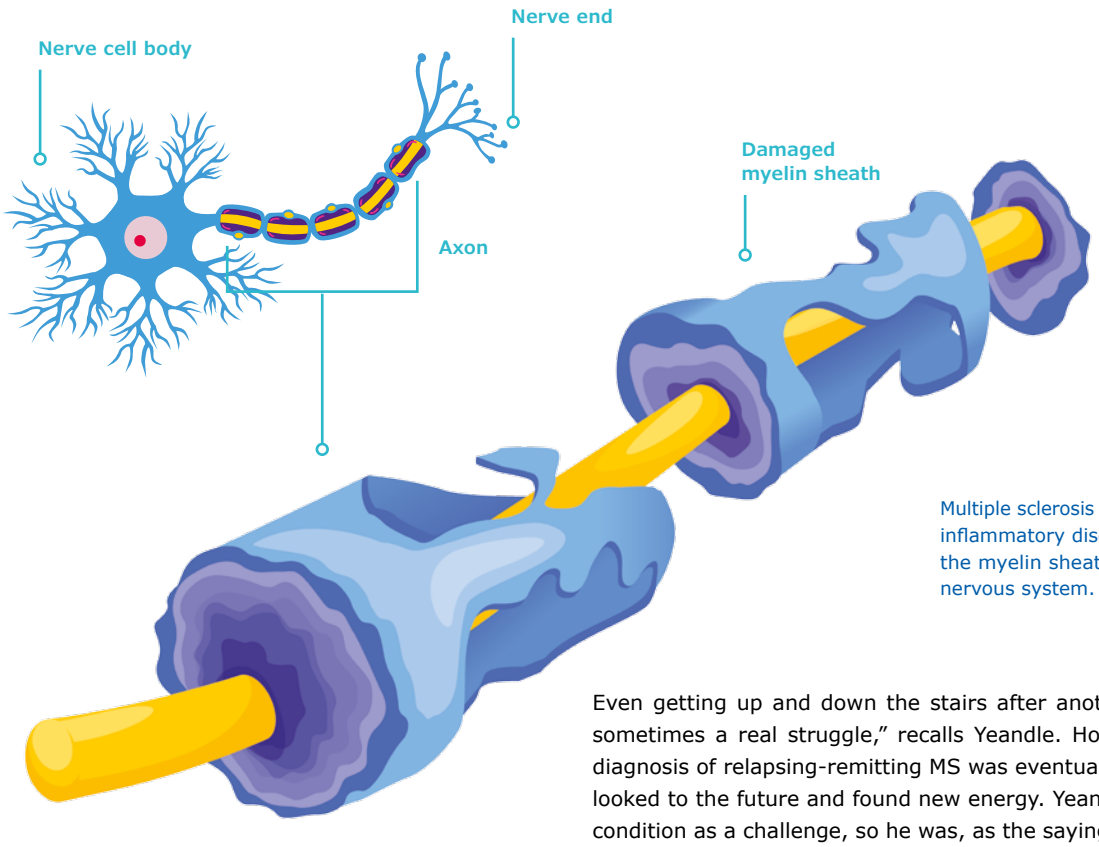
How curious are employees at work? Do employers even value curiosity? And if so, do they foster it? We wanted to find the answers to these questions, which is why we launched the Curiosity Study 2016. Using scientific methods, we surveyed more than 3,000 employees from various companies in the United States, Germany and China. The results are the first-ever broad look at the state of curiosity in today's workplace. They also confirm one of our main tenets: If curiosity is nurtured and fostered, it can help solve many current and future challenges. This will make it possible to remain a step ahead and to drive scientific discoveries, innovations and economic success in a rapidly changing market environment.

Looking ahead

David Yeandle is one of the approximately 2.3 million people worldwide with multiple sclerosis (MS). He has found his own way of living with this disease.

David Yeandle


Healthy
myelin sheath
Electrically insulated outer
layer of the nerve fibers
Nerve fibers
Damaged
myelin sheath



Multiple sclerosis (MS) is a chronic inflammatory disease that attacks the myelin sheath of the central nervous system.

“To get what you want, you sometimes have to get your hands dirty,” says Yeandle, with a grin. He is aware that this turn of phrase sounds like something out of a mafia movie, but this 63-year-old looks nothing like a godfather. Quite the opposite, in fact. A personable man living near the port city of Southampton in the United Kingdom, Yeandle uses this ambiguous saying to describe his personal approach to managing his disease – multiple sclerosis (MS). “As a boy, I spent a great deal of time helping out on my grandfather's farm, and to this very day I still love gardening. With this metaphor, I mean to say that in nature as in life, with MS you must invest time and energy in order to achieve results,” explains Yeandle. He first started having symptoms of the disease around ten years ago. At the time, Yeandle was working as the head of employment policy for an organization representing the UK manufacturing industry to government. Driven by a passion for his job, he worked long hours under tight deadlines and traveled in Europe fairly extensively. “Even though I was used to rushing around, I suddenly started tripping more and more frequently over the pavement. The toes of my shoes were getting really scuffed,” recalls Yeandle. It wasn’t until he'd fallen over a few times getting on and off the London Underground that he decided to seek medical advice. The doctor told Yeandle that he probably had MS. “In some ways, it was almost a relief to hear that,” he comments. “At least it wasn’t a brain tumor, and I already knew something about MS. You see, my sister had been diagnosed with MS more than 30 years before.” A variety of tests were required to get a thorough diagnosis. However, this was during the Christmas period, so it took a few months for the results to come back. “There was this uncertainty looming over everything. It took a real effort on my part to do anything. Even getting up and down the stairs after another relapse was sometimes a real struggle,” recalls Yeandle. However, when his diagnosis of relapsing-remitting MS was eventually confirmed, he looked to the future and found new energy. Yeandle looked at his condition as a challenge, so he was, as the saying goes, prepared to get his hands dirty. He learned as much as he could about MS; he attended a patient workshop and was pleasantly surprised at the variety of treatment options available. His doctor prescribed Rebif® from our company (see page 12), which he self-injects three times a week. He had no problem with the injection process itself. “At first, I was injecting myself in the evening, which caused me to experience mild flu-like symptoms. Then my MS nurse suggested that I change to injecting in the morning, and these side effects have largely disappeared,” recalls Yeandle. The medicine does its job, and his condition has remained stable with no further relapses. Yet he soon wondered whether he would be able to continue his stressful job despite having MS. “My manager was very understanding of my situation, but when on the job, it's difficult to overcome the sudden fatigue that typically occurs with MS,” explains Yeandle. “Indeed, I often found that I was so shattered on Friday evenings that I wasn't able to do very much at the weekend.” After nine months, Yeandle took a hard look at the situation and decided to retire early. For the first several months, he enjoyed the peace and quiet. “But I believe that in life, like in gardening, doing nothing contributes to the growth of weeds,” he says, laughing. So he has now found new roles that give him a sense of fulfillment, such as advising multinational companies on employment issues and consulting for the United Nations. Through these pursuits, Yeandle has remained very active and busy for several years, but nowhere near the rapid pace he kept up before developing MS. “These days, I'm somewhat more relaxed about everything and try to pace myself with regular breaks, which is good for me. Because I've learned that to live a productive life with MS, you must tend your body in the same way that you tend a garden.”

“To get what you want, you sometimes have to get your hands dirty.”

David Yeandle

Inhibiting inflammation

We have many years of experience with drug treatments for autoimmune diseases such as multiple sclerosis (MS) – and also has new therapies in the pipeline.

Multiple sclerosis is a chronic inflammatory disease of the central nervous system. It frequently impacts young adults, but can also occur in later adulthood. Women develop the condition about twice as often as men. Frequent symptoms include visual disturbances, numbness or a tingling sensation in the extremities, muscle weakness, and difficulties with coordination. The progression of the disease is unpredictable. The most common type is relapsing-remitting MS, which is characterized by episodic symptoms that disappear either at random or as a result of treatment. In around half of patients with relapsing MS, their condition ends up transitioning to a progressive form of the disease. To this day, the causes of the disease have not been fully clarified. The disease process consists of an autoimmune response against the nerves in the body, which means that inflammatory and immune cells mistakenly attack the body's own structures. No cure has yet been found for MS, but drugs can be used to treat it. With Rebif® (interferon beta-1a), we offer a disease-modifying drug for the treatment of relapsing forms of MS. Rebif® has been proven to reduce disease progression and relapse rates, as well as the expansion and activity of lesions as detected by magnetic resonance imaging. The treatment was approved in Europe in 1998 and in the United States in 2002; it is now registered in more than 90 countries worldwide. In January 2012, the European Commission approved the extension of the indication of Rebif® in early multiple sclerosis. “In MS, while there are therapies available, we know there are still opportunities for improvement in terms of efficacy, dosing and response duration, as well as safety and patient quality of life. And we hope to achieve an advance with our cladribine tablets,” says Dr. Andrew Galazka, who is leading the global cladribine research and development program in the company’s Biopharma business. Cladribine tablets are an oral medication that selectively and periodically targets the lymphocytes thought to be integral to the pathological process of MS. Cladribine tablets are currently under clinical investigation. Clinical trials have shown that taking this medicine orally for 20 days over two years can result in a long-lasting reduction in relapse rates. “The results show that the beneficial effects of cladribine tablets on the relapse rate are maintained in most patients for an additional two years without the need for redosing,” says Dr. Giancarlo Comi, Professor of Neurology, Chairman of the Department of Neurology, and Director of the Institute of Experimental Neurology at the Scientific Institute San Raffaele of Vita-Salute San Raffaele University in Milan, Italy, and lead investigator of the studies. This would mean an enormous improvement in the quality of patients’ day-to-day lives. “I believe that use of agents that can reshape the immune system to gain long-term control of MS when the patient is in the early active phase of the disease will be the key treatment strategy in the near future,” says Comi.

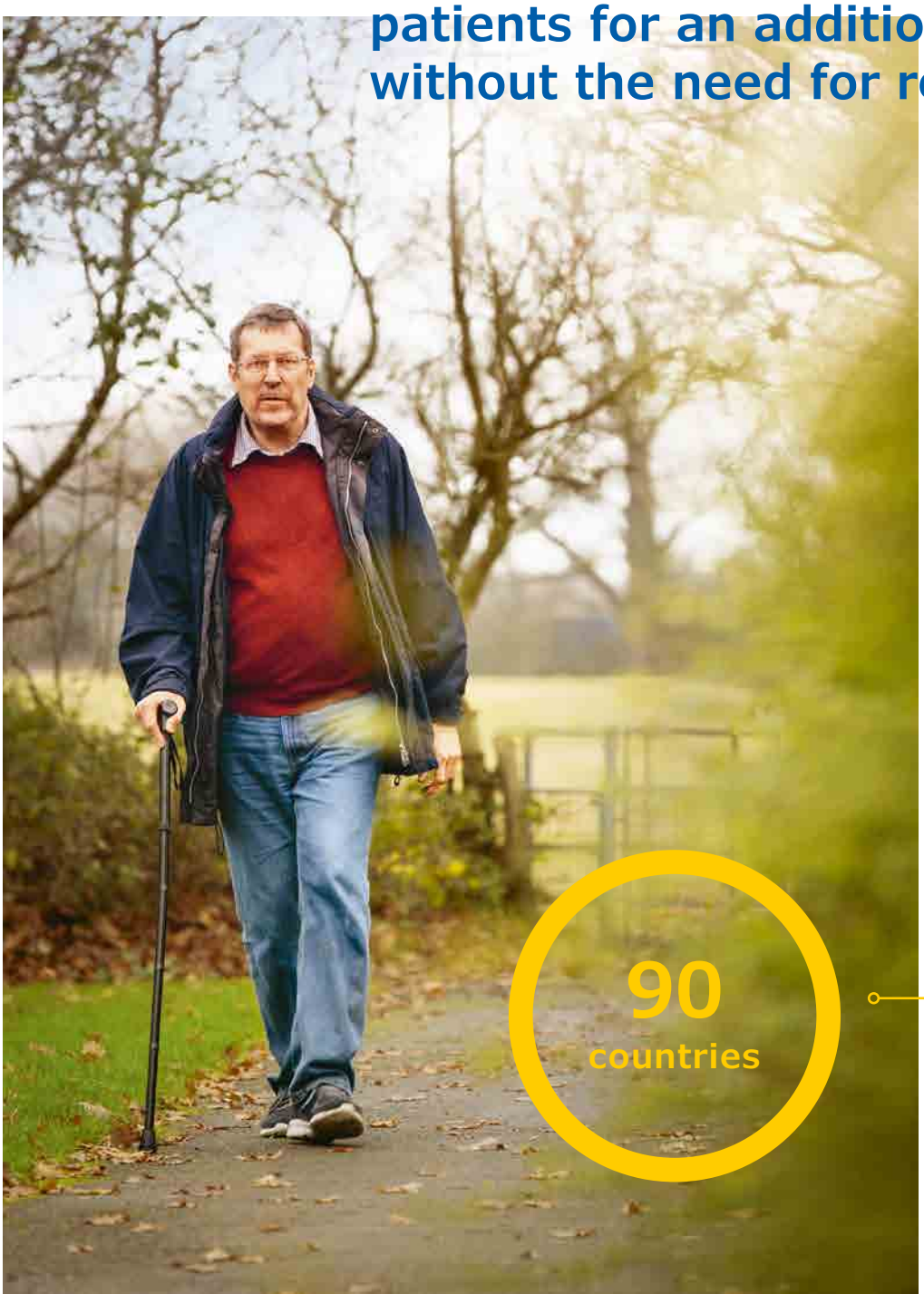
We are also investigating treatment options for other autoimmune diseases such as systemic lupus erythematosus (SLE). SLE can cause pain and swelling in the joints, skin rashes, extreme fatigue, and kidney damage or even failure. “I have personally met SLE patients and heard their stories, which motivates me to work even harder to find a treatment. Current trials on our drug candidate atacicept are showing great promise,” says Simone Favre-Zimmerli, one of our researchers in Immunology. Other drug candidates are being investigated for patients living with chronic conditions including rheumatoid arthritis (RA), an inflammatory disease of the joints. “We are working to discover new therapies that treat autoimmune diseases and their associated symptoms, but also that slow or reverse the progression of the disease,” explains Favre-Zimmerli.

Worldwide, around 2.3 million people have multiple sclerosis (MS).

“We are working to discover new therapies that treat autoimmune diseases and their symptoms, but also that slow or reverse the progression of the disease.”

Simone Favre-Zimmerli,
PhD Senior Scientist

“The results show that the beneficial effects of cladribine tablets on relapse rate are maintained in most patients for an additional two years without the need for redosing.”



Dr. Giancarlo Comi,
lead investigator of the studies on cladribine tablets – a potential new MS treatment from Merck KGaA, Darmstadt, Germany.

The MS treatment Rebif® was approved in Europe in 1998 and in the United States in 2002. It is registered in more than 90 countries around the world. In 2012, the European Commission approved an indication extension for use in early-stage MS.


DIGITAL
HEALTH

Whether focused on prevention, diagnosis, treatment compliance, or efficiency – websites, apps, blogs, and online forums are playing an increasingly important role in medical care. Our Innovation Center promotes start-ups that have fresh ideas on digitalizing healthcare.

The Internet has an answer to every question, including health-related ones. Thanks to Wikipedia, blogs, and forums, patients these days are well informed and expect their treating physicians to interact with them as equal partners. “In principle, I think this is a very positive development. Many patients go online to research the potential causes of their symptoms before even consulting their doctor. Their conjecture is sometimes correct, but their research can naturally lead to incorrect assumptions as well,” says Stephanie Brockötter, a general practitioner based in Nordwalde, Germany. One thing is certain, though: Digitalization is making it easier for people to learn about symptoms and treatments. In addition, an increasing number of mobile apps are focusing on digital health. For instance, they can remind patients to take their medication, document health data and provide nutritional advice. “Digital health is a market with massive potential. More than anyone else, small start-ups are driving this dynamic development, and we intend to support these companies through our Accelerator program,” says Michael Gamber, Head of our Innovation Center (see also the box on page 17).

Diagnosing malaria with a smartphone app

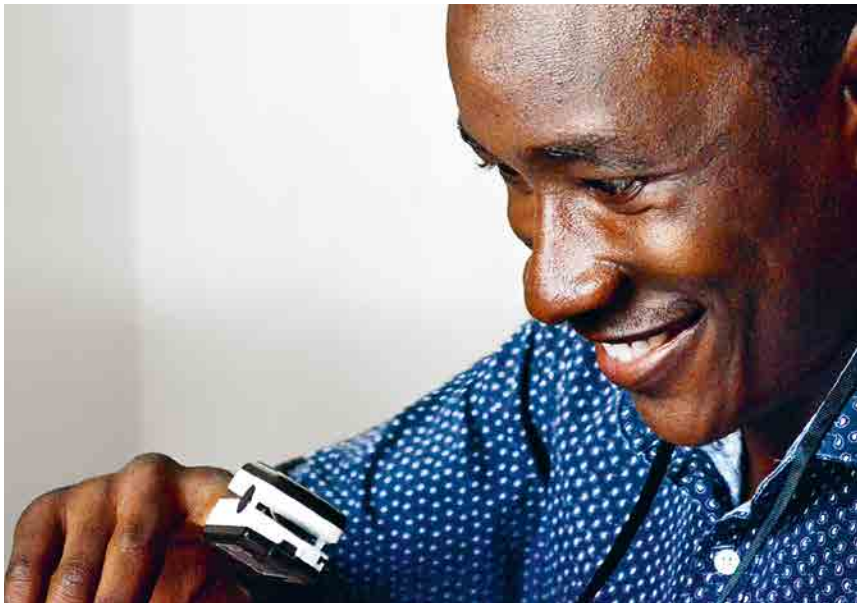
Brian Gitta is one of the start-up founders who has benefited from the Accelerator. Together with his colleagues, this young man from Kampala (Uganda) has developed an app that allows patients to be tested for malaria without drawing blood. The idea was inspired by his personal medical history. “As a computer science student, I suffered from an illness that meant I had to get three injections a day. When I then also began showing symptoms of malaria, I wasn't in the mood to get stuck by yet another needle,” Gitta recalls. The standard method of diagnosing malaria is to draw multiple blood samples. Gitta began researching less unpleasant ways to detect the disease. But much more importantly, if malaria is identified early, it can be treated with medicine. However, this dangerous disease can only be diagnosed using the facilities of a medical clinic, which many communities in Africa lack. Gitta believes this is why many illnesses are detected too late. “I discovered that light sensors can be used to read the blood’s oxygen content through the skin, and I wondered whether it would be possible to detect malaria this way as well,” says Gitta. Working with several fellow students, he developed a prototype finger scanner that can be connected to a smartphone. This device uses infrared sensors to scan red blood cells for malaria protozoa. Diagnosis results appear on the smartphone screen after mere minutes. This procedure is not only completely pain-free, but is also much faster, less expensive and more accessible than conventional methods. The team named the finger scanner “Matibabu”, which means “medical clinic” in Swahili, and then founded the start-up thinkIT. Through our Accelerator program, the young entrepreneurs worked at the Innovation Center in Darmstadt to further hone their creation. “We were given the freedom necessary to develop our idea into a viable business. In discussions with experts from other fields, we considered, for instance, how our technology could also be used to diagnose other diseases,” says Gitta, pointing out a benefit of the program.

“We were given the freedom necessary to develop our idea into a viable business.”

Brian Gitta,
Founder of thinkIT, a start-up

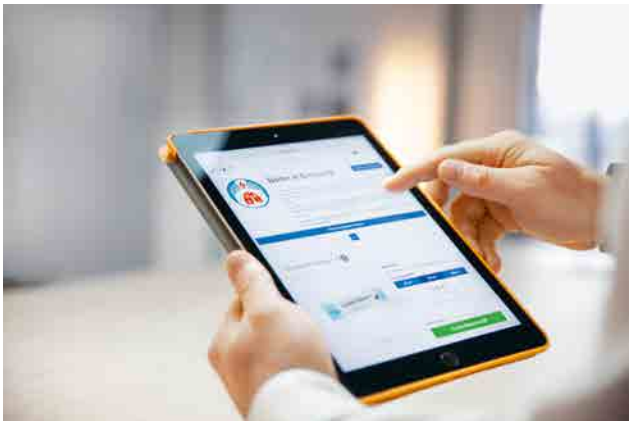
“I discovered that light sensors can be used to read the blood’s oxygen content through the skin and I wondered whether it would be possible to detect malaria this way as well.”

Brian Gitta,
Founder of thinkIT, a start-up



A finger scanner, which is connected to a smartphone, makes it possible to diagnose malaria.

Start-up company Check-ER has developed an app that estimates emergency room waiting times, among other things.



Apoly allows patients to purchase over-the-counter medicines via an online platform (above).

Maisha Meds of Kenya offers pharmacies an app to manage their inventory (left).

Shorter waiting times

The idea developed by Israeli start-up Check-ER takes a completely different approach. This company likewise spent three months at the Innovation Center in Darmstadt, working on an app that shows users in need of emergency care when and where to seek treatment. The app has a symptom checker. Based on the user's personal symptoms, the app provides a recommendation for the best entry point into the healthcare system – from an emergency room to a doctor, urgent care, or even telemedicine. The app is connected to the hospital administration systems and estimates waiting times based on the patients already waiting as well as the urgency of the symptoms. "Check-ER can be used to avoid overcrowded emergency rooms and delays in hospital treatment, which improves patient satisfaction as well as quality of care," says co-founder Rachel Bodkier. In collaboration with the second largest private hospital chain in France, Check-ER is testing the app in 25 hospitals.

Marketplace for pharmacies

As Germany's first pharmacy marketplace, Apoly allows patients to purchase over-the-counter medicines via an online platform. This start-up connects customers to local pharmacies via the Internet. The online platform features a tool that helps users self-diagnose based on their symptoms, after which it recommends the appropriate medicine. They can input customer-specific information such as allergies, which the tool takes into consideration when suggesting a product. Orders are forwarded to the nearest partner pharmacy, which generally offers same-day delivery. In return, Apoly receives a transaction fee from the pharmacies. "Through the Accelerator program, we received support from mentors and coaches that enabled us to review our hypotheses and devise new strategies – that was a really big help," says co-founder Luca Christel. The start-up, located in Leipzig, Germany, is already offering its service in major German cities.

Online inventory

In February 2016, our Accelerator program expanded to Nairobi, Kenya, where we've been exclusively supporting start-ups in the field of digital health. Take for instance Maisha Meds, one of the companies we have funded. This start-up offers an inexpensive, easy-to-use app that enables small, private pharmacies in rural regions of Kenya to manage their inventory. Many pharmacies in Africa are still working with pen and paper, which makes it hard to keep track of inventory and causes information to get lost. With the app from Maisha Meds, pharmacies have an easy way to digitally manage their inventory and source medicines. In addition to this, they can also use a mobile payment system to stay in better contact with customers, informing them of special offers via SMS. Thanks to our Accelerator, this start-up has made many strategically important contacts.

"Digital health is a market with massive potential. More than anyone else, small start-ups are driving this dynamic development, and we intend to support these companies through our Accelerator program."

Michael Gamber,
Head of Innovation Center

Promoting good ideas

Our Accelerator actively cultivates the innovative spirit of young companies in healthcare, life science and performance materials, especially those focusing on digital solutions. In Darmstadt, this three-month program offers select start-ups up to € 50,000 in funding, regular coaching sessions and workshops, and space at our Innovation Center. In February 2016, we expanded our Accelerator program to Nairobi, Kenya, opening our first Accelerator site outside of Germany. The program there, also three months long, focuses on digital health start-ups. Besides co-working space, a curriculum and access to mentors, companies also receive up to US$ 30,000 in funding. A major component of the Accelerator is the opportunity for young innovators to network and share expertise to the benefit of all involved. The program features experts from our sites worldwide along with external experts from the spheres of business, science and society.

We intend to expand our Accelerator program into a global platform so that people can turn good ideas into reality regardless of where they are.

PARTNER IN IDEAS

Customer orientation is of crucial importance for the Life Science business. With sophisticated end-to-end solutions, we offer biopharmaceutical companies worldwide comprehensive services along the entire value chain.

It's a long way from discovery to the commercialization of a new drug. This applies particularly to the biopharmaceutical industry – after all, it's concerned with providing products to help sick people. In other words, medicines whose benefit has to be significantly greater than any potential risk. Besides medicinal efficacy, the quality assurance of manufacturing processes is the prerequisite for obtaining regulatory approval to market new drugs. This includes validating and documenting processes and methods, as well as qualifying staff and having suitable facilities with high-quality installations and equipment. Through our Life Science business, we offer a broad range of innovative products, services and expertise that support customers in the biotech industry with their research, development and production activities. With an end-to-end portfolio of products and solutions that deepened with the Sigma-Aldrich acquisition, we can cover the full bioprocessing value chain.

A win-win situation

And our holistic approach comprises more. "It is very important to us to have a precise understanding of our customers' goals, wishes and ideas. We plan, test and implement every individual step in close exchange with them. As a strategic partner, we accompany our customers up to market success and beyond – that's a win-win situation," says Guillaume Plane. As Global Development and Marketing Manager based in Bordeaux, France, he often travels on business and always stays close to customers. Acticor Biotech is a good example: This biotech company based in Paris is developing an antithrombotic drug for the emergency treatment of ischemic stroke without risk of hemorrhage. It is estimated that every year 15 million people worldwide suffer a stroke. Systemic thrombolysis is mostly used to unclog the patient's affected vessel as rapidly as possible. However, this therapy is associated with the risk of brain hemorrhage. Acticor Biotech aims to eliminate this risk with its new molecule. "I'm very happy that we could partner with Merck KGaA, Darmstadt, Germany, at an early stage of our project. Aspects such as quality, cost and our timetable were decisive. This is helping us to move our project ahead," says Gilles Avenard, CEO of Acticor Biotech.

"I'm very happy that we could partner with Merck KGaA, Darmstadt, Germany, at an early stage of our project. Aspects such as quality, cost and our timetable were decisive. This is helping us to move our project ahead."

Gilles Avenard,
Chief Executive Officer of
Acticor Biotech

Representation of a monoclonal antibody.

Mobius® 2000L single-use bioreactor.

M Lab™ Collaboration Center
in Songdo, Korea.

Process development
unit at our Biodevel-
opment Center in
Martillac, France.

“It’s a bit like a builder entrusting an experienced architect with his project – and we’re taking the role of the architect.”

Guillaume Plane,
Global Development and Marketing Manager for Merck KGaA, Darmstadt, Germany in France

End-to-end solutions for customers

Whether a start-up or an established biopharmaceutical company – we offer the Provantage® End-to-End Solution as a comprehensive suite of products and services. This enables biopharmaceutical companies to accelerate the progression of molecules through clinical development and towards commercialization. The turn-key package includes process development, GMP clinical manufacturing, facility design, equipment for plant production, equipment qualification and training, process scale-up and technology transfer as well as facility start-up services. “It’s a bit like a builder entrusting an experienced architect with his project – and we’re taking the role of the architect,” says Plane, explaining our company's approach. Y-mAbs Therapeutics, Inc., a U.S. company based in New York City, is also utilizing the advantages of Provantage® End-to-End in order to advance its monoclonal antibody in late-stage clinical development. “Through our agreement with Merck KGaA, Darmstadt, Germany, Y-mAbs is taking a major step towards our commitment of making these breakthrough pediatric treatments available to children with advanced and life-threatening cancers,” says Thomas Gad, founder and president of Y-mAbs. “We expect to take delivery of cGMP drug product for our planned clinical trials by the first half of 2017. We are committed to making this leading immunotherapy product available to patients with life-threatening diseases worldwide.”

Access to medicine

It is especially important to us to improve access to high-quality medicines. This applies above all to emerging economies, whether in Africa, Asia or Latin America. Therefore, we support established biopharmaceutical companies that decentralize their production and have to quickly and efficiently build local production facilities. “With an end-to-end approach, we can facilitate and accelerate scaling and technical transfer of an entire process to a new location,” says Plane. Small biopharmaceutical companies in early-phase clinical development with limited resources and infrastructure benefit from our company as a partner with strong expertise and experience in the development of biologics processes and GMP clinical manufacturing to help them accelerate their early clinical development programs.

Faster development thanks to M Lab™

The new M Lab™ Collaboration Centers are another approach highlighting the customer orientation of our Life Science business. The ultramodern facilities are a relaunch of the global network of customer collaboration centers that have existed for over 20 years. The network includes sites in Brazil, China, France, India, Japan, Singapore, Korea, and the United States. M Lab™ Collaboration Centers address customers who do not outsource their process development but are looking for the technical experience and expertise of our scientists and technicians in finding solutions to the challenges of their individual biopharmaceutical processes. The M Lab™ Collaboration Centers provide a suitable environment for hands-on experiments and practical training. Customers can apply best practices and new methods to develop or optimize processes. and facilitate global technology transfer – from discovery to the commercialization of a new drug.

“Through our agreement with Merck KGaA, Darmstadt, Germany, Y-mAbs is taking a major step towards our commitment of making these breakthrough pediatric treatments available to children with advanced and life-threatening cancers.”

Thomas Gad,
Founder and President of Y-mAbs

ON THE ROAD.

Cars are speeding ahead towards a digital future. What was science fiction yesterday is reality today. And it’s clear that there will be a lot from our company inside the car of tomorrow.

Organic photovoltaics

Polysilazane-based coatings, e.g. to protect against heat and dirt

“Urbanization, electrically powered vehicles and digitalization will fundamentally change individual mobility.”

Prof. Dr. Harry Wagner,
Professor for Automotive & Mobility Management, Technical University of Ingolstadt

On a winter’s day in 1895, Walter Arnold floors the accelerator of his motor car and rattles through the English village of Paddock Wood. Arnold has to pay a price for his thrill for speed; he is the first driver in the world to get a speeding ticket. He had clocked up a whole 13 kilometers per hour on his speedometer, although only about three kilometers per hour were allowed. Although legally and technically speaking, maximum speed limits have increased exponentially since the pioneering days of the automobile, in our present-day megacities it’s scarcely possible to move faster today than it was then. Bumper-to-bumper traffic congestion is a daily occurrence on our roads. Fine dust pollution causes breathing problems and the automobile has long been proclaimed a climate killer. But a lot is happening. “Urbanization, electrically powered vehicles and digitalization will fundamentally change individual mobility,” says Harry Wagner, Professor for Automotive and Mobility Management at the Technical University of Ingolstadt in Germany. Increasingly stringent global environmental regulations make it clear that the future lies in new drive technologies. However, it will most likely be decades before electric vehicles dominate the roads, for instance.

Rolling computers

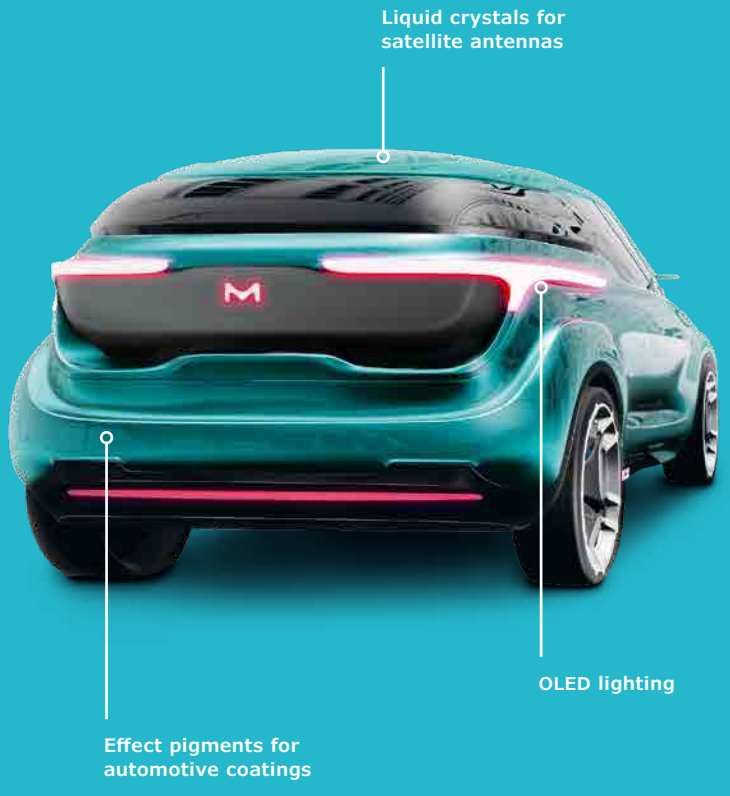
Digital change is happening at a much faster pace. Today’s cars are already rolling computers. In the future, they will even communicate with other vehicles and traffic control systems to a far greater extent. Experts agree that autonomous driving will be the next big thing. Digital connectivity makes it possible to smartly manage the traffic flow, possibly even without traffic lights. And this is likely to increase safety – owing to fewer accidents. But what do people do in self-driving cars? They’ll be online – working, phoning, surfing, playing and shopping. An enormous flood of data on four wheels, which can be used to make money. And that’s probably the main reason why Internet companies are suddenly interested in the car-making business. Car makers, on the other hand, will develop into mobility providers. “The emotional significance of owning a car will decrease; car sharing is on the advance. Apps will increasingly steer how we use intermodal travel – combining different modes of transport – to get from A to B quickly and efficiently,” forecasts Wagner.

Innovative materials and technologies

Nobody knows exactly what the car of the future will look like. That makes it all the more exciting – for us as well. “Our Performance Materials business sector is developing many innovative materials and technologies with which we can help shape the future of the automobile,” says Nadine Langguth. She heads our Automotive Platform, which focuses on the innovation fields of automobility. With the “Displaying Futures” initiative, among other things, the company seeks direct exchange with manufacturers, suppliers and experts from various relevant disciplines. “We want to identify and understand the diversity of trends and requirements at an early stage in order to even better leverage our opportunities going forward as a development partner and materials supplier,” states Langguth. We have long been supplying the automotive industry with a wide range of products. These include effect pigments for coating applications, liquid crystal mixtures for displays and semiconductor materials for microchips.

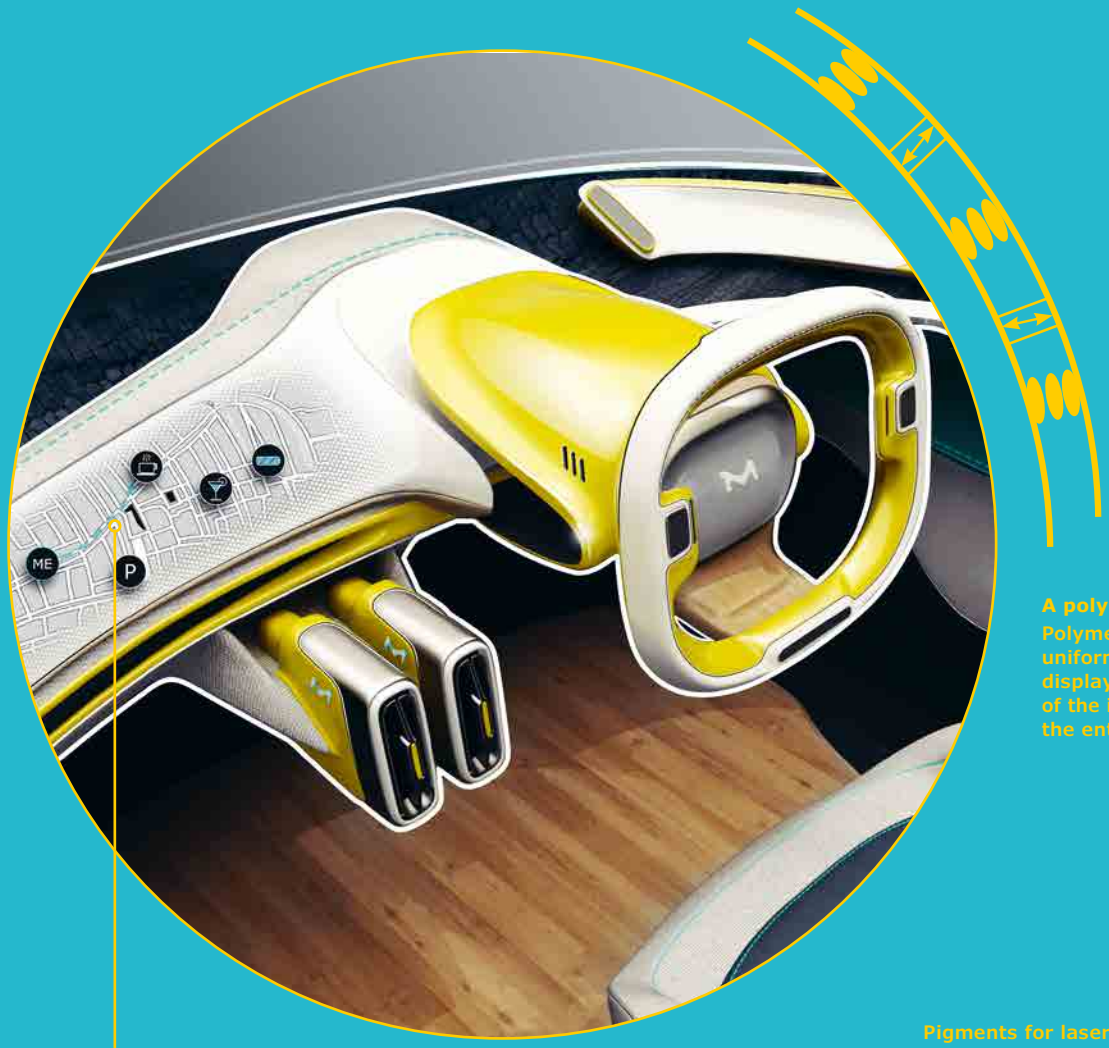
Own concept car

With its “Intelligent Concept Car”, our company is showcasing the materials it manufactures for applications in the car of the future. For example, liquid crystals make high-resolution automotive displays with high thermal stability and an extremely long lifetime possible. The broad color spectrum produces an exceptionally high image quality. OLED (organic light-emitting diode) materials are used both in displays and lighting and offer new design possibilities with their extremely thin structure. OLED displays provide exceptionally high contrast, brilliant colors and razor-sharp images from every angle, and can even be transparent. Free-form displays with liquid crystal or OLED



"We are developing many innovative materials and technologies with which we can help shape the future of the automobile."

Nadine Langguth,
Director – Automotive Platform
Performance Materials | Display Materials



A polymer wall display
Polymer wall structures ensure uniform spacing, even when the displays are bent. The quality of the image is maintained across the entire surface.

Materials for free-form displays

Pigments for laser marking powder coatings and polymers

Laser direct structuring

High-tech materials for sensors and other semiconductors

technology can be seamlessly incorporated into various spaces such as in dashboards, doors and seats. Very thin glass or even plastic can be used for them. The first prototypes for cars already exist. The materials used to produce highly reliable and powerful microchips and sensors are important for self-driving cars, for example. Laser direct structuring is used to directly mount electronic circuits onto plastic components or powder-coated parts. However, we want to set new standards not only in car interiors. Liquid crystal windows for switchable sunroofs in cars allow continuously variable switching from dark to light and vice versa in just seconds. When built into sunroofs or dashboards, printable photovoltaic cells can help to power cars in an eco-friendly way.

“Liquid crystal antennas have the potential to transform cars into fully networked mobile communications systems.”

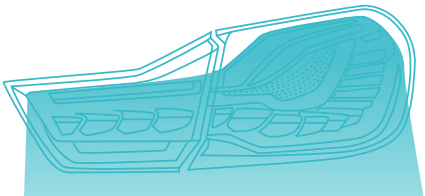
Owain Parri,
Marketing manager, Display Materials

The end of wireless dead zones

In a digitalized world, it is becoming increasingly important to also have powerful Internet access in cars. Smart satellite antennas with our expertise inside make this possible. Through a thin functional liquid crystal layer, the antenna beam can be steered electronically in different directions instead of mechanical positioning to the satellite as with conventional technologies. Special software ensures reliable contact to the satellite – making wireless dead zones a thing of the past. “Liquid crystal antennas have the potential to transform cars into fully networked mobile communications systems. And in view of the rapidly growing data volumes, we can score with our experience in this promising field of technology,” says Owain Parri, marketing manager within the Display Materials business unit. The technology has been developed together with the Technical University of Darmstadt. Kymeta, a U.S. start-up, is planning to launch the first smart antenna in 2017 using liquid crystal mixtures specifically designed for this application.

Light sources: safe and trendy

Smart lighting for the car of the future is another promising field of research that our company is focusing on. Headlights containing liquid crystals have a higher resolution, allowing them to adapt automatically to any imaginable situation. A high beam headlight would thus provide maximum illumination without blinding oncoming drivers or pedestrians. In addition, we are collaborating with Osram, a lighting manufacturer, to develop innovative automotive lighting technologies. “Organic light-emitting diodes are opening up completely new design options for automotive lighting,” says Marc Lünnemann, Head of OLED at Osram. The first series



Osram rear lights with OLED materials

“Organic light-emitting diodes are opening up completely new design options for automotive lighting.”

Dr. Marc Lünnemann,
Head of OLED at Osram

vehicles with ultraflat, glass-based OLED rear lights are now coming onto the market. Their light is extremely homogeneous and precise and offers automobile designers a variety of options for differentiation. “The next leap in innovation will be flexible OLED lighting that can be applied to bendable panels and designed in virtually any shape,” says Lünnemann. The abundance of examples shows that the possibilities for the car of the future are developing at top speed – without any speeding tickets. And we areleading the race.


MAKING IT
BIG
IN SCIENCE

Scientific progress thrives on the curiosity of researchers. Many young talented people are also achieving astonishing things – for example within the scope of scientific competitions.

Ivo Zell is standing on a hill in the idyllic Rheingau region of western Germany, looking into the distance. In his hands he's holding a black box with an antenna. Nothing happens. However, within a few seconds it becomes increasingly clear what the young man is concentrating on: A small dot on the horizon is coming closer and getting bigger. But what is it? Zell smiles meekly and says ambiguously, "Perhaps the future." The object that the 18-year-old is making glide through the air by means of a remote control is not a typical model airplane, but a flying wing. This is a fixed-wing aircraft without a fuselage or a tail section. Ivo Zell has been working intensively on this "tailless" airplane for months. He combs through the specialist literature, develops his own model with a 1.20-meter span and launches countless test flights. His hard work pays off: In April 2016, Zell wins the Physics category of the "Jugend forscht" (Young Researchers) competition in the German federal state of Hesse, which we have been hosting since 1996 (see article on page 32).

One wing is enough

Why is Zell convinced that one wing is enough? "In comparison with conventional aircraft, flying wings have optimized aerodynamics and thus use considerably less fuel," he explains. That sounds logical. But these special airplanes also have some disadvantages: They are hard to control and can start to spin easily. This is precisely where the challenge lies. "The aim of my project was to build a flying wing that does not need electronic stabilization," says Zell. The bell-shaped lift distribution developed by the Horten brothers in the 1930s forms the basis of his extensive calculations. He then brings his data to life in his father's carpenter's workshop using CAD tools and 3D printing – the model airplane is ready for takeoff. He is now starting a test and evaluation phase by means of telemetry, video analysis, his own sensors, and measuring procedures. With great success. With his model, Ivo Zell has managed to establish unproblematic flight characteristics – an interesting discovery for the international aeronautics industry. In addition to the "Jugend forscht" competition in Hesse, he also won the German national competition and reached second place at EU level. Now Zell is looking forward to participating in Intel ISEF, the world's largest pre-college science competition, being held in May 2017 in Los Angeles, California. Despite this spectacular, lofty challenge, he remains grounded: "I plan to study mechanical engineering so that later I can work as an aerospace researcher."

As light as a feather

By contrast, Patricia Asemann is reaching astronomical heights – albeit only in theory. Together with her project partner Robin Heinemann, she is developing a computer simulation with which they will investigate the influence of gravity on the evolution of planetary systems. But how does one come up with this unearthly idea? "I can spend hours solving complex mathematical problems – I really enjoy it!" Fascinated by outer space, which is still largely unexplored, she is currently working on her topic for "Jugend forscht" with the Head of the Student Research Center in Kassel, Germany. "Molecules form dust disks and pieces of rock, which in turn become huge mountains. But the question of what effect gravity has on this process has not yet been answered," explains Asemann in simple terms. First she delved deeply into the world of specialist literature and contacted scientists around the globe who were researching similar topics. "They were delighted by the interest I showed and were happy to help me," recalls the 18-year-old. With the information she had gathered in her mind, she sits down at her computer. Her complex simulations consider various parameters such as homogeneity, density, number and velocity of the objects. The main finding of her research is that gravity only plays a role when larger fragments have already formed. In the initial phase, however, factors such as electromagnetism and fluid mechanics are decisive. With this contribution, the two young researchers impress the jury in the category of Geo and Space Sciences and win first prize in both the state-wide competition in Hesse and the national competition. Today, Patricia Asemann studies mathematics and physics in Jena, devoting her free time to new areas of research: For example, the development of an invisibility cloak that bends sound waves around an object. However, there is one question that the talented young scientist cannot answer: "I have no idea why there are so few women in the subjects I study."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Highly reactive

Elias Chalwatzis from Bensheim, Germany, comes across an explosive question of an entirely different nature during a chemistry lesson. If you put an alkali metal into water, it causes a vigorous reaction in which hydrogen is generated. “It can give off a really loud bang,” says the 19-year-old. Today, scientists are still not in agreement on the chemistry behind it. Some explain the detonation as being caused by an oxyhydrogen reaction. Others put it down to a physical explosion in which the water suddenly vaporizes due to the high degree of heat. Recent research points to the repulsion between the resulting metal ions as the cause of the explosion. It’s a topic that Elias Chalwatzis and his fellow pupils Christian Brudy and Daniel Crusius can’t stop thinking about – they want to learn more about the reaction mechanism. “First we did some research on the Internet and talked to ‘real’ scientists such as a professor of chemistry in Prague,” says Chalwatzis. Then the pupils started their experiments in the school laboratory – under supervision, as such experiments can be dangerous. They analyze the reactions of alkali metals with water and other reagents using high-speed recordings and conductivity measurements. Their results support the current thesis known as the Coulomb explosion. The three young men win the Hesse state competition in the Chemistry category and the special prize for Work Safety in the national competition. Chalwatzis is now studying chemistry in Darmstadt, where our headquarters are located. “Working there one day would be an interesting prospect,” he says, smiling.

Around 4,500 of our employees have provided exciting insights into the world of science in classrooms and at our sites in 36 countries.

More than 60,000 pupils put on lab coats and had fun conducting experiments.

Innovation through curiosity

We promote aspiring scientific talent through a variety of programs

As a global science and technology company, we are involved in a wide range of activities in the education sector. "Promoting young scientists is very important to us. Our commitment to education is a key element of our Corporate Responsibility strategy," says Frank Gotthardt, Head of Public Affairs and Corporate Responsibility. In 2016 alone, we invested € 3.2 million in educational projects. The company's activities also include awarding international scholarships – for example in India and China, or awards for excellent students in Ghana, Nigeria and Kenya. For more than 30 years, our company has been a partner of "Jugend forscht", Germany's largest and most successful young scientist competition. Since 1996, the company has been staging the state competition in Hesse and has hosted the national finals twice. Pupils, apprentices and students between the ages of 15 and 21 are called upon to develop creative projects. The participants can choose the topics themselves, but the project must fit into one of seven categories. These are: the world of work, chemistry, biology, geo and space sciences, mathematics/information technology, physics, and technology. "We are repeatedly impressed by the high level of the projects that are submitted," says Julian Wenzel from our Community Relations department.

We widely promote STEM subjects, namely science, technology, engineering, and mathematics. Continuous support of schools is having an impact: around 80% of the "Jugend forscht" projects from the state of Hesse that make it to the Hesse state competition are from schools sponsored by us. "In addition to this specific sponsorship, it is important to us to promote general scientific education and to show that chemistry is exciting and fun," explains Christa Jansen, Associate Director of School Sponsorships. With its various offers as an extracurricular place of learning, we help young people in their choice of studies and careers. Through advanced teacher training, innovative technologies such as liquid crystals and OLEDs have even been incorporated into school lessons. In cooperation with the Technical University of Darmstadt, we run a junior chemistry and biology laboratory for pupils. This laboratory has ultramodern equipment that permits entirely new experiments. Internationally, this recipe for success will now be implemented in selected countries.

In addition, our company is engaged in numerous educational initiatives worldwide to awaken young people's interest in science. This includes the SPARK program that was launched in early 2016. It motivates employees across our Life Science business sector to volunteer to share their scientific knowledge with students at schools in 192 cities around the world. To date, around 4,500 employees have provided exciting insights into the world of science in classrooms and at our sites in 36 countries. More than 60,000 pupils have put on lab coats and had fun conducting hands-on experiments. Through SPARK, our company collaborates with schools and non-profit organizations, for example the Swiss Science Center Technorama in Winterthur, to teach students about and spark their interest in science. In addition, we have launched Curiosity Labs where pupils have the opportunity to conduct experiments on processes such as water filtration or DNA extraction that are part and parcel of daily scientific practice.

To Our Shareholders

33–44

To Our Shareholders

33 – 44

It is a great pleasure for me to write to you for the first time as Chairman of the Executive Board and CEO. First, and most importantly: our company is doing superbly. Our company is in excellent shape.

In 2016, we again achieved profitable growth. Compared with 2015, our sales increased by 17%, setting a new record at € 15 billion. EBITDA pre exceptionals, the key financial indicator used to steer our operating business, grew by 23.7% to € 4.5 billion. Profit after tax in 2016 came in at € 1.6 billion, an increase of 45.3%. At the same time, we lowered our net financial debt by over € 1 billion to € 11.5 billion. As shareholders, you benefit from this good business performance. In 2016, our share price developed well, advancing from € 89.57 at the beginning of the year to € 99.15 at year-end, equivalent to an 11% increase in value, nearly four percentage points better than that of the DAX, Germany's blue-chip index. For 2016, we will propose to the Annual General Meeting a dividend of € 1.20.

The excellent performance of our business shows that we are on the right track. Our strategy is working. First and foremost, this is due to the accomplishments of the more than 50,000 men and women who work for our company worldwide. I would like to sincerely thank all of them for their strong engagement and passion, with which they have moved our company forward.

For the management, 2016 was a year of change. On April 30, 2016, I took over the chairmanship of the Executive Board. Two new members, Udit Batra and Walter Galinat, were appointed to the Executive Board, assuming responsibility for our Life Science and Performance Materials business sectors, respectively.

Stefan Oschmann
Chairman of the Executive Board and CEO

We are a vibrant science and technology company. We perform research and manufacture products in a wide variety of fields – from cancer therapy and laboratory technology to liquid crystals in smartphones. Yet all of our business activities have a common driving force: scientific curiosity. Our work on new technologies for a better life reflects our tremendous passion for discovery. And that is where we are investing. In 2016, we spent € 2 billion on research and development.

Our efforts are paying off. We made significant progress in all three business sectors last year.

Healthcare reached important milestones on its journey towards launching new medicines. We submitted cladribine tablets for approval in Europe to treat relapsing-remitting multiple sclerosis. We are also making progress in immuno-oncology. We submitted avelumab, our active ingredient that we are co-developing with the U.S. company Pfizer, for approval in the United States and Europe for the treatment of Merkel cell carcinoma, a rare and aggressive form of skin cancer. In China, our business developed extremely well. In 2016, we were the fastest-growing international pharmaceutical company in this highly promising market.

For patients, we develop more than medicines. Fertility is one such example. Worldwide, around 2.5 million babies have been born to date with the help of our fertility drugs. We are proud of this. To help more couples who wish to become parents, we are expanding our offerings. Not only medicines, but also technologies play a crucial role in successful fertility treatment. In cooperation with Genea Biomedx of Australia, we therefore offer solutions that support all important treatment steps undertaken by in vitro fertilization laboratories – for better treatment outcomes and even more happy families.

Our Life Science business sector benefited from strong demand in the biopharmaceutical industry and grew faster than the market. The integration of Sigma-Aldrich, which we acquired in 2015, is progressing better than expected. At the end of 2016, we had already achieved € 105 million in annually recurring cost synergies as compared with the originally planned amount of € 90 million. Moreover, we are expecting additional, previously unplanned top-line synergies. Overall, we now assume that total annual synergies from the acquisition will total € 280 million in 2018 instead of € 260 million.

Performance Materials once again maintained its global market and technology leadership in liquid crystals – even during a period of overstocking of LC displays. At the same time, we are further diversifying our business. One technology that holds great promise and potential for high growth is OLED, or organic light-emitting diodes. It is already one of our fastest-growing businesses today. And we are strengthening our market position, for instance through a new production plant, which we inaugurated in Darmstadt in September. We aim to be a leading global supplier of OLED materials in the future. In addition, our semiconductor materials business delivered growth rates in 2016 that were far above-average.

Technological progress is fundamentally changing our markets. New suppliers with innovative business models are shaking things up. This means that remaining idle is an easy way to fall behind. We want to cooperate with leading tech companies and start-ups. Just recently we formed a close partnership with Palantir, a leading U.S. company for complex data analytics. Our Accelerator program offers emerging companies with highly promising business models financial support and access to our experts. Additionally, we are taking financial stakes in the most promising start-ups in healthcare, life science, performance materials, and beyond. For this purpose, we doubled the volume of our Corporate Ventures fund for these types of investment, to € 300 million.

Yet we also have a lot of plans for our existing business. In Healthcare, we want to launch a new medicine or new indication per year. We hope to be able to register avelumab in further cancer indications. At the same time, we have other highly promising active ingredients in oncology, immuno-oncology and immunology that are currently being investigated in clinical trials.

In Life Science, our work to realize the full synergy potential of the Sigma-Aldrich acquisition will continue through 2018. At the same time, we're aiming for our business to continue to grow faster than the market. To this end, we are focusing on promising new offerings, such as gene editing tools and services. This exciting technology is now more accessible and easier to use, enabling scientists to study how a specific gene or variation of a gene can affect a disease or certain types of cancer. We want to rank among the leading technology suppliers in this growing and important market.

Specialty chemicals from Performance Materials offer great potential for future mobility. Our Automotive Platform developed specifically for this purpose illustrates this well. Our products include liquid crystals for free-form displays, antennas with high data transmission power, OLEDs and LEDs for headlights, semiconductor materials for sensors, as well as functional pigments. It's already certain today that a lot from our company will be inside the cars of tomorrow.

Ladies and gentlemen,

Our business prospects are good. We have a clear strategy. But as a company with an international presence, we are concerned about political developments that could restrict global trade. Reliable international framework conditions and open markets are essential – for both our company and for overall economic development.

At the same time, technological progress pays little heed to political uncertainty and is advancing at lightning speed. We want to help shape this change. Scientific curiosity is our driving force. That's because we know breakthroughs begin with curiosity. And breakthroughs are what we want to achieve in the coming years. For patients, for our customers, and of course for you, our shareholders.

It is a special honor for me to lead this unique company. We are well-positioned for sustainable and profitable growth. We have a lot planned. We are curious about the future. I hope that you share our curiosity – and that you will continue to support us as shareholders.

Sincerely,

Stefan Oschmann
Chairman of the Executive Board and CEO

The Executive Board

Marcus Kuhnert, Stefan Oschmann, Kai Beckmann, Udit Batra, Walter Galinat, Belén Garijo

from left to right

Marcus Kuhnert

Member of the Executive Board
Chief Financial Officer

Responsibility for Group functions: Group Accounting; Group Controlling & Divisional Controlling; Group Tax; Group Treasury; Finance Operations; Mergers & Acquisitions; Investor Relations

Stefan Oschmann

Chairman of the Executive Board & CEO

Responsibility for Group functions: Group Strategy & Transformation; Group Legal & Compliance; Group Internal Auditing; Group Communications

Kai Beckmann

Member of the Executive Board
Chief Administration Officer

Responsibility for Group functions: Group Human Resources; Group Business Technology; Group Procurement; Environment, Health, Safety, Security, Quality; Inhouse Consulting; Site Operations

Udit Batra
Member of the Executive Board
CEO Life Science

Walter Galinat
Member of the Executive Board
CEO Performance Materials

Responsibility for Group functions:
Patents & Scientific Information

Belén Garijo
Member of the Executive Board
CEO Healthcare

Responsibility for Group functions:
Public Affairs & Corporate Responsibility

Short biographies
More information can be found
at www.emdgroup.com
→ Management → Executive Board

Our shares

At a glance

Overall, the development of the stock markets in 2016 was subdued. Following weak performance in the first three quarters, share prices only started to pick up more noticeably towards the end of the year. By contrast, our share price rose nearly 11% over the entire period, finishing the year at € 99.15. Our shares thus again outperformed all the relevant comparative indices in 2016: The performance of our shares was nearly 4 percentage points stronger than that of the DAX® and almost 7 percentage points better than the relevant chemical industry index. Even more pronounced was the difference to the relevant pharmaceutical index, which our shares outperformed by nearly 23 percentage points.

In a generally weak market in the first quarter, our shares hit their annual low of € 71.40 on February 11, 2016. At the end of 2015, concerns about macroeconomic activity had already resurfaced in the markets. These related mainly to economic developments in China and in emerging markets as well as to the perceptible oil price decline. Moreover, our report on the full-year results of 2015, which included first qualitative indications of expected sales and earnings performance in 2016, triggered cautious reactions by some market participants with regard to our future earnings potential.

However, in the course of the following months, our share price recovered noticeably, both in absolute terms and relative to the relevant comparative indices. Among other things, the presentation of a succession of good quarterly results that were either in line with or above market expectations, along with steady, consecutive upgrades of the guidance on our business performance in 2016, most likely helped to ease the initial concerns of some market participants.

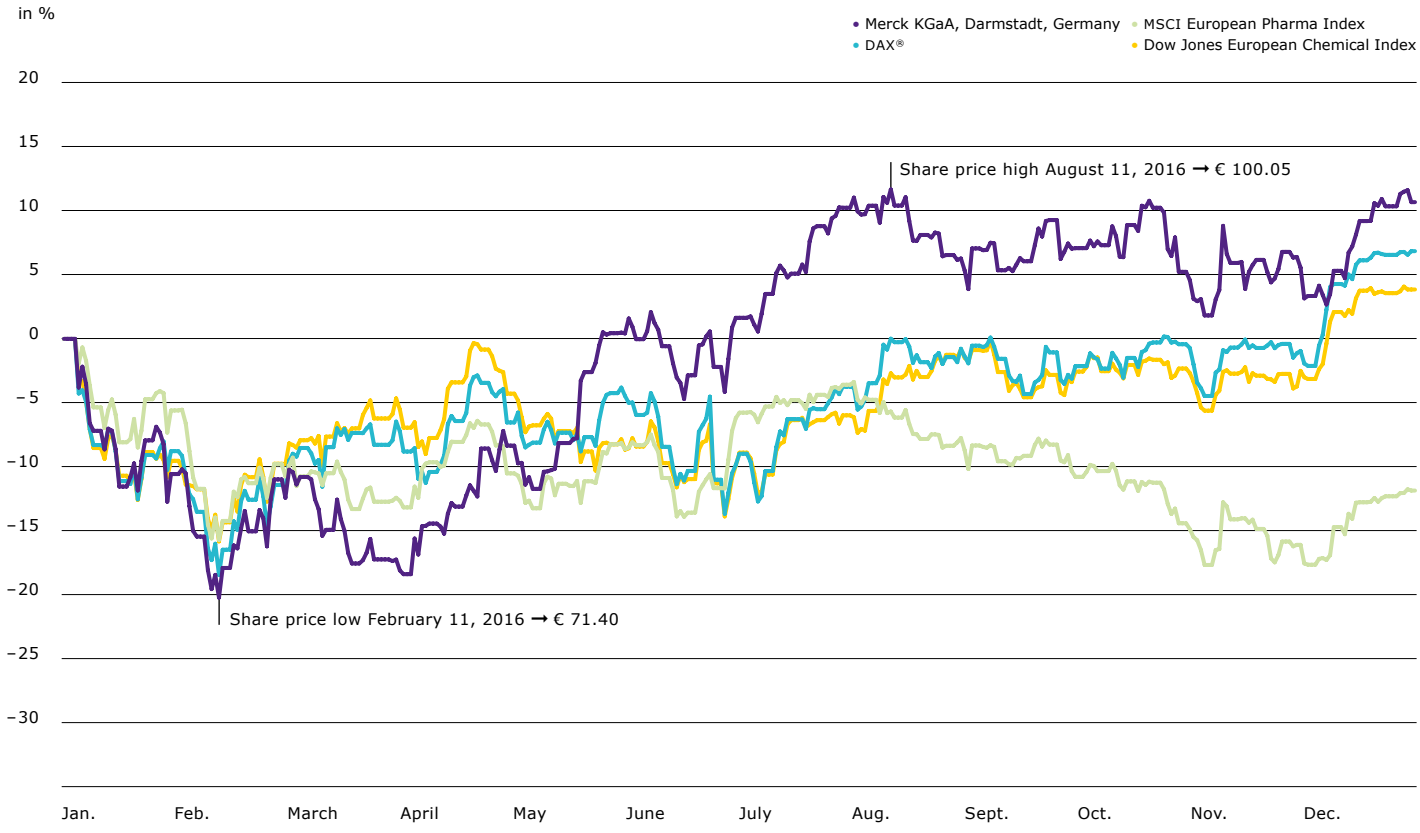
Additionally, in early June 2016, we presented clinical data on our key pipeline compound avelumab at both the important pharmaceutical ASCO meeting (American Society of Clinical Oncology) in Chicago, Illinois (USA) and during a conference call. This update was received positively by investors and analysts. The referendum in the United Kingdom concerning the country's exit from the European Union led to noticeable share price corrections in the financial markets. However, our shares largely remained unaffected by this development owing to the company's broad geographic positioning and limited dependence on this market. The situation was similar as of mid-August 2016, when share prices, specifically in the pharmaceutical sector, began to weaken noticeably. Among other things, this was due to increasing uncertainty among market participants over potentially significant changes in the United States, the world's largest pharmaceutical market, in the run-up to the presidential elections. Another important reason was disappointing clinical data presented by a competitor in the field of immuno-oncology. However, our share price only reflected this to an insignificant extent and even marked its annual high of € 100.05 on August 11, 2016. Instead, positive economic data and a significant recovery in oil prices led to a share price pick-up in the broader stock market, which also benefited our shares. Our broad positioning and limited dependence on a single industry were most likely the key reasons for this assessment by market participants. Our Capital Market Day on October 13, 2016 also resonated very well with investors and analysts, who, as in 2015, had the opportunity to meet members of the management of all our business sectors and to engage in an in-depth dialogue with them. The good development of our share price in the summer saw further acceleration towards the end of the year with the announcement of good third-quarter results, the partly unexpected outcome of the U.S. presidential elections in November 2016 as well as the development of the euro/U.S. dollar exchange rate, which showed a favorable trend for European companies. Our shares closed at € 99.15, which was close to their annual high reached in August 2016.

In addition to the discussions at Capital Market Day in October 2016 and the conference call on our research and development pipeline in June 2016, members of our executive management and IR team held in-depth briefings with more than 700 investors and analysts worldwide in 2016. These took place within the scope of investor conferences, roadshows and conference calls. In April 2016, our Investor Relations team achieved first place in the prestigious "All-Europe Executive 2016 Ranking" by Institutional Investor Magazine in the category "Best Investor Relations Program – Nominated by the Sell Side" in the pharmaceutical sector (third place in 2015). More than 700 portfolio managers and 900 sell-side analysts took part in the survey, rating important criteria such as credibility, competence, expertise and objectivity in communication with financial market participants as well as reaction speed as regards future developments within the company or in response to inquiries.

The average daily trading volume of our shares decreased by around 18% from approximately 563,000 in 2015 to roughly 464,000 in 2016. The North America region again dominated the free float in 2016, yet its proportion decreased to around 31% in comparison with the previous year (2015: 38%). By investor type, GARP (growth at reasonable price) and value-oriented investors dominated, as in the previous year. However in 2016, growing interest could be seen among growth-oriented investors, who meanwhile hold nearly 30% of the free float. At the end of 2016, the top five investors held around 18% of the free float (2015: 19%).

OUR SHARES

Share price development from January 1, 2016 to December 31, 2016



Source: Bloomberg (closing rates) on XETRA®

OUR SHARES

Key share price data[1]

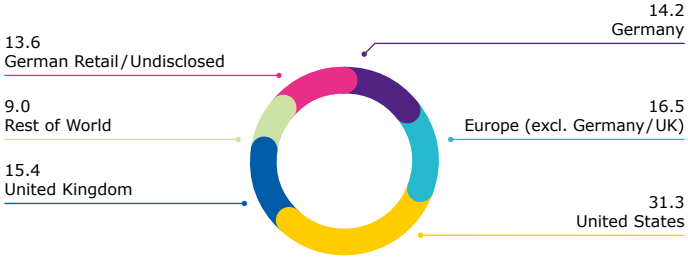
		2016	2015
Dividend	€	1.20	1.05
Share price high	€	100.05	111.25
Share price low	€	71.40	74.90
Year-end share price	€	99.15	89.57
Daily average number of shares traded[2]	units	468,408	563,370
Market capitalization[3] (at year-end)	€ million	43,108	38,943
Market value of authorized shares[4] (at year-end)	€ million	12,814	11,576

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

OUR SHARES

Identified investors by region as of December 2016

in %



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

OUR SHARES

Identified investors by type as of December 2016

in %

Source: Nasdaq Shareholder Identification.

Combined Management Report*

Combined Management Report*

45–154

* The management report for Merck KGaA, Darmstadt, Germany, has been combined with the Group management report and published in our 2016 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 2016 are being 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 EBITDA pre exceptionals, operating result (EBIT), business free cash flow, net financial debt and earnings per share pre exceptionals, which are not defined by International Financial Reporting Standards (IFRS). 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 IFRS.
The figures presented in this combined management report have been rounded. This may lead to individual values not adding up to the totals presented.

Fundamental Information about the Group

The Group

We are a global science and technology company headquartered in Darmstadt, Germany. With a history of nearly 350 years, we are the oldest chemical and pharmaceutical company in the world. In line with our strategic direction, our company comprises three business sectors: Healthcare, Life Science, and Performance Materials, which encompass the Group's six businesses.

In Healthcare, we discover, develop and manufacture prescription medicines used to treat cancer, multiple sclerosis, and infertility, among other things, as well as over-the-counter pharmaceutical products for colds and pain. Our products help millions of people around the world.

In Life Science, we conduct research for researchers, providing scientists with laboratory materials, technologies and services. Our aim is to make research and biomanufacturing easier, faster and more successful.

Performance Materials develops specialty chemicals and materials for demanding applications – from liquid crystals and OLED materials for displays to effect pigments for coatings and cosmetics to high-tech materials for the manufacture of integrated circuits.

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 – following the completed acquisition of Sigma-Aldrich – in the life science business and as EMD Performance Materials in the high-tech materials business.

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, 2016, we had 50,414 employees worldwide, which compares with 49,613 on December 31, 2015.

Healthcare

Our Healthcare business sector comprises the four businesses Biopharma, Consumer Health, Biosimilars, and Allergopharma. Since 2015, Belén Garijo has been the CEO of our Healthcare business sector and member of the Executive Board. In 2016, Healthcare generated 45% of Group sales and 43% of EBITDA pre exceptionals (excluding Corporate and Other), making it the largest of our three business sectors. The regions Europe and North America generated 60% of Healthcare's net sales in 2016. In recent years, we have steadily expanded our presence in growth markets. In 2016, Asia-Pacific and Latin America accounted for 33% of sales.

Biopharma

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

In 2016 we reinforced our commitment to growing our immunology pipeline to provide new options to better the lives of people with immunological diseases as we prepared for the potential launch of cladribine tablets. Our activities included major milestone accomplishments and an impactful presence at key medical meetings around the world.

New data on Rebif®, Biopharma's top-selling drug and leading multiple sclerosis (MS) therapy, and investigational cladribine tablets were presented at both the American Academy of Neurology's (AAN) Annual Meeting in April 2016 and the Congress of the European Academy of Neurology (EAN) in May 2016. In addition, results of more than 30 clinical studies were presented at the world's largest international MS conference, the 32nd Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) in London, United Kingdom.

In June 2016, we reached a major regulatory milestone with the submission for registration of cladribine tablets to the European Medicines Agency (EMA). We believe that cladribine tablets, if approved, could lead to high and sustained efficacy through selective modulation of B and T cells resulting in lasting resolution of inflammation. The additional data we have gathered over the past four years provides better characterization of the safety and tolerability profile and this coupled with a unique oral short course will serve as an important therapeutic advance for patients with relapsing-remitting multiple sclerosis (RRMS).

In July 2016, we announced the EMA's acceptance for review of the Marketing Authorization Application (MAA) for the investigational product cladribine tablets for the treatment of RRMS.

We also presented data on atacicept, our investigational treatment for systemic lupus erythematosus (SLE) at the 2016 American College of Rheumatology/Association of Rheumatology Health Professionals (ACR/ARHP) Annual Meeting held in November. Although the primary endpoint was not met in the overall study population of the ADDRESS II Phase IIb, multicenter study on

atacicept in patients with SLE, there was a trend favoring atacicept with statistical significance achieved in a pre-specified sensitivity analysis of the primary endpoint using treatment Day 1 as baseline (rather than screening visit). Additionally, analyses of a predefined subpopulation of patients with high disease activity demonstrated statistically significant treatment effects of atacicept when compared to placebo.

Erbitux® (cetuximab) remains the second best-selling drug in the portfolio of the Biopharma business and is the company's flagship product in oncology. The product is a standard of care for patients with epidermal growth factor receptor (EGFR)-expressing, RAS wild-type metastatic colorectal cancer (mCRC) therapy, as well as both recurrent/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 whom it will benefit most. In April 2016 we reached a major milestone regarding its expansion in growth markets with the positive results of the pivotal Chinese Phase III TAILOR study.

In addition, we continued to support our goal of improving care for patients with mCRC by further advancing in the area of liquid biopsy technologies through collaborations. In 2016, we became the first pharmaceutical company to collaborate with multiple diagnostic providers to support RAS biomarker testing, with new agreements announced with Biocartis and Amoy Diagnostics Co., Ltd. for different testing technologies to meet the needs of various laboratory segments. These agreements follow our first collaboration with Sysmex Inostics, which achieved a notable milestone in 2016, when the liquid biopsy technology we are co-developing received CE Mark approval in April.

Importantly, through another key collaboration, our strategic alliance with Pfizer Inc., USA, we continued to make progress in the development and envisaged commercialization of avelumab*, an investigational fully human anti-programmed death-ligand 1 (PD-L1) antibody.

The positive results from JAVELIN Merkel 200, the pivotal Phase II study in patients with metastatic Merkel cell carcinoma (MCC) treated with avelumab in second or subsequent lines of therapy, were presented at the American Society of Clinical Oncology (ASCO) 2016 annual meeting. These results supported the submission and acceptance of the Biologics License Application to the U.S. Food and Drug Administration (FDA), as well as the Marketing Authorization Application to the European Medicines Agency. Additionally, we initiated two pivotal Phase III trials for avelumab in 2016, including a combination trial with axitinib for the first-line treatment of renal cell carcinoma and as a first-line treatment for ovarian cancer.

These pivotal trials are part of the larger clinical development program for avelumab, known as JAVELIN, which involves at least 30 clinical programs and more than 4,000 patients evaluated across more than 15 different tumor types. As part of the strategic alliance, we are also advancing our co-promotion of Pfizer's anaplastic lymphoma kinase (ALK) inhibitor Xalkori® (crizotinib), indicated for the treatment of patients with metastatic non-small cell lung cancer (NSCLC) whose tumors are ALK-positive. Xalkori® is being co-promoted in two waves, the first of which began in 2015 in the United States, Canada, Japan, and five EU countries (France, Germany, Italy, Spain, and the United Kingdom). The second wave began in 2016 including Argentina, China and Turkey.

As part of our efforts in immuno-oncology we have an exclusive strategic collaboration and license agreement with Intrexon Corporation to develop and commercialize Chimeric Antigen Receptor T-cell (CAR-T) cancer therapies.

An important growth driver for our Biopharma business is our fertility portfolio, offering products that help couples to conceive a child, ranging from drugs to technologies. Infertility has become a key topic globally due to the current trend towards delaying childbirth. We see a steadily increasing demand in growth markets, fueling current and future sales. In addition, we are facing a rapidly changing environment in the fertility market, with commoditization and price pressure in the drugs business, more educated patients and an increasing importance of Fertility Technologies. The strategic innovation of our fertility business model to develop from the world market leader in fertility treatments into an integrated fertility treatment partner focuses on turning these trends into opportunities for our company and will drive further growth. The first step to achieve this goal was to extend our existing drug portfolio into our continuously expanding innovative technologies offering.

We are the only company to offer recombinant versions of the three natural hormones needed to treat infertility as well as a complete and clinically proven portfolio for every stage of the reproductive cycle. In early 2016, our portfolio of drugs was further complemented by the improved Gonal-f® prefilled pen, a new pen version including various advanced features designed to facilitate administration for patients.

Our Fertility Technologies business expanded and is now providing solutions for all key steps of in vitro fertilization (IVF). Our automated vitrification instrument Gavi™** can now freeze oocytes and embryos at key stages. For the incubator Geri™** an annotation software was introduced (Geri™ Connect & Assess 1.0), and with a humidified incubation feature the incubation environment now resembles the conditions in the uterus more closely. A new version of the incubator Geri™+ allows for use with the Early Embryo Viability Assessment (Eeva®) Test, for which a new software version was launched. With Geri™ medium we introduced a new single-step medium supporting undisturbed embryo growth. Finally, our innovative witnessing and tracking system Gidget™ helps to reduce the potential for error and improves lab workflows. Key parts of our technologies portfolio were made available for clinical use in Europe in 2016, and now are also marketed in Canada and Japan.

* Avelumab is not yet approved for any indication in any market. The EMA has validated the Marketing Authorization Application for avelumab for the treatment of metastatic MCC, marking the first acceptance of an EU market authorization application to review the safety and efficacy results for this investigational product. The U.S. FDA has also accepted the Biologics License Application for avelumab for the treatment of metastatic MCC, marking the first acceptance of an application by the U.S. FDA to review this investigational product.

** Gavi™ and Geri™ are not available in the United States.

In June, the Global Fertility Alliance welcomed two new members: Zeiss (Carl Zeiss AG, Oberkochen) and Hamilton Thorne Ltd., USA. The alliance paves the way forward into the future of fertility treatment and adds to our strong basis in the drug business and our highly innovative Fertility Technologies business.

Every day, 55 million patients around the world are using our trusted general medicine and endocrinology (GM&E) medications. Today Concor®, Euthyrox®, Glucophage®, and Saizen® are high-value 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 our Healthcare business sector, contributing significantly to the overall profitability of Biopharma and our company. 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 leading treatment for hypothyroidism, a disease with high prevalence but still low diagnosis in most emerging markets. Glucophage®, containing the active ingredient metformin, is the drug of choice for first-line treatment of type 2 diabetes. In October 2016, metformin received a positive CHMP opinion for treatment of type 2 diabetes patients with moderate renal impairment (CKD stage 3), which will be reflected in a label change in Europe. This will allow Glucophage® and other metformin products to be used safely by a larger group of patients with type 2 diabetes. The indication for Glucophage® is being extended to include prediabetes and has been granted approval in 12 markets around the world.

We also help to raise awareness and education in the areas we operate in, such as thyroid diseases. Highlights include our continuous engagement in International Thyroid Awareness Week and our partnership with the Royal Health Awareness Society (RHAS) of Jordan, signed in October.

Saizen® (somatropin) is our main endocrinology product and is indicated for the treatment of growth hormone deficiency (GHD) 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.

As part of our continuous commitment to deliver high-quality medicines to our patients, we are continuously investing in our manufacturing network across the globe. In 2016, we completed the construction of a new facility in Nantong, China, expanded our plant in Rio de Janeiro, Brazil, and initiated the construction of a ew packaging center in Darmstadt, Germany, in order to meet the increasing worldwide demand for our General Medicine products Glucophage®, Concor® and Euthyrox®. In order to meet the increasing worldwide demand for our biotech portfolio of medicines, we completed the expansion of our plant in Tres Cantos, Spain. In Aubonne, Switzerland, we pushed forward with the construction of our new packaging center.

Consumer Health

In our Consumer Health business we focus on consumer-centric innovation under the umbrellas of several strategic brands such as Neurobion®, Bion®, Seven Seas®, Nasivin®, Femibion®, and Dolo-Neurobion®, as well as Vivera®/Floratil®, Sangobion®, Vigantoletten®, Apaisyl®, and Kytta®. Our latest innovations are the probiotic Vivera and the Femibion BabyPlanning line extension. We aim at emotionalizing these over-the-counter and food supplement brands so that they become irresistible love brands in the eyes of our consumers and customers alike. Most of these brands are fully aligned with the newly established purpose of the Consumer Health business: “We exist to prepare society for a new era of humans living 100 healthy years.”

Global megatrends favor the future growth of the Consumer Health business. People are becoming more health-conscious and take care of their own physical well-being. Preventive healthcare and as little invasive medication as possible are growing in importance – in both established and developing markets, the latter characterized by a growing middle class with specific needs. And people and societies are growing older than ever before. This is why we developed and started establishing a movement around our new purpose to actively drive change in the societies we are operating in, all under the independent label and motto “WE100® – young for old, old for young.”

We are currently among the top 15 players in the global OTC market and already generate more than 50% of our annual sales in developing growth markets. In particular, markets such as Chile, Brazil, the United Kingdom, South Africa, Thailand, Indonesia, India, Malaysia, and the Philippines are delivering significant growth rates. To further align the regional with the strategic brand strategies and to even better focus on efficient region-brand combinations, we have reorganized our regional structure.

Biosimilars

Our Biosimilars business is committed to providing access to high-quality biologics to more patients all over the world. In addition, we are developing a biosimilars portfolio focused on oncology and inflammatory disorders through both in-house research and development expertise in biologics and partnerships with other biosimilar players. In 2016, we advanced our pipeline well into clinical development, with our adalimumab Phase III study recruiting the first patient and finishing recruitment in the same year. Biosimilars is an attractive market in which we are well-positioned, building on existing strengths and capabilities across the biosimilars value chain.

Our company has strategic alliances with Dr. Reddy's in India to co-develop multiple cancer drugs and with Bionovis in Brazil to supply the Brazilian market with biological products under the Productive Development Partnership (PDP) policy of the Brazilian Ministry of Health.

We are in advanced stages of negotiations to divest the Biosimilars business and the transaction is expected to close in 2017.

Allergopharma

Our allergy business Allergopharma is one of the leading companies in the field of allergy immunotherapy (AIT). The Allergopharma portfolio includes a diverse spectrum of approved allergen products that meet high quality standards. AIT (hypo-sensitization, desensitization, specific immunotherapy) is the only causal therapy for treating allergies to unavoidable allergens.

We manufacture products to diagnose and treat type 1 allergies such as hay fever or allergic asthma. Our allergy business offers high-dose, hypoallergenic, standardized products for allergen immunotherapy of pollen and mite allergies. These allergoids have a special focus in Allergopharma's product portfolio and constitute a cornerstone in its integrated health approach for patients suffering from these conditions. For effective treatment, reliable diagnosis is key. Allergopharma offers a broad range of diagnostics in the field of allergies with more than 100 single allergens, providing physicians with the specific tools needed to identify the substances causing an allergy. In addition, Allergopharma provides individual allergen extracts on a named patient basis, which are needed to treat less frequent allergies. Personalized medicine has been a reality for Allergopharma for many years now. Products of Allergopharma are available in more than 20 countries worldwide.

Life Science

With one of the broadest product and technology portfolios in the industry, the purpose of our Life Science business sector is to solve the toughest problems in life science by collaborating with the global scientific community. Udit Batra has been the CEO of our Life Science business sector since 2014 and became a member of our Executive Board in April 2016. In 2016, our Life Science business sector contributed 38% to Group sales and 34% to EBITDA pre exceptionals (excluding Corporate and Other).

We are a leading player in the attractive € 100 billion life science industry, serving more than one million global customers with the aim of advancing science faster to accelerate access to health for people everywhere. We offer innovative solutions for scientists and engineers at every stage. Our products and services are used in the research, development and manufacture of biotechnological and pharmaceutical drug therapies, as well as in research and application laboratories. In addition, our products and services also reach adjacent markets such as the food and beverage industry.

In November 2015, we acquired the Sigma-Aldrich Corporation, a leading life science company. This marked the largest acquisition in the history of our company – and one of the largest in the industry. As a combined business, we are able to serve life science customers around the world with a highly attractive set of established brands such as Millipore, Sigma-Aldrich, Milli-Q®, SAFC, Supelco and BioReliance. Moreover, we have a highly efficient supply chain through which we can deliver standard products in 24 to 48 hours worldwide. In the laboratory and academia business, we offer customers an extensive and customized range of products across laboratory chemicals, biologics, and reagents.

Life Science operates in 66 countries around the world with the headquarters in Darmstadt, Germany and major hubs in Boston (Massachusetts), St. Louis (Missouri), Milwaukee (Wisconsin) and Molsheim in France. In July, we announced plans to build a new campus in Burlington, Massachusetts that will serve as a major hub for our North American life science business with an investment of US$ 115 million. The 26,000 m^2 facility will include an M Lab™ Collaboration Center customer collaboration laboratory and training center as well as office space – a state-of-the-art, shared, exploratory environment where the company's scientists and engineers work together with customers.

Our Life Science business sector generates recurring sales and stable, attractive cash flows in an industry that is characterized by stringent regulatory requirements. A highly diversified and loyal customer base additionally ensures a low risk profile. We benefit from a broad and relevant portfolio, a highly efficient supply chain including a superb eCommerce platform and global reach.

Our eCommerce platform sigmaaldrich.com allows customers in nearly every country to more easily find the exact products needed to advance their research. Currently, more than 70% of addressable legacy products of our Life Science business are available on sigmaaldrich.com. In 2016, we implemented a centralized initiative to manage all customer acquisition channels and scaled search advertising to include more than two million active keywords driving increased website traffic to the content customers are looking for, resulting in a streamlined customer experience.

Our Life Science business sector is organized into three business areas which reflect customer segments. Research Solutions focuses on academia and pharmaceutical research institutions; Process Solutions markets products and services for the entire pharmaceutical production value chain, and Applied Solutions serves clinical and diagnostic testing laboratories, as well as the food and environmental industries.

To support these customer segments, our Strategic Marketing & Innovation (SMI) teams promote and deliver innovation tailored to our customers' needs. The SMI organizations are responsible for defining customer segment strategy, maintaining and innovating the product portfolio and communicating the business's strategic value propositions.

In addition, we have two commercial areas which are managed by region and customer segment to leverage regional and local expertise: one dedicated to the lab customers between Research and Applied and one dedicated to Process Solution customers. These areas are responsible for marketing, sales as well as customer and dealer relationships.

Research Solutions offers a broad and relevant portfolio of solutions that enable scientific discovery through complete partnership across the customer journey. This includes more than 200,000 products and services including molecular platforms, protein and pathway technologies, biochemicals, materials science, and cell culture workflow tools.

In Danvers, Massachusetts, we launched a transformation project at our current Mobius® manufacturing facility to improve capabilities within the facility. The project will include an additional 1,250 m^2 of cleanroom space to help meet the increasing market demand for single-use products.

In 2016, we introduced MILLIPLEX® MAP Human High sensitivity cytokine panel for faster and more cost-effective human cytokine assays. The new assay is the first 384-well kit for use with the Luminex FLEXMAP3D® platform and allows researchers with limited sample volumes who require high throughput to get more results, faster.

Our Process Solutions business offers a diverse range of products to pharmaceutical and biotechnology companies that enable customers to develop large- and small-molecule drugs safely, effectively and cost-efficiently. With the 2015 combination of Sigma-Aldrich and our Life Science business, we now offer the broadest portfolio in the industry. The 15,000-plus products and services in Process Solutions include single-use manufacturing, filtration, chromatography and purification, virus reduction, pharma and biopharma raw materials, drug delivery compounds and engineering and validation services.

Our single-use solutions offer increased flexibility to biopharma customers since they eliminate time- and cost-intensive cleaning procedures. Moreover, these single-use solutions are compatible with various products, thus reducing investment costs for our customers. Launched in 2016, the new Mobius® products include a 1,000-liter single-use bioreactor with an industry-leading design, a 2,000-liter system for difficult-to-mix biopharma ingredients and a large-volume transport system for sterile and non-sterile liquids. These products meet our customers' increasingly complex demands for user-friendly systems that allow them to focus on their science. We also deliver full end-to-end biopharma solutions by offering clients a full process line cGMP (current good manufacturing practices), from clone to commercial production.

In 2016, we expanded our industry-leading Emprove® risk assessment program to include selection of products for filtration and single-use processing. Rapid and easy access to risk assessment information is critical in an ever-changing regulatory landscape. The Emprove® program provides documentation and regulatory information on materials used in the manufacture of drug products and includes Millipore Express® filters, Pureflex® and Pureflex® Plus bags, Viresolve® Pro filtration devices and Durapore® filters.

In November 2016, we announced an € 80 million investment in a Life Science Center in Nantong, China, demonstrating a commitment to the industry's fast growth by providing a wide range of leading, innovative solutions for customers and partners in China. The facility will reinforce our leading position in inorganic salts for active pharmaceutical ingredients and excipients and cell culture media for the pharmaceutical, biopharma and healthcare markets in China as well as ready-to-use media for environmental and sterility testing.

The Applied Solutions business area focuses on diagnostic, testing and industrial customers and provides trusted products and comprehensive workflow solutions that streamline processes, lower costs and deliver consistent, reliable results. Our 62,000-plus products and services include analytical separation systems, reference materials, lab water instruments with consumables and services and microbiology and bio-monitoring testing materials.

Building on our commitment to improving workflows, we launched the Elix® high-throughput water purification system. Designed to operate at the heart of a central water purification solution, the Elix® system offers full connectivity, providing users real-time remote monitoring via computer, tablet or smartphone with access to all important water quality data. The product integrated seamlessly with existing systems and decreases energy and water consumption while maintaining water quality.

Our popular Guava® flow cytometers line was expanded with the addition of 532 nanometer lasers that increase the capabilities of the Guava® easyCyte instrument line to enable simultaneous detection of multiple fluorescent proteins. Since the discovery and isolation of the genes encoding proteins responsible for biological fluorescence, proteins have changed life science research. The new line enhances optical capability and flexibility and results in better optical configuration.

Performance Materials

Our entire specialty chemicals business is combined in our Performance Materials business sector. The portfolio includes high-tech chemicals for applications in fields such as consumer electronics, lighting, coatings, printing technology, paints, plastics, and cosmetics. Performance Materials comprises four business units: Display Materials, Integrated Circuit Materials, Pigments & Functional Materials, and Advanced Technologies.

Walter Galinat has been the CEO of our Performance Materials business sector since 2010. In April 2016 he was appointed to our Executive Board. In 2016, the business sector's share of Group sales amounted to 17% and its share of EBITDA pre exceptionals (excluding Corporate and Other) was 23%. The EBITDA margin pre exceptionals was 44.1% of sales.

In 2016, we defended our position as the global market and technology leader for established liquid crystal technologies even though the growth in demand for liquid crystal displays (LCDs) was lower than expected. Large – mainly Asian – display manufacturers are among the customers of our Liquid Crystals (LC) business. The Display Materials business unit comprises the broadest product offering. We offer liquid crystal mixtures, for technologies such as PS-VA (polymer-stabilized vertical alignment) technology (primarily for televisions) and IPS (in-plane switching) technology (primarily for smartphones and tablets), photoresist materials and reactive mesogens. New developments such as energy-efficient UB-FFS (ultra-brightness fringe field switching) technology established themselves further in the market for smartphones and tablets.

The development of new application possibilities for liquid crystals was again an important focus of our LC 2021 strategic initiative in 2016. This primarily includes the development of liquid crystal window technology. In order to protect against solar radiation, these windows allow continuously variable switching from light to dark in just seconds and have high color neutrality compared with competitive technologies. A privacy version of the windows permits switching from transparent to opaque. To achieve faster market penetration of the new technology, we are investing around € 15 million in a production facility for liquid crystal window modules at a site in Veldhoven, the Netherlands. The manufacture of these switchable modules, which our customers can process into smart windows and glass façades, is to start at the end of 2017.

In 2016, our annual "Displaying Futures" symposium focused on future mobility. We want to use the Automotive Platform that we have developed to show the potential that our materials have in view of future trends. These include liquid crystals for free-form displays, liquid crystals for mobile antenna applications or adaptive lighting in headlights, OLEDs (organic light-emitting diodes), LEDs (light-emitting diodes), semiconducting materials in chips or functional pigments. To further young companies and researchers, in 2016 we presented the Displaying Futures Award for the first time. The prize, which is worth US$ 50,000 and awarded for new ideas involving liquid crystal materials, went to three teams from the United States and the Netherlands.

Integrated Circuit Materials is our second-largest business unit and supplies products to manufacture integrated circuits and microelectronic systems, for antireflection coatings, and for the miniaturization of transistor structures. By integrating the two acquisitions, namely the SAFC Hitech business of Sigma-Aldrich and Ormet Circuits, we have ideally complemented our portfolio to include deposition materials and conductive pastes for semiconductor packaging. Advanced semiconductor manufacturers benefit from our cutting-edge material solutions for next-generation lithography, for example in directed self-assembly (DSA). We hold a leadership position in DSA technology thanks to our extensive expertise in polymer synthesis as well as many years of process and formulation experience. An important topic for the semiconductor industry is the development of increasingly powerful computer chips. This is being achieved by either making the structures on the chip even smaller (Moore's law) or combining different chips in the component or three-dimensional structures ("beyond Moore"). Our company offers various innovative products for both approaches. In addition to smartphones and servers, the main applications include sensors, for example for the automotive industry, and the Internet of Things. As an important partner to leading global electronics manufacturers, the business unit achieves more than 60% of its sales in Asia, generating around three-quarters of sales with products that are the leaders in their respective markets. In 2016, we also strengthened our positioning in the growth market of China.

The Pigments & Functional Materials business unit develops and markets a comprehensive product portfolio of decorative effect pigments and functional materials. The effect pigments are primarily used in automotive and industrial coatings, plastics, printing applications, and cosmetics in order to give products a unique shine. Functional materials include laser marking, conductive additives, applications for counterfeit protection as well as high-quality cosmetic active ingredients, for example for use in skin care, as well as sun protection and insect repellents. In 2016, we offered our customers various new products in all areas: For example, we launched the new Thermaval™ series of pearlescent pigments for high-temperature applications. They allow ceramic glazes to retain their brilliant colors and sparkle effect, also when used in ceramic glazes at cost-efficient single-firing temperatures. In 2016, our portfolio expansion and distribution activities also focused on collaborations – for example, with Agrimer of France to use marine cosmetic actives and with PolyOne of the United States to refine and market an innovative 3D plastics technology. Triggered by the Zika virus epidemic, we gained further market share with our insect repellent IR3535®, even in the existing market. The substance provides effective protection against mosquito bites and is also safe for pregnant women, who are at particular risk from the Zika virus. We received the prestigious European Frost & Sullivan Award for Product Leadership 2016 for its pioneering role in pigments used in high-quality automotive coatings. This recognizes the success achieved with the innovative Meoxal® and Xirallic® NXT lines.

The Advanced Technologies business unit invests particularly in future-oriented research and development in Performance Materials. A very good example of this are our materials for organic light-emitting diodes (OLEDs). The OLED materials business is one of our fastest-growing businesses. We opened the new production facility for OLED materials in Darmstadt in September as planned. After a 14-month construction period, high-purity OLED materials are being produced in the approximately 3,600 m^2 building. These are used not only in state-of-the-art displays, but also in modern lighting systems, such as in high-quality automotive tail lights. With a total investment of around € 30 million, this is one of the largest single investments our company has made at the Darmstadt site in recent years. The plant makes it possible to significantly increase production capacity. We aim to be a leading supplier of OLED materials by 2018. In order to meet the increasing demand and supply customers with a broad range of high-performance OLED materials, we have entered into a cooperation agreement with the Japanese company Idemitsu Kosan.

Quantum materials are another interesting new technology to improve displays. They enable ultra-bright displays with a notable expansion of the color gamut. In order to meet the growing demand for quantum materials, we entered into a licensing agreement with the Nanoco Group of the United Kingdom. The license allows us to immediately start marketing Nanoco's environmentally friendly cadmium-free quantum materials and to establish its own production facilities in the long term. In addition, we are also conducting research in quantum technology via the Israeli start-up Qlight Nanotech, which we acquired in 2015.

Objectives and Strategies

We want to advance technologies for a better life. Based on scientific research and in collaboration with partners, we are focusing on specialty products in healthcare, life science and performance materials.

General principles and Group strategy

General principles

Our company is a vibrant science and technology company. Our aim is to achieve technological progress that will improve life and make our customers and business associates more successful. This aspiration is embodied by values-based and economically sustainable corporate governance, has been anchored in our new brand promise since 2015, and steers the strategic development of the Group.

Our annual strategic planning process follows firmly defined principles. Our business portfolio must always be balanced so that it reflects an optimum mix of entrepreneurial opportunities and risks. We achieve this through our diversification into three complementary business sectors that make the company as a whole less dependent on economic cycles, as well as by expanding our presence in global growth markets. This exemplifies the long-term direction of our Group strategy. We want to continue the nearly 350-year-old success story of our company into future generations and to achieve sustainable profitable growth. The partner structure of Merck KGaA, Darmstadt, Germany, with members of the Merck family as personally liable partners also contributes to this. It requires the Executive Board, whose members are also personally liable partners, to pay special attention to the long-term development of value.

For us, the principle of sustainability applies not only to economic aspects, but also encompasses corporate responsibility. We pursue three strategic spheres of activity: health, the environment and culture. The focus is always on the future viability of society and the competitiveness of our company. With our current and future product portfolio, we want to help solve global challenges, from urbanization to aging populations.

Group strategy

Over the past decade, our company has transformed itself from a classic supplier of chemicals and pharmaceuticals into a global science and technology company. The main driver was the transformation of our business portfolio, particularly through the divestment of our Generics business (2007) and the acquisitions of Serono (2007), Millipore (2010), AZ Electronic Materials (2014), and Sigma-Aldrich (2015). In addition, we focused our businesses on innovation-driven and highly specialized products, extensively revamped our internal structures and processes, and expanded our presence in global growth markets.

Today, we hold leading positions in the respective markets of our three business sectors Healthcare, Life Science and Performance Materials, and are working to bolster and expand these. To this end, we are pursuing innovation-driven, organic growth. For instance, by 2022 we are targeting sales of around € 4 billion with new products. New medicines from the pharmaceutical pipeline are to contribute around € 2 billion, with Life Science and Performance Materials innovations each contributing around € 1 billion in sales.

Targeted acquisitions capable of meaningfully complementing or boosting our strengths remain a growth option. However, our company continues to rule out major acquisitions of more than € 500 million as long as the debt level expressed as the ratio of net financial debt to EBITDA pre exceptionals is greater than 2, unless divestments could be used to finance them. By 2018, we aim to reduce our debt level to below 2 again.

Our Group strategy aims to resolutely continue the transformation of our company into a specialized technology company and to position the company as a leading player in a changing market environment. For this purpose, we set up the Group Strategy & Transformation function in 2016. It unites the previously separately managed units Strategy, Innovation and Digitalization, and is designed to ensure the successful and timely implementation of core strategic projects. We have assigned these projects to three areas of key priority, namely “Performance”, “People” and “Technology”.

"Performance" encompasses all activities that create sustainable, profitable growth. To this end, we are closely aligning our businesses with the wishes and needs of customers and patients, not only through our products, but also best possible proximity. The basis for this is formed by efficient structures and processes as well as sustainable financial management. "Performance" is illustrated by the rapid and seamless integration of Sigma-Aldrich into our Life Science business as well as the realization of the associated synergies. We have progressed here faster than planned. In addition, previously unplanned top-line synergies are expected to contribute an additional € 20 million to earnings by the end of 2018. Consequently, total synergies from the Sigma-Aldrich acquisition will amount to € 280 million instead of originally € 260 million per year.

Our growth strategy calls for a work culture that values diversity, promotes collaboration and responds flexibly to changing requirements. That's because in today's global knowledge society, qualified and motivated people are a crucial factor for entrepreneurial success, especially in a science and technology company like ours. As a key priority area, "People" includes the further development of people management practices and creating an environment where innovation and creativity can thrive. We are paying particularly close attention to our leadership culture, talent pipeline and strengthening collaboration across national and departmental borders, for example through flexible work models or the use of a modern communication infrastructure.

The priority area "Technology" 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 customers, business associates and patients. 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 (Big Data).

Additionally, we are working Group-wide to expand the physical and virtual infrastructure for technology-driven growth. The centerpiece will be formed by the Innovation Center in Darmstadt. Currently under construction, this 7,000 m^2 building is scheduled for completion by the end of 2017. Until its opening, our modular Innovation Center, which opened in 2015, offers a platform for the development of new technologies, for instance within the scope of our Accelerator program. Through this initiative and our expertise in science and technology, we support start-ups in transforming their visions into viable business models.

In 2016, we expanded our existing Biopharma venture fund to all three business sectors, increasing the total funding volume to € 300 million. Additionally, businesses beyond our current portfolio represent the fourth investment arm of the new Corporate Ventures fund of Merck KGaA, Darmstadt, Germany.

Capability initiatives

In 2013, we introduced four capability initiatives. They address topics that are of strategic importance to the performance of the entire company: The capability initiatives ONE brand, ONE Talent Development, Rewards, and Performance Management, ONE Process Harmonization, and ONE Global Headquarters continue to drive important change or have started to evolve into regular activities. In October 2015, we introduced a fundamental revision of our brand design along with a simplified brand architecture, which we are currently implementing globally at all levels. In this context, we launched the digital brand campaign in 2016 called "Breakthroughs begin with curiosity" (curiosity.emdgroup.com), which puts the spotlight on scientific curiosity and passion for discovery as the driving forces of innovations.

Business strategies

Healthcare strategy

Global megatrends such as a growing world population and general increase in life expectancy are driving the demand for our healthcare products, namely biopharmaceuticals primarily for high unmet medical needs as well as consumer health brands that reflect the rising demand for preventive healthcare from an increasingly health-conscious society.

To meet these demands and appropriately respond to the dynamics of our healthcare markets, we have significantly transformed our Healthcare business sector in recent years. We are driving pipeline projects with the aim of bringing new groundbreaking medicines to patients, maximizing our existing portfolio and continuing our expansion in growth markets.

Our Healthcare business sector comprises the four businesses Biopharma, Consumer Health, Biosimilars, and Allergopharma. The diversity and profound medical expertise we have in these businesses are core strengths and key differentiators in the market. Within each business, we specialize in key therapeutic areas and specific diseases.

Our ambition in Healthcare is to become a global specialty innovator, to operate in therapeutic areas with significant unmet medical needs and to bring significant value to patients and consumers. Therefore, we invest heavily in research and development to discover new treatment options and improve existing ones. We are committed to working with our stakeholders and our partners to ensure that people can access the medicines they need to stay healthy and live longer.

In order to succeed in these areas, we seek sustainable ways to leverage our size, global set-up and innovation power. Here, striking the balance between innovation and operational excellence will be key. We are pursuing a comprehensive effort to further enhance our focus on customers. To boost customer intimacy, we are strengthening our relationships with healthcare professionals and building capabilities in digital, predictive and Big Data analytics.

The first pillar of our strategy is to reinforce our global footprint by developing our tailored portfolio to address unmet medical needs in all regions worldwide. While developed markets such as the United States, Japan and Europe are key strategic markets for our specialty innovation products, sales in growth markets such as China will be driven by our mature specialty, established biologics and broad general medicine portfolios. At the same time, it will be essential for us to continue to focus our efforts on growing in the United States in order to realize our ambition of being a truly global leader. For example, with the co-promotion of Xalkori® with Pfizer, we have entered the United States oncology market, which is helping us to prepare for the future launch of avelumab, our anti-PD-L1 antibody.

The second pillar of our strategy is to develop specialty assets in early- and late-stage clinical development. Here, we are concentrating our efforts on oncology and immunology as well as ensuring we remain a relevant player in our core therapeutic areas. For example, we have made significant investments in R&D, especially in areas of unmet medical need, and refined our focus on mechanisms of action and molecules that are expected to lead to transformative innovations in cancer care, neurology and immunology. Our aim is to turn cancer patients into cancer survivors by being at the forefront of changing the future of cancer care. Further development programs for immunology and neurology include cladribine tablets, with a first-of-its-kind dosing regimen that serves as an important therapeutic option for patients with relapsing-remitting multiple sclerosis, and atacicept as a potential therapy of choice for lupus patients with high disease activity.

The third pillar of our strategy is innovation. Our aspiration is to develop high-quality, first-to-market and best-in-disease assets, and to build a portfolio in each of our chosen therapeutic areas. We have streamlined our pipeline and upgraded our innovation capabilities with strong investigational drug candidates. In order to maximize the impact of our R&D investments and increase our chances of success in discovering and developing new medical therapies, we focus our expertise on specific therapeutic areas and are exploiting synergies in disease mechanisms and biological pathways.

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 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 industry, including Pfizer and Genea.

We are innovating beyond our pipeline projects with our Medical Devices and Services unit and our Fertility technologies. In addition to innovative therapeutic approaches, the way in which we engage with customers will be vital to achieving our objective of becoming a global specialty innovator.

We are in advanced stages of negotiations to divest the Biosimilars business and the transaction is expected to close in 2017.

Life Science strategy

As a leading business in the € 100 billion life science industry, the purpose of our Life Science business sector is to solve the toughest problems in life science by collaborating with the global scientific community. To best meet the needs of our customers and accelerate innovation, the business areas responsible for life science innovation and product development are strategically organized around our customers. Research Solutions focuses on academia and pharmaceutical research institutions. Process Solutions markets products for the entire pharmaceutical production value chain. Applied Solutions serves clinical and diagnostic testing laboratories as well as the food and environmental industries. With an expanded portfolio of more than 300,000 products, most of which are available on our industry leading e-commerce platform sigmaaldrich.com, Life Science offers solutions, services and expertise across the entire biopharma value chain.

Our strategy focuses on three areas: driving our core business; realizing the planned synergies from our Life Science business and Sigma-Aldrich integration by the end of 2018, and establishing new pillars of growth.

To grow our portfolios, we are refreshing our operating model and go-to-market strategy. Additionally, we will strengthen key capabilities across Life Science by optimizing supply chain performance to align service levels in Research Solutions and Applied Solutions. In Process Solutions, we are showing strong business continuity and upgrading quality performance in specific areas. Our innovation capabilities remain critical for future growth and we will leverage intellectual property as a strategy in key areas such as gene editing. Information technology is a core capability for Life Science as we work to improve our eCommerce, digital marketing and analytics competences. Here we are building on and further expanding our leadership position from legacy Sigma-Aldrich.

We have completed the first of three years of integration and have made tremendous progress with all relevant roles in the new organization in place and consolidation of integration teams into respective business functions. The value of the integration is evident, with a significant increase in sales and the realization of synergies faster than anticipated through multiple geographic synergy initiatives, the eCommerce platform and complementary customer accounts. We continue to focus on basic process harmonization throughout the organization for employees and customer satisfaction.

Based on a broad assessment of the market and competitive landscape and key industry trends, we have identified six strategic initiatives to drive future growth. These include gene editing and cell therapy as well as end-to-end solutions, where we aim to be the partner of choice to accelerate product and drug development. We are focused on completing our end-to-end offering of early and late stage process development and facility design services for accelerating local drug production. In addition, we are creating a new connected lab ecosystem to solve laboratory pain points such as data collection, documentation and replenishment.

Performance Materials strategy

In our Performance Materials business sector we want to sustainably secure our market and technology leadership in display materials. In addition, we want to leverage our expertise in liquid crystals beyond the application field of displays. At the same time, we benefit from the trends in the semiconductor industry and will also continue to dominate the effect pigments market in applications for coatings.

Global demand for innovative display solutions grew further in recent years. We assume that increasing demand for high-quality consumer goods will come from an expanding middle class in growth markets also in the coming years. Therefore, we aim to continue to strengthen our position as the market and technology leader for liquid crystals. Key to this are new, sophisticated liquid crystal technologies. Our eco-friendly, resource-conserving and efficient liquid crystal technology SA-VA (self-aligned vertical alignment) for large-area displays is the next technology, with which the first products are expected on the market in 2017.

The Integrated Circuit Materials business unit supports the entire semiconductor industry with a portfolio of customized solutions. There are limits to further increasing the capacity of conventional silicon chips. At the same time, the costs, which for modern chips today already amount to more than 50% of manufacturing costs, are no longer declining at the same pace as before. This offers us the opportunity to develop novel materials that allow our customers to produce more powerful chips on the one hand, and to counteract rising costs with innovative processes on the other hand. Photolithography, deposition materials and dielectrics can increase semiconductor efficiency. Packaging materials are becoming increasingly important for the development of 3D chip variants. This is precisely where we have strengthened our portfolio through the acquisition of Ormet Circuits.

In the Pigments & Functional Materials business unit, we are further expanding our leading position in effect pigments for automotive coatings. We are continuing to defend our good market position in pearlescent pigments for plastics, printing and cosmetics applications. Here we are concentrating on high-quality products and on optimizing the supply chain. In functional materials, the focus of our growth strategy continues to be on niche applications in cosmetics (such as UV filters, insect repellents and anti-aging substances) as well as technical functional materials (such as laser marking and antistatic applications). Collaborations with external partners are particularly attractive here.

Our Advanced Technologies business unit aims to develop profitable future businesses – both for Performance Materials and for our other business sectors. These also include the further development of OLED materials as well as organic photovoltaics. In 2016, we realigned our projects for future business fields to megatrends such as miniaturization and the Internet of Things.

Strategic initiatives

The two strategic initiatives OLED (organic light-emitting diodes) and LC 2021 are to significantly contribute to our future growth and continue to generate attractive margins. It is our declared goal to become the leading supplier of OLED materials. The commissioning of our new production plant for OLED materials in Darmstadt, which significantly increases our production capacity, has brought us an important step closer to this goal. The technology has the potential to change the future for displays and lighting. Intense colors, an especially deep black, thin structure, flexible use and low energy consumption are just some of the advantages offered by self-luminous OLED displays. OLED lighting applications score high with thin, filigree, lightweight lighting panels and a natural-appearing color spectrum. Under the umbrella of the LC 2021 strategic initiative, we are combining future applications of liquid crystals beyond classic displays. In six fields altogether, we are focusing on improved user experience on the one hand, and light and data management on the other hand. First and foremost, this comprises liquid crystal windows. In Veldhoven, the Netherlands, we are establishing our own production for modules used in sun protection and privacy control variants. It is scheduled to be commissioned at the end of 2017.

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 meet our obligations at all times and adhere to a conservative and proactive funding strategy that involves the use of various financial instruments.

We have diversified and profitable businesses as the basis for our strong and sustainable cash flow generation capacity. Moreover, we have several funding resources in place. A € 2 billion syndicated loan facility through to 2020 exists 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 can use a € 2 billion commercial paper program to issue short-term commercial paper with a maturity of up to one year.

Furthermore, we are using bilateral bank loan agreements with first-class banks in order to optimize the funding structure and cost. In this context, the bond market generally represents a key element. However, owing to our focus on deleveraging, no bonds were issued in 2016. In the past, our company has mainly focused on bond issues in Europe. In addition, we issued hybrid bonds amounting to € 1.5 billion in 2014 and U.S. dollar bonds amounting to US$ 4 billion in 2015 outside the Debt Issuance Program in order to broaden the funding basis and to address 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 and an A rating from Standard & Poor's (S&P), both with a stable outlook. In addition, the European rating agency Scope began covering our credit rating in 2016. The rating is A- with a stable outlook. Within the next two to three years, it is of utmost importance to us to sharply reduce our debt and to regain the ratings we had prior to the Sigma-Aldrich acquisition.

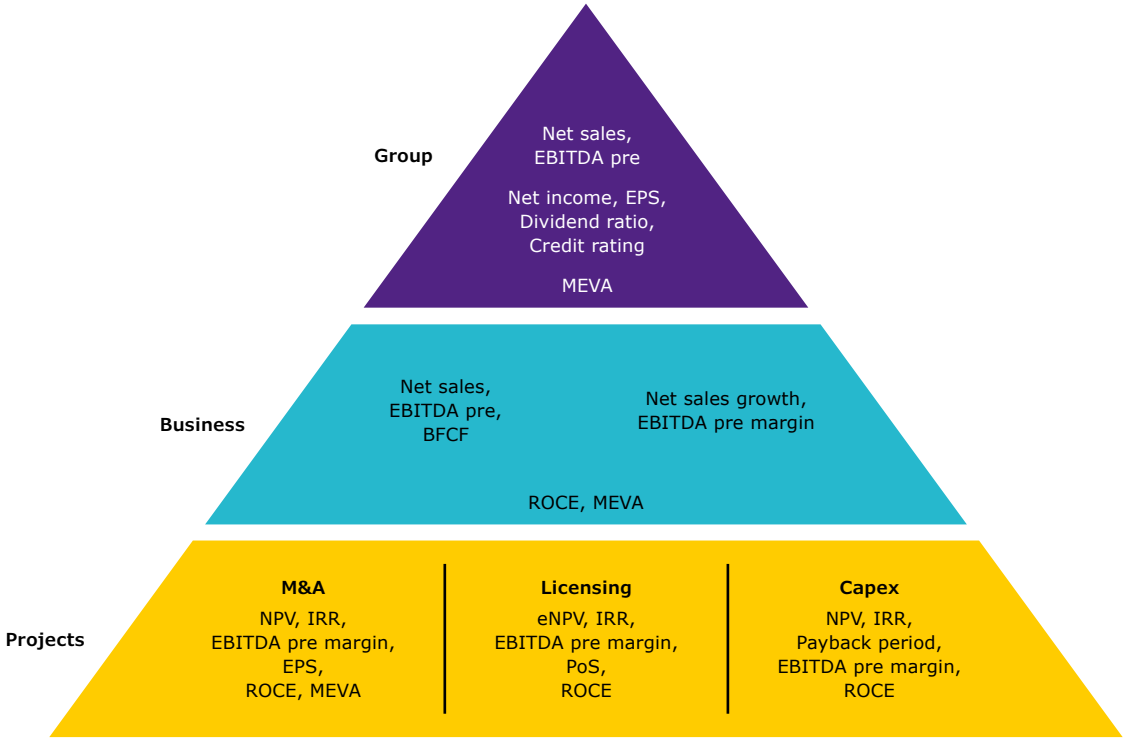
Dividend policy

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 EPS pre exceptionals.

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

[1] Financial indicator not defined by International Financial Reporting Standards (IFRS).

Key performance indicators of the Group and its businesses

The three key performance indicators net sales, EBITDA pre exceptionals[1], and business free cash flow[1] 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.

GROUP

Net sales

			Change	
€ million	**2016**	2015	€ million	in %
Net sales	**15,024**	**12,845**	**2,179**	**17.0%**

EBITDA pre exceptionals

EBITDA pre exceptionals 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 exceptionals. The exceptionals are restricted to the following categories: integration costs, IT costs for selected projects, restructuring costs, gains/losses on the divestment of business, acquisition costs, and other exceptionals. The classification of specific income and expenses as exceptionals 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 exceptionals[1]

			Change	
€ million	**2016**	2015	€ million	in %
Operating result (EBIT)[1]	**2,481**	**1,843**	**637**	**34.6%**
Depreciation and amortization	1,805	1,383	422	30.5%
Impairment losses/reversals of impairment losses	129	128	2	1.2%
EBITDA[1]	**4,415**	**3,354**	**1,061**	**31.6%**
Restructuring costs	22	48	–26	–54.0%
Integration costs/IT costs	193	78	116	>100.0%
Gains (–)/losses (+) on the divestment of businesses	–304	2	–305	>100.0%
Acquisition-related exceptionals	153	133	20	15.3%
Other exceptionals	11	16	–5	–32.7%
EBITDA pre exceptionals[1]	**4,490**	**3,630**	**861**	**23.7%**

[1] Financial indicator not defined by International Financial Reporting Standards (IFRS).

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 exceptionals 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]

			Change	
€ million	**2016**	2015	€ million	in %
EBITDA pre exceptionals[1]	**4,490**	**3,630**	**861**	**23.7%**
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–859	–609	–250	41.1%
Changes in inventories according to the consolidated balance sheet	3	–950	953	>100.0%
Changes in trade accounts receivable as well as receivables from royalties and licenses according to the consolidated balance sheet	–177	–514	337	–65.6%
Adjustment first-time consolidation of Sigma-Aldrich	–149	1,210	–1,359	>100.0%
Adjustment first-time consolidation of BioControl Systems	10	–	10	>100.0%
Business free cash flow[1]	**3,318**	**2,766**	**552**	**20.0%**

[1] Financial indicator not defined by International Financial Reporting Standards (IFRS).

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. 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 operating result (EBIT) pre exceptionals 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 into property, plant and equipment 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 exceptionals (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 exceptionals, in other words adjusted for the effects of integration costs, IT costs for selected projects, restructuring costs, gains/losses on the divestment of businesses, acquisition costs and other exceptionals. Moreover, amortization of acquired intangible assets as well as impairment losses on property, plant and equipment and intangible assets are adjusted. 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.

Credit rating

The rating of our credit worthiness 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 (S&P) 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 to our shareholders, we are pursuing a reliable dividend policy with a target payout ratio based on EPS pre exceptionals (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.

[1] Financial indicator not defined by International Financial Reporting Standards (IFRS).

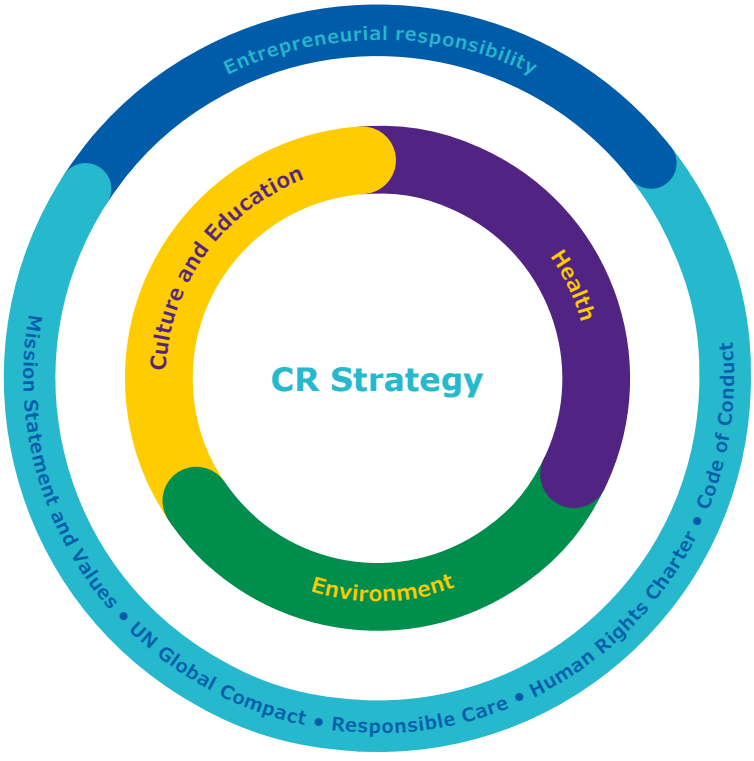
Corporate Responsibility

We take responsibility every day – and have been doing so for nearly 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. Belén Garijo, Executive Board Member and CEO Healthcare, became chairperson of the committee in June 2016.

Mankind is confronted with global societal challenges such as climate impact, resource scarcity and insufficient access to health in low- to middle-income countries. We believe that we can help resolve these global challenges through our innovative healthcare, life science and performance materials products, as well as through responsible governance. Responsible conduct means looking, listening and doing better. We respect the interests of our employees, customers, investors, and society, and work to minimize ethical, economic and social risks, thereby securing our success. This is an integral part of our corporate strategy, which in turn underpins our CR strategy, the basis for the responsible governance we live each and every day. In realizing our corporate responsibility, we focus our resources on those areas where we can have the greatest impact. We pursue three strategic spheres of activity: health, the environment as well as culture and education. The focus here is always on securing the future of society and our competitiveness.



Health: In low- to middle-income countries, many people lack access to high-quality health solutions. We are applying our expertise here and joining forces with strong partners to develop solutions for patients locally. Our fight against the worm disease schistosomiasis in Africa is a good example.

Environment: We are constantly working to improve the sustainability footprint of our products and are furthermore helping our customers achieve their own sustainability goals. One example is the development of new liquid crystal technologies through which our liquid crystals reduce the power consumption of smartphone and tablet displays.

Culture and education: Cultural offerings inspire people and expand their horizons. Research and development throughout the world thus benefit from creativity, ingenuity, and enthusiasm. Cultural inspiration also opens people up to new ideas. It favorably influences society's acceptance of science, technological progress and innovations. This is why we promote cultural initiatives and educational programs around the world.

We support relevant responsible governance initiatives. We are a member of the United Nations Global Compact and are committed to complying with the compact's principles regarding human rights, labor standards, environmental protection, and anti-corruption. Moreover, we also live our corporate responsibility through our commitment to follow the guidelines of the Responsible Care Global Charter, an initiative of the International Council of Chemical Associations (ICCA). Responsible Care aims to drive continuous improvement and achieve excellence in environmental, health and safety, and security performance in the chemical industry. We were among the first companies to sign the revised version of the Responsible Care Global Charter in 2014. Furthermore, 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). As part of this globally unique alliance, the partners want to make sustainability a core part of the chemical industry's guiding principles and to jointly drive the sector's position within the German economy as a key contributor to sustainable development.

To us, corporate responsibility means taking action and listening. The dialogue with our various stakeholder groups is therefore highly important to us. These stakeholders include employees, business associates, the Merck family, investors, regulatory agencies, and associations. We also engage in this continuous exchange to create transparency and clearly demonstrate how we live our company values.

Thanks to good performance with respect to responsible and sustainable entrepreneurial conduct, we were again included in the FTSE4Good index in 2016. To be included in this leading international sustainability index, a company must demonstrate socially conscientious, ecological and ethical conduct. In 2016, we also maintained our good standing in other major sustainability indices. For instance, we were again included in the STOXX Global ESG Leaders index, as well as the Euronext Vigeo Eurozone 120 index and the Ethibel Sustainability Index (ESI) Excellence Europe. In autumn 2016, among the German blue-chip companies included in the DAX, we achieved tenth place in the Good Company Ranking published by Kirchhoff Consult.

Strategic sphere of activity: Health

Access to Health (A2H) is one of our strategic priorities. Through our A2H approach, which spans all our businesses, we aim to help improve sustainable access to high-quality health solutions for underserved populations and communities in low- and middle-income countries. Since we realize that access is a complex and multifaceted challenge with no one-size-fits-all solution, our programs and initiatives are tailored to global, regional and local needs. We consider partnerships, collaboration and dialogue to be key instruments in delivering sustainable results.

During his presidency of the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA) from 2014 to the end of 2016, Stefan Oschmann, Chairman of the Executive Board and CEO, focused on the core topic of accelerating access to high-quality health solutions for people in low- to middle-income countries.

In November 2016, the Access to Medicine Foundation of the Netherlands recognized our efforts to improve access to health. In the 2016 Access to Medicine Index, our company ranked fourth, moving up two places relative to 2014 and 13 places relative to 2010. Every two years, this index assesses the world's leading pharmaceutical companies with respect to their activities and initiatives to promote access to medicine in developing countries. The Access to Medicine Foundation praised us for our access goals, which have now been aligned with the Sustainable Development Goals (SDGs) of the United Nations. Through this ranking, the foundation also recognized our Access to Health (A2H) strategy, which is embedded in our core business and focuses on four areas known as the "4As": Availability, Affordability, Awareness, and Accessibility. The Access to Medicine Foundation also praised our numerous access initiatives.

Availability

Availability entails the research, development and refinement of health solutions that address unmet needs and are tailored to local environments. Together with our partners, we are working to fight widespread diseases in developing countries. One example is the Pediatric Praziquantel Consortium. Through this public-private partnership, we are working on a pediatric formulation of praziquantel to treat the worm disease schistosomiasis in children under the age of six. In 2016, the consortium launched a Phase II study in Ivory Coast. The objective of the study is to find the optimum dose of the new formulation. In October 2016, the consortium was furthermore awarded a prestigious research grant from the Japanese Global Health Innovation Technology Fund for the third time. Another example is our partnership with the Medicines for Malaria Venture, which seeks to develop new antimalarials. In 2016, we also launched a research collaboration with the University of Cape Town in South Africa to pursue the same objective. In addition to these efforts, our Healthcare and Life Science business sectors are currently developing a kit for malaria diagnosis based on the MUSE cell analysis system. This kit will detect and type the malaria pathogen as well as identify relevant immune cells in the event of a concurrent HIV infection. When used in insect repellents, our product IR3535® helps protect against infections transmitted by mosquito bites, such as malaria, yellow fever and the Zika virus. Products containing this active ingredient stand out due to their particularly good tolerability in young children and pregnant women.

Affordability

We seek to address affordability challenges through our efforts to provide assistance to those people who are unable to pay for the health solutions they need. To tackle these challenges, we have taken a pro-access approach through our intellectual property initiatives and are engaging in equitable pricing strategies. We provide transparent information about our patents and patent applications on publicly available databases. Moreover, we are a member of WIPO Re:Search, an open innovation platform sponsored by the World Intellectual Property Organization (WIPO). Through intellectual property and knowledge sharing, platform partners seek to accelerate early discovery for infectious diseases. In early 2016, our partnership with the University of Buea in Cameroon, which aims to repurpose compounds from our library to develop a treatment for onchocerciasis (also known as river blindness), received a research grant from the renowned Wellcome Trust of the United Kingdom. Furthermore, we are working with the World Health Organization (WHO) to combat the worm disease schistosomiasis in Africa. Through the Praziquantel Donation program of our company, we are donating Cesol® 600 tablets containing the active ingredient praziquantel to WHO. Since the start of this program, more than 100 million patients – primarily school-aged children – have been treated. In total, we have donated more than 500 million praziquantel tablets to WHO since 2007. As a founding member of the Global Schistosomiasis Alliance, we are helping to eliminate schistosomiasis worldwide.

Awareness

We help to raise awareness by empowering health workers, communities and patients with the appropriate tools, knowledge and skills to make informed decisions. For instance, we have been supporting the Developing Countries Vaccine Manufacturers Network (DCVMN) since 2012 in order to improve the safety and quality of biotech production. Through our Access Dialogues series, we are promoting discourse on access-to-health challenges with numerous public and private stakeholders. In 2016, the series focused on the supply chain. In India, we are working with various non-governmental organizations as well as the Indian Health and Family Ministry to support the Su-Swastha project, which is working to provide underserved rural populations with affordable health solutions and raise awareness on health issues. In 2016, the project had reached 26,129 people through 1,238 community meetings. The Global Pharma Health Fund (GPHF), a non-profit organization funded by our company, works to combat counterfeit medicines in developing and emerging countries. To date, the GPHF has supplied more than 795 Minilabs at cost to detect counterfeit medicines in more than 90 countries. Furthermore, through our Capacity Advancement Program (CAP), we are working to raise awareness and further the prevention of non-communicable diseases such as diabetes and cancer, as well as to address the issue of infertility.

Accessibility

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 support training and knowledge sharing with our manufacturing partners in Africa, Asia and Latin America with the aim of strengthening local manufacturing quality standards. In India, we are cooperating with the non-profit organization known as Narmada Samagra. Our River Ambulance transports health workers and provides healthcare solutions to local populations living in the remote region along the Narmada River. In early 2016, we donated a new boat to River Narmada Samagra so that even more people can be reached in the future. Additionally, we are funding a health center that serves around 150 patients a month in Jharkhand, a state in northeastern India.

Strategic sphere of activity: Environment

Through our products, we are helping overcome global challenges such as climate impact and resource scarcity. At the same time, we are also helping our customers to reduce the negative impacts of their own activities and to achieve their own sustainability goals.

Performance Materials: Investments to boost sustainability

In 2016, our Performance Materials business sector made several large investments. In August 2016, we announced plans to invest € 15 million in the construction of a production plant for liquid crystal window modules in Veldhoven, the Netherlands. In doing so, we are pursuing the goal of leveraging our market and technology leadership in liquid crystals beyond their use in energy-saving displays. The manufacture of the switchable glass modules is to begin at the end of 2017. According to initial measurement results, our smart windows can cut the energy use of air-conditioned buildings by up to 40% and replace conventional shading solutions. We are thus helping builders to save resources and costs. These windows can be manually or automatically controlled to darken and provide sun protection – and to do so in a variety of colors. This technology is made possible thanks to the special properties of our liquid crystals, which in smart windows are combined with customized dyes. When a low electric voltage is applied, the liquid crystals allow electromagnetic waves (i.e. light) to be either absorbed and blocked (dark state), or to pass through (transparent state). Another variant can control the transparency of liquid crystal windows. If people want more privacy, they can switch to privacy mode, which turns the glass opaque. In contrast to competitive technologies, our long-lasting licrivision® materials switch in seconds and have high color neutrality. Architects and builders can customize the desired color to suit the setting.

Furthermore, we opened a new OLED materials production plant at our Darmstadt site in September 2016. With a total investment of around € 30 million, this is one of the largest single investments we have made at the Darmstadt site in recent years. Organic light-emitting diodes (OLEDs) are semiconducting organic materials that luminesce when electric voltage is applied. They are particularly well suited for use in state-of-the-art displays and lighting. OLED displays provide brilliant colors and sharp images from any viewing angle and are highly energy-efficient. They are also thin and flexible, which enables entirely new shapes and opens up a broad spectrum of totally new applications.

For the semiconductor industry, we have developed a series of environmentally sustainable specialty chemicals and materials – including PFOS-free antireflective and photoresist coatings that contain no trace of dangerous chemicals.

In cooperation with our customers from the cosmetics industry, we are developing cosmetic formulations that meet strict sustainability criteria and align with the continuing trend towards more natural cosmetics. Many of our products meet the criteria defined by Ecocert, an independent organization representing high international standards for natural cosmetic raw materials.

Life Science: Reducing our customers' environmental impacts

Within our Life Science business sector, the Design for Sustainability (DfS) program aims to reduce environmental impacts of devices and instruments, also through customers' own use. Beginning with the concept stage, product teams identify potential environmental impacts in various product life cycle stages and opportunities to make improvements. A scorecard is used to assess product design in six focus categories: Materials, Energy & Emissions, Waste, Water, Packaging, as well as Usability & Innovation. As of December 31,

2016, we had achieved improvements in at least three of our self-defined sustainability criteria for 32% of our new Biomonitoring product developments and/or further developments.

In biopharmaceutical production, numerous products such as plastic bags and tubing are used only once and then disposed of. This is due, among other things, to the low risk of contamination posed by single-use products. Together with customers and recycling firms, our Life Science business sector is developing sustainable recycling programs. Our objective is to avoid incinerating the waste streams by offering recycling options so as to reduce the environmental impacts.

In addition, our Life Science 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 production that is as environmentally compatible as possible, and to minimize adverse effects on human health. Within the framework of Green Chemistry, researchers seek alternative, environmentally sustainable reaction media with higher reaction rates and lower reaction temperatures in order to make production more energy-efficient. With Dozn®, we have developed a Web-based analysis tool for Green Chemistry. To date, we have used the matrix to evaluate more than 40 products and improve them afterwards.

In 2016, we launched Cyrene™ onto the market. The solvent is based on renewable cellulose and is used, among other things, as an alternative to dimethylformamide. With Cyrene™ we help our customers in the pharmaceutical and agrochemical industries to lower the environmental impact of their production processes and make them safer. Joint research work with the University of Strathclyde in Glasgow, United Kingdom, has proven the efficacy of Cyrene™.

Strategic sphere of activity: Culture and Education

Cultural promotion is a core element of our commitment to society, building on our centuries-old tradition of supporting art as well as culture and education. After all, culture nurtures characteristics that are essential to our business activities as a high-tech company: creativity, enthusiasm for new discoveries, curiosity, and the courage to transcend boundaries. Our cultural initiatives focus on music, literature and education.

The Deutsche Philharmonie of Merck KGaA, Darmstadt, Germany

The Deutsche Philharmonie of 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 are highly popular, with around 23,000 people attending them per year. They represent an integral part of the cultural life in the vicinity of our Group headquarters in Darmstadt. Special events for children and adolescents are intended to make classical music more accessible to young people, as do partnerships with schools like the orchestra workshop we have held once a year since 2010. In 2016, the Deutsche Philharmonie of Merck KGaA, Darmstadt, Germany, celebrated its 50th anniversary and, among other activities, performed a joint concert at the Frankfurt Jahrhunderthalle with Einshoch6, a Munich-based hip-hop band.

Promoting literature

Literature can stimulate the imagination; it can alleviate fears and give courage. Literature can also address scientific issues, thus furthering a deeper understanding of science and research. Through our involvement, we want to help society better accept science and scientific progress. Furthermore, as an international company, we further writers who drive cultural exchange in our globalized world.

We grant and promote five literary prizes worldwide. Since 1964, we have been sponsoring the renowned Johann Heinrich Merck Award for Literary Critique and Essay, which is presented by the German Academy for Language and Poetry at its annual autumn conference. Worth € 20,000, this award went to writer and blogger Kathrin Passig in 2016. For 14 years, we have been sponsoring the Premio Letterario of Merck KGaA, Darmstadt, Germany, in Italy. This award is worth € 10,000 and recognizes authors who build bridges between literature and science, thereby making them accessible to a wide audience. In 2016, the winners were Italian immunologist Alberto Mantovani and British writer, historian and naturalist Helen Macdonald. In India, we partners with the Goethe-Institut Calcutta to present the Merck Tagore Award of Merck KGaA, Darmstadt, Germany. Worth 500,000 Indian rupees (around € 6,800), this literary prize is granted every two years to authors who have made a distinctive contribution to the cultural exchange between Germany and India. In 2016, psychoanalyst and writer Sudhir Kakar received the award. In Japan, we partner with the Goethe-Institut Tokyo to present the Merck Kakehashi Literature Prize of Merck KGaA, Darmstadt, Germany. Worth a total of € 20,000, this award is granted every two years to contemporary works by German authors that are made accessible to a wider readership in Japan. In 2016, the prize went to writer Ilma Rakusa and her translator Fuminari Niimoto. In September 2016, our company in Russia presented the first Merck Translation Award of Merck KGaA, Darmstadt, Germany, to Vladislava Agafonova (fiction), Kirill Levinson (non-fiction) and Alexandra Gorbova (children's literature). Each winner received € 4,000 in prize money.

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 nurture creativity. We therefore support educational projects at many of our sites by granting scholarships, for instance, or by sponsoring specific classes. To promote young scientists, our company has hosted the renowned annual "Jugend forscht" science competition for the German federal state of Hesse every year since 1996. In partnership with the Technical University of Darmstadt, we inaugurated the Junior Biology Lab in autumn 2016.

The SPARK initiative was launched in early 2016. This volunteer program motivates employees from our Life Science business sector to share their knowledge with school students. In February and March 2016, 3,465 employees in 36 countries for the first time gave students exciting insights into the world of science, for example.

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.

Through our compliance policies for our Biopharma and Consumer Health businesses, we set standards for responsible marketing activities relating to our medicines. These aim to ensure that patients and healthcare professionals have access to the relevant information, and that patients receive effective treatment.

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 our Group-wide Product Safety Chemicals 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 regulations 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.

We are working to register all our chemical substances in accordance with REACH. We successfully completed registration phase I in 2010 and registration phase II in 2013. The next step, in phase III, is for us to evaluate and register all substances produced or imported in quantities ranging from one to 100 metric tons annually by the beginning of June 2018. This process now also includes substances from Sigma-Aldrich and is fully on schedule.

Safety of our healthcare products

Patient and consumer safety has top priority in everything we do. During the entire life cycle of our medicines and consumer health products, we provide patients, consumers 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 (MSEB). Our Global Drug Safety unit continuously monitors and evaluates the safety and risk-benefit ratio of our medicines worldwide (pharmacovigilance). For our Consumer Health products, this function is performed by the Global Product Safety unit. Overall responsibility for the safety of our over-the-counter products is borne by the Chief Medical Officer for the Consumer Health business, supported by the Safety & Labelling Committee (SLC).

For products in our Allergopharma business, we have developed comprehensive clinical efficacy and safety profiles that we continuously update. For the safety of our 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 with high-quality brand-name 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 source raw materials, packaging materials, technical products, components, and services from suppliers across more than 130 countries. Our basic expectations for suppliers and service providers include their compliance with fundamental environmental and social standards, which 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 and are integrated into our general terms and conditions. They therefore constitute the foundation of every sourcing transaction and procedure. Due to the growing significance of emerging markets as sourcing markets for our company, we have reinforced our efforts to ensure adherence to our supply chain standards. At the end of 2014, we joined the Together for Sustainability (TfS) chemical industry initiative. Since then, we have been utilizing the supplier assessment and audit results shared among all member companies, who in turn abide by all restrictions stipulated within competition law. Through TfS, we currently have access to assessments for more than 670 of our most important suppliers. Since 2015, we have initiated around 400 TfS assessments. In addition, we have initiated 26 TfS audits since 2014.

Responsibility for our employees

Employees are crucial to the success of a company. They therefore play a central role in our business endeavors. In accordance with our company values, we live a culture of mutual esteem and respect. We seek to further our entrepreneurial success by recruiting, developing and motivating the most suitable employees, which is why we focus our employee strategy on talent development, compensation, and performance management. We furthermore strive to foster diversity among our employees (more information can be found under “People”).

Responsibility for the environment

In the manufacture of our products, we seek to impact the environment as little as possible. 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 EHS Policy, we have defined our principles and strategies for environment, health and safety. This policy is implemented through internal guidelines and instruction manuals on compliant behavior in day-to-day operations, such as the Group EHS Security and Quality Manual. At all our sites, local EHS managers are in charge of operational environmental protection measures. These employees continually receive training and obtain additional qualifications. Since our businesses are constantly changing, our environmental management system must also remain flexible and adaptable. For this reason, internal and external audits are conducted on a regular basis to determine whether the ISO 14001 requirements are still being met. In 2016, we obtained an ISO 14001 group certificate for our environmental management system for the eighth consecutive year. This certificate covers 57 sites. Seven sites belonging to the recently acquired company Sigma-Aldrich are already certified to ISO 14001. Our spending on environmental protection, health and safety efforts totaled € 189 million in 2016, which also includes investments made during the year.

Focus areas: Energy efficiency, greenhouse gas emissions, water

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. To achieve this goal, we have launched EDISON, a climate protection program that consolidates all our climate impact mitigation and energy efficiency activities. In 2017, we will continue investing in efforts to conserve energy and reduce greenhouse gas emissions. Through the approximately 270 EDISON projects initiated since 2012, we aim to annually save around 94 metric kilotons of CO_2 in the medium term. In 2016, we lowered our greenhouse gas emissions by around 10% relative to the 2006 baseline, despite growth in our operating business. Our Life Science business sector is playing a major role in our efforts. In 2014, process optimizations resulted in a two-thirds reduction in our process-related emissions at our facility in Jaffrey, New Hampshire (USA). In 2015, we initiated a project to further cut emissions that is scheduled to end in 2017. Other projects are being planned. In 2016, we also successfully completed measures to reduce greenhouse gas emissions and energy consumption at our site in Onahama, Japan. Because of its pigment production operations, this facility is one of the highest energy consumers of all our sites worldwide. For this reason, we switched the process steam generation for production to natural gas combustion, and the pigment kilns are now fired with natural gas. These changes are saving us roughly 3,200 metric tons of CO_2 emissions per year.

ENERGY CONSUMPTION[1]

(in GWh)	2012	2013	2014	2015	**2016**
Total energy consumption	2,058	2,108	2,158	2,256	2,253
Direct energy consumption	1,187	1,286	1,354	1,451	1,443
Natural gas	1,070	1,157	1,212	1,212	1,272
Liquid fossil fuels	104	114	115	104	30
Biomass and self-generated renewable energy	13	15	27	135	141
Indirect energy consumption	871	822	804	805	810
Electricity	744	743	707	709	715
Steam, heat, cold	127	79	97	96	95

[1]Portfolio-adjusted in accordance with the Greenhouse Gas Protocol.

CO_2EQ EMISSIONS (EQ = EQUIVALENTS)[1]

Emissions in kt, Scope 1 and 2	2012	2013	2014	2015	**2016**
Total CO_2eq emissions	761	784	736	729	715
Direct CO_2eq emissions	379	417	390	393	386
Indirect CO_2eq emissions	382	367	346	336	329

[1]Portfolio-adjusted in accordance with the Greenhouse Gas Protocol.

Energy management plays a key role in our efforts for sustainable energy efficiency and climate impact mitigation. Our production sites in Darmstadt and Gernsheim account for around 29% of our global energy consumption. In 2012, both of these facilities qualified for ISO 50001 – Energy Management System certificates, which were reaffirmed in 2016. Currently, 13 of our production sites have a certified energy management system. The results of the Carbon Disclosure Project likewise indicate that we are on the right path. In 2016, this independent non-profit organization ranked us among the top five companies in our industry in German-speaking countries. For the first time, we achieved the status of sector leader and, at fourth place, moved up two places relative to 2015. The Carbon Disclosure Project assesses companies in terms of their emissions reduction progress and climate impact reporting.

In addition to energy, we also focused on the topic of water in 2016. We systematically examined our sites to determine which ones have a high annual water consumption and are located in regions where water is scarce and thus an especially precious resource. At the beginning of 2016, we set 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).

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 society through our knowledge, our skills and our products.

Our social responsibility activities are primarily focused on those areas in which we have specific expertise stemming from our core businesses. We are thus engaged in health and environmental projects and furthermore support education, especially in the natural sciences. We provide disaster relief in emergency situations, particularly in those regions 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 local projects are made by our subsidiaries. In 2016, we spent a total of € 43 million on community engagement activities. Our patient support programs, for instance the Erbitux® China Patients Assistance Program amounting to around € 153 million, are not taken into consideration here.

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.

To address long-term health and technology trends in both established and growth markets, approximately 6,200 employees work for our researching innovations.

In 2016, our company spent around € 2.0 billion on research and development, thus exceeding the previous year's level (2015: € 1.7 billion). This was due mainly to the intensified R&D activities of our Healthcare business sector. We focus on both in-house research and external collaborations, which enable us to increase the productivity of our research while simultaneously reducing financial outlay. The organizational set-up of our research and development activities reflects the structure of our company with three business sectors.

Healthcare

Biopharma

Oncology

With regard to Erbitux®, we announced in April that the pivotal Chinese Phase III (TAILOR study) met its primary endpoint of significantly increasing progression-free survival (PFS) in patients with RAS wild-type metastatic colorectal cancer (mCRC) treated with Erbitux® (cetuximab) plus FOLFOX chemotherapy, compared with FOLFOX alone. Detailed data were presented from this first prospective study to evaluate an anti-EGFR antibody in first-line therapy of patients with RAS wild-type mCRC at the European Society for Medical Oncology (ESMO) World Congress on Gastrointestinal Cancer in July in Barcelona. The study included 393 patients and showed that Erbitux® (cetuximab) plus FOLFOX statistically significantly improved outcomes compared to FOLFOX alone, including best overall response rate (61.1% vs. 39.5%), lowered the risk of disease progression by 31%, and decreased the risk of death by 24%. Progression-free survival was significantly improved by the combination of Erbitux® plus FOLFOX vs. FOLFOX alone (9.2 vs. 7.4 months), as was overall survival (20.7 vs. 17.8 months). These results reaffirm that Erbitux® plus FOLFOX is an effective treatment regimen for patients with RAS wild-type mCRC. As the first prospective trial evaluating Erbitux® in RAS wild-type patients, the TAILOR results show the importance of RAS biomarker testing in order to determine the appropriate targeted therapy for individual patients, based on their tumor's genetic make-up. The safety profile of Erbitux® in this trial was manageable and similar to that observed in other pivotal trials, with no unexpected safety findings. Based on these results, we are evaluating the most appropriate way to make Erbitux® available in China as a first-line treatment for patients with RAS wild-type mCRC as soon as possible.

In April we announced that a new liquid biopsy RAS biomarker test, which we are co-developing and commercializing with Sysmex Inostics, has been granted CE Mark approval. This test will now be made widely accessible for patients with metastatic colorectal cancer in Europe, Asia, Latin America and Australia. The testing technology, OncoBEAM® RAS CRC assay can be used to determine which patients would benefit from anti-epidermal growth factor receptor (anti-EGFR) therapies, such as Erbitux® (cetuximab). The liquid biopsy RAS biomarker test is a comprehensive 34-mutation panel that is based on the BEAMing (Beads, Emulsion, Amplification and Magnetics) technology. The test only requires a small blood sample (10 ml), rather than a tissue biopsy, to determine the mutation status of tumors. The test has the potential to provide mutation status results within days, which can help guide quicker treatment decisions. We and Sysmex Inostics originally entered into an agreement to co-develop and commercialize the liquid biopsy test in 2014.

In January we announced that we have signed a collaboration agreement with Biocartis for the development and commercialization of a new liquid biopsy RAS biomarker test for patients with mCRC. The test will be developed on Biocartis' innovative, fully automated molecular diagnostics system, Idylla™, which is designed to offer accurate and reliable molecular information from virtually any biological sample. The Idylla™ system is a fully automated sample-to-result PCR-based (polymerase chain reaction) molecular diagnostics system. Whereas most of today's solutions only look for the most prevalent RAS mutations, the Idylla™ RAS test will be designed to detect an extended panel of RAS mutations. The new test will also provide a BRAF V600 mutation analysis directly integrated with the Idylla™ RAS test, to allow clinicians to evaluate BRAF and RAS mutation status simultaneously. Based on a 2 ml sample of blood plasma, the test aims to provide high sensitivity and ease-of-use, requiring less than 2 minutes of hands-on time and a turnaround time of approximately 2 hours, enabling clinical

decision-making in a timely manner. Our company and Biocartis plan to implement the Idylla™ liquid biopsy RAS test in numerous medical centers across the world, excluding the United States, China and Japan. The test was subsequently submitted for a CE Mark.

In March we announced that we had entered into a collaboration focused on cancer metabolism with the European Molecular Biology Laboratory (EMBL), located in Heidelberg, Germany. The aim of the collaboration is to investigate mechanisms by which cancer cells generate energy and growth-enabling building blocks, which could ultimately deliver novel therapeutic targets, as well as biomarkers. The collaboration will make use of EMBL's capabilities in the area of metabolomics. During the three-year collaboration, EMBL will apply its unique expertise, combining modelling and bioinformatics with experimental approaches to investigate these metabolic pathways and shed light on their control mechanisms. EMBL will also utilize the cutting-edge equipment of its Genomics and Metabolomics Core Facilities to resolve the transcriptional and metabolic profiles of the samples for the study.

New research on Erbitux® and our pipeline compounds was presented at the Annual Meeting of the European Society for Medical Oncology (ESMO) in Copenhagen, Denmark, in October. Presentations focused on hard-to-treat cancers, and included study results for Erbitux® in mCRC and in squamous cell carcinoma of the head and neck (SCCHN), reaffirming Erbitux® as a standard-of-care therapy for mCRC patients with RAS wild-type tumors and patients with SCCHN. Preliminary study results were presented for our investigational product avelumab in bladder cancer, supporting its further development in this indication, as well as preliminary results from a combination study of avelumab with axitinib in renal cell carcinoma (RCC) that support the rationale to evaluate this combination in a Phase III pivotal study in RCC. Results on the investigational compound tepotinib, a highly selective c-Met kinase inhibitor, were presented on three posters, and included updates on the ongoing study program in c-Met-positive metastatic non-small cell lung cancer.

In September we commenced the clinical development of our investigational BTK inhibitor (M7583) in Oncology, with the start of our first Phase I clinical study of this compound. This first-in-human study in hematological malignancies represents a milestone of this program.

In June we announced jointly with Array BioPharma Inc. and Pierre Fabre the initiation of a randomized, global Phase III clinical trial of BRAF-mutant mCRC, investigating a new combination of Erbitux® plus encorafenib, with or without binimetinib. The trial, known as BEACON CRC (Binimetinib, Encorafenib And Cetuximab Combined to treat BRAF-mutant Colorectal Cancer) will assess the efficacy and safety of these two novel combinations in patients with BRAF-mutant tumors, compared with investigator's choice of Erbitux® plus irinotecan or Erbitux® plus FOLFIRI. Approximately 650 patients are expected to be enrolled by 2018 and, after a lead-in period to assess the safety and tolerability of Erbitux® plus encorafenib (a BRAF inhibitor) and binimetinib (a MEK inhibitor), will be randomized to receive one of the two novel combinations, or the investigator's choice. The primary endpoint of the trial is overall survival. Key secondary endpoints include progression-free survival, objective response rate, duration of response, safety and tolerability. The trial will also assess health-related quality of life.

Our Grant for Oncology Innovation (GOI) initiative, which awards funds for pioneering independent research in oncology, was awarded on the occasion of the ESMO meeting on October 9. There were 405 applications from 49 countries for the 2016 award. Three research teams from Italy, New Zealand and Spain were selected to share the € 1 million grant to fund their research in the areas of breast cancer, colorectal cancer and lung cancer.

Immuno-Oncology

The investigational product avelumab is our most advanced clinical development program in immuno-oncology with eight Phase III studies sponsored by our Alliance with Pfizer now underway in a variety of solid tumors.

On October 31, our company and Pfizer Inc. announced that the European Medicines Agency (EMA) had validated for review our Marketing Authorization Application (MAA) for avelumab, for the proposed indication of metastatic Merkel cell carcinoma (MCC). A rare and aggressive skin cancer, MCC impacts approximately 2,500 Europeans a year. Validation of the MAA confirms that submission is complete and begins the EMA's centralized review process. If approved, avelumab, an investigational fully human anti-PD-L1 IgG1 monoclonal antibody, could be the first approved treatment indicated for metastatic MCC in the EU. Patients with metastatic MCC face a very poor prognosis, with less than 20% surviving beyond five years. Avelumab received an Orphan Drug Designation (ODD) from the European Commission for MCC. The avelumab metastatic MCC MAA submission is supported by data from JAVELIN Merkel 200, a multicenter, single-arm, open-label, Phase II study of 88 patients with metastatic MCC whose disease had progressed after at least one chemotherapy treatment. The JAVELIN Merkel 200 study represents the largest data set of any anti-PD-L1/PD-1 antibody reported in this patient population. These data were recently published in the medical journal Lancet Oncology.

In November our company and Pfizer Inc. announced that the U.S. Food and Drug Administration (FDA) had accepted for Priority Review the Biologics License Application (BLA) for avelumab in metastatic MCC. The application was submitted by EMD Serono, the biopharmaceutical business of our company in the United States and Canada. This review relates to avelumab's proposed use in patients with metastatic MCC, based on tumor response results from the JAVELIN Merkel 200 trial. The FDA's Priority Review status reduces the review time from ten months to a goal of six months from the day of filing and is given to drugs that may offer major advances in treatment or may provide a treatment where no adequate therapy exists. The FDA previously granted avelumab Orphan Drug Designation for MCC, as well as Fast Track and Breakthrough Therapy Designations for the treatment of patients with metastatic MCC whose disease has progressed after at least one previous chemotherapy regimen. Breakthrough

Therapy Designation is intended to expedite the development and review of treatments for serious or life-threatening disease where preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies for one or more endpoints.

The presence of our alliance with Pfizer at the 2016 American Society of Clinical Oncology (ASCO) annual meeting demonstrated how the collaboration between the two companies is making significant progress to rapidly accelerate the expansive, international development program (known as JAVELIN) for its investigational product avelumab. The program comprises 30 ongoing clinical programs assessing avelumab as monotherapy or combination therapy including nine pivotal studies, and approximately 4,000 patients across more than 15 tumor types. The data presented at ASCO 2016 contribute to the growing understanding of the potential role of avelumab in treating a broad range of cancers. In total 14 avelumab abstracts were presented (two oral presentations and 12 posters/poster discussions) across seven different cancer types.

One of the oral presentations concerned the results of JAVELIN Merkel 200 in metastatic MCC. The study showed a 31.8% objective response rate. There were 8 complete responses and 20 partial responses. Tumor responses were rapid, with 78.6% of patients (22 of 28) responding within 7 weeks of starting treatment, and durable, with 82.1% of patients (23 of 28) still responding at the time of analysis. Tumor responses were seen in patients regardless of the status of certain biomarkers (PD-L1 and Merkel cell polyomavirus). No unexpected safety signals were reported. Treatment-related adverse events (AEs) occurred in 62 patients (70.5%); the most common were fatigue (23.9%) and infusion-related reactions (17.0%), all of which were Grade 1 or 2 in severity. Grade 3 treatment-related AEs were reported in four patients (4.5%).

Other highlights of the avelumab clinical program reported at ASCO included the presentation of data in adrenocortical carcinoma, gastric/gastro-esophageal junction cancer, mesothelioma, non-small-cell lung cancer, ovarian cancer and urothelial (bladder) cancer. Additionally, safety data were presented from 1,300 patients enrolled in the Phase Ib JAVELIN Solid Tumor trial, the largest Phase I trial investigating an anti-PD-L1 therapy.

In April our company and Pfizer announced the initiation of a Phase III study of avelumab in an advanced renal cell carcinoma setting. The study, JAVELIN Renal 101, is a multicenter, international, randomized, open-label Phase III trial designed to evaluate the potential superiority, assessed by the progression-free survival, of first-line avelumab combined with INLYTA® (axitinib) compared with SUTENT (sunitinib malate) monotherapy in patients with unresectable, locally advanced or metastatic RCC with clear cell component. It is the first pivotal trial investigating avelumab in combination with INLYTA® (axitinib), a tyrosine kinase inhibitor (TKI), in patients with previously untreated advanced RCC. Moreover, it is the only Phase III trial currently evaluating an anti-PD-L1 immunotherapy in combination with a vascular endothelial growth factor (VEGF)-receptor TKI in this setting.

In July we initiated a new Phase III study evaluating avelumab as a first-line treatment for ovarian cancer. This study, known as JAVELIN Ovarian 100, is an open-label, international, multi-center, randomized trial in treatment-naïve patients with locally advanced or metastatic ovarian cancer (Stage III or Stage IV). It is the first Phase III study evaluating the addition of an immune checkpoint inhibitor to standard-of-care in first-line treatment for this aggressive disease and aims to enroll approximately 950 patients, who will receive concurrent avelumab and chemotherapy, avelumab following chemotherapy, or chemotherapy alone.

In January our company and Pfizer entered into an exclusive collaboration agreement with Syndax Pharmaceuticals, Inc. to evaluate avelumab in combination with Syndax's entinostat, an investigational oral small molecule that targets immune regulatory cells (myeloid-derived suppressor cells and regulatory T-cells), in patients with heavily pre-treated, recurrent ovarian cancer. Syndax will be responsible for conducting the Phase Ib/II clinical trial.

In March, our company, Pfizer and Verastem announced that they had entered into an agreement to evaluate avelumab in combination with Verastem's VS-6063, an investigational focal adhesion kinase (FAK) inhibitor, in a Phase I/Ib trial in patients with advanced ovarian cancer.

In early 2017, we announced that we had entered into an agreement with the University of Texas MD Anderson Cancer Center for a three-year strategic collaboration aiming to more quickly advance the development of investigational therapies in four cancers – breast, colorectal, glioblastoma, and leukemia – through the study of biomarkers of response and resistance. We are therefore the first company to gain access to MD Anderson's Adaptive Patient-Orientated Longitudinal Learning and Optimization Platform (APOLLO) that standardizes the long-term collection of patients' medical history and data derived from tissue samples in order to better understand the biology of cancer and accelerate research-driven patient care.

Also in early January 2017, we reached a licensing agreement with Vertex Pharmaceuticals Inc., Boston, Massachusetts (USA),, for the worldwide development and commercialization of four promising research and development programs that represent novel approaches to the treatment of cancer. As part of the agreement, we have licensed-in two clinical-stage programs targeting DNA damage and repair, along with two additional novel pre-clinical programs for which we will assume full responsibility for development and commercialization.

Neurology

The EMA accepted for review our MAA for the investigational product cladribine tablets for the treatment of relapsing-remitting multiple sclerosis (MS). This MAA submission includes data from three Phase III studies, CLARITY, CLARITY EXTENSION and ORACLE MS, and the Phase II ONWARD study. In these trials, cladribine tablets showed a significant reduction in relapse rates, risk of disability progression and development of new MS lesions, as detected by MRI, versus placebo in patients with relapsing-remitting MS. Together with interim long-term follow-up data from the prospective registry, PREMIERE, the new MAA includes follow-up data consisting of over 10,000 patient years of observation, with follow-up in some patients exceeding eight years.

At the European Academy of Neurology (EAN) meeting in Copenhagen in May 2016, new data and analyses were presented from clinical studies with cladribine tablets. Outcomes in patients from across the spectrum of relapsing MS were presented from the CLARITY, ORACLE-MS and ONWARD studies. The results of a re-analysis of the ORACLE-MS data in clinically isolated syndrome (CIS) were chosen by the organizers to be shown at the highlights session that showcases the most interesting data presented during the congress. This analysis showed efficacy of cladribine tablets in patients who would now be classified as having early multiple sclerosis according to the latest disease definitions, as well as an adverse event profile in line with previous experience. Further data investigating brain atrophy associated with cladribine tablet therapy vs placebo was presented from the CLARITY study. Final results on safety and tolerability were reported from the ONWARD study.

In September we presented clinical data for investigational cladribine tablets in two oral presentations at the 32nd Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) in London. The findings, from the CLARITY and CLARITY EXTENSION trials and from the open-label maintenance period of the ORACLE-MS study, demonstrated durable efficacy of cladribine tablets in patients with MS along with an acceptable safety profile. Results from these studies confirmed that 20 days of oral dosing over two years was effective in reducing the frequency of relapses and slowing disability progression for up to four years. The second oral presentation reported data from the open-label maintenance period of the Phase III ORACLE-MS study. ORACLE-MS showed that for patients with a first demyelinating event, treatment with investigational cladribine tablets significantly reduced the risk of progression to clinically definite MS compared with placebo. For the open-label portion of the study, patients who converted to clinically definite MS during the initial treatment period were switched to Rebif® therapy. The new data presented at ECTRIMS show that patients who had received investigational cladribine tablets in the initial treatment phase had lower annualized relapse rates over the maintenance period compared to those who had received placebo in the initial treatment phase.

On the occasion of the ECTRIMS meeting, we announced the recipients of the fourth annual Grant for Multiple Sclerosis Innovation (GMSI). In 2016, 260 proposals from 45 countries were submitted, representing innovative research projects taking place across the globe. Four international research teams from Canada, Germany, Israel, Qatar, Spain, and the United Kingdom were selected to share the € 1 million grant to support their research. The GMSI was launched in October 2012 with the aim of improving the understanding of MS for the ultimate benefit of patients living with the disease.

Concerning Rebif®, results of two non-interventional studies (REBIFLECT and REBISTART) were presented showing the positive effect of the RebiSmart™ injection device as well as nurse support for patient adherence to treatment, a key concern in patients requiring treatment for a chronic disease. In addition, a retrospective claims analysis was presented to investigate the reasons for treatment discontinuation over time.

As part of our portfolio prioritization efforts, and to allow us to focus on other ongoing projects in Neurology and Immunology, we returned the rights to the Phase II MS project ATX-MS-1467 to Apitope.

Immunology

In August the first patient in a Phase IIa clinical trial was dosed with our internally developed investigational product, the BTK inhibitor M2951. The study will evaluate the efficacy and safety of M2951 in subjects with rheumatoid arthritis on stable methotrexate therapy. A Phase II study with the same compound was initiated in December in systemic lupus erythematosus (SLE).

In November we announced the results of the ADDRESS II, Phase IIb, multicenter study on atacicept in patients with SLE, which were presented at the 2016 American College of Rheumatology / Association of Rheumatology Health Professionals Annual Meeting in Washington, DC (USA). Patients on standard-of-care therapy (n = 306) were randomized to weekly subcutaneous injections of atacicept (75 or 150 mg) or placebo for 24 weeks. The primary endpoint was the proportion of patients achieving a clinical response as defined by a composite SLE Responder Index (SRI)-4 at week 24. Secondary endpoints included SRI-6 response rate and time to severe flare, assessed by the SLEDAI flare index (SFI) or BILAG. Although the primary endpoint was not met in the overall study population, there was a trend favoring atacicept with statistical significance achieved in a pre-specified sensitivity analysis of the primary endpoint using treatment Day 1 as baseline (rather than screening visit); atacicept 75 mg (55.9%, adjusted odds ratio/ OR 1.88, $p = 0.029$) and 150 mg (55.8%, adjusted OR 1.96, $p = 0.020$) compared with placebo (41.0%). BILAG A flares were significantly reduced compared to placebo with atacicept 75 mg ($p = 0.019$), and severe SFI flare reduced with 150 mg ($p = 0.002$). Additionally, analyses of a predefined subpopulation of patients with high disease activity demonstrated statistically significant treatment effects of atacicept when compared to placebo. SRI-6 response at week 24 was significantly greater with atacicept 150 mg compared with placebo. Both atacicept doses led to significant reductions in the incidence of severe flare versus placebo, BILAG A flare and SFI flare. Atacicept was also associated with increased serum complement C3 and C4, and decreased IgG, IgM, IgA, and anti-dsDNA antibodies over time. Treatment-emergent adverse event incidence was slightly higher with atacicept (150 mg, 80.8%; 75 mg, 81.4%) than placebo (71.0%), however, the risks of serious adverse events or serious / severe infections were not increased with atacicept versus placebo, and there were no deaths. The safety findings were comparable for the high disease activity subpopulation.

Fertility

In July we announced our continued support for the advancement of medical science in the field of fertility through the Grant for Fertility Innovation (GFI) program by awarding grants totaling € 1.5 million in 2016/17. The announcement was made on the occasion of the 32nd annual meeting of European Society of Human Reproduction and Embryology (ESHRE) in Helsinki, Finland. Launched in 2009, the GFI is dedicated to transforming innovative translational fertility research projects into concrete health solutions to improve the outcomes of assisted reproductive technologies. In 2016, six winning projects from China, Hong Kong, Ireland, the United States, and Italy (two teams) were selected from 112 global proposals with the overall goal of improving the chances of conceiving.

In October we launched two innovative fertility technologies, Gavi™ oocyte protocol and Geri™ medium. Both products help to improve key steps of assisted reproductive treatment (ART) – an area where laboratory technologies play a vital role for treatment success.

The launches represent the seventh and eighth product launch in 18 months our Fertility Technologies unit, demonstrating the company's healthcare strategy to deliver innovation through best-in-class assets. Gavi™ enables clinics to preserve human egg cells, also called oocytes, and embryos at the main stages of ART, while Geri™ medium supports undisturbed cultivation of embryos. Preserving oocytes or embryos for future in vitro fertilization and embryo transfers by cooling them to deep sub-zero degrees is a key step in the laboratory. Gavi™ is the world's first automated instrument for this preservation technique, also called vitrification. With its latest product innovation, Gavi™ provides clinicians with added flexibility when taking important treatment decisions with and for their patients. Geri™ medium was developed to help improve another critical factor for successful treatment, embryo cultivation. After fertilization, the embryo needs to grow and develop before it is transferred into a woman's womb. With the single-step culture medium, our company now provides a way to support undisturbed incubation and optimal embryo development. Both products are being commercialized as part of the partnership between us and Australian company Genea Biomedx.

We announced in mid-November that we had launched two new innovative fertility technologies, Gidget™ and Geri™+, to extend our innovative portfolio to support all steps performed by fertility laboratories during ART, where technologies play a vital role for treatment success. Gidget™ is designed as an easy-to-use witnessing and tracking system to reduce the potential for error and improve lab workflows, and Geri™+ is the basis to combine the Geri™ embryo incubator and the innovative Eeva® algorithm. Both new products underline our healthcare strategy to provide innovation to patients/customers through best-in-class products. Gidget™ and Geri™+ stem from the ARTinnovations development hub, which we formed in collaboration with Genea Biomedx, Australia. ARTinnovations is an incubator for ideas and innovations for fertility treatment and technologies. It combines the commitment and know-how of both partners to develop ideas that can take root and grow into better outcomes for patients.

Integrating bright- and dark-field imaging, the Geri™+ incubator allows for combination with the Eeva® software and any Geri Assess version. Geri+ becomes a multifunctional incubator, which gives embryologists a multitude of possibilities around embryo analytics. It brings together the benefits of undisturbed incubation, while complying with the high control and safety standards of the Geri™ incubator and the analytics of the Eeva® software, the first automated algorithm clinically shown to improve embryo assessment.

Gidget™ is a hand-held device for the IVF laboratory that lets the embryologist focus on the science by eliminating any chance of mismatching, and includes unique tracking and workflow features. It provides electronic witnessing, lab workflow management and support for traceability and audit reporting.

General Medicine & Endocrinology

In mid-October we announced that the Committee for Medicinal Products for Human Use (CHMP) of the EMA has issued a positive opinion recommending extension of the label for all metformin-containing products, including the Glucophage® product portfolio and Glucovance®, for the treatment of type 2 diabetes patients. The label change will lift the former contraindication for stable renal failure CKD stage 3. The maximum daily metformin dose will be 2,000 mg/day in CKD stage 3a (GFR = 45 – 59 ml/min) and 1,000 mg/day in CKD stage 3b (GFR = 30 – 44 ml/min), allowing a large additional group of type 2 diabetes patients with reduced kidney function to benefit from the treatment. In a recent analysis in CPRD, a UK medical record database, 32.7% of all diabetic patients had CKD stage 3.

Following a routine evaluation of the safety of metformin medicines, it was found that based on scientific evidence and clinical guidelines, patients with moderate renal failure may stand to benefit from treatment with metformin, and that the contraindication may therefore no longer be justified. Based on this evidence, the EMA issued an Article 31 referral requesting a cumulative review of the benefit and risk in this patient group across all metformin selling companies in the European Union. Leveraging around 60 years of experience in market as the metformin originator, we supported the EMA request by providing a comprehensive analysis of all available clinical data on the efficacy and safety of metformin in patients with CKD stage 3. This was balanced against a cumulative analysis of all case reports our company has received for lactic acidosis, the very rare risk associated with metformin accumulation due to acute or severe renal failure. The EMA reviewed the data submitted by all companies, and as a result, the CHMP issued a positive opinion on lifting the contraindication for treatment of type 2 diabetes patients with renal impairment CKD stage 3.

In September we announced the recipients of the Grant for Growth Innovation (GGI) for 2016. The awards are intended to advance understanding in the field of human growth disorders. This year's winners were announced at an award presentation meeting held on the occasion of the 55th European Society for Pediatric Endocrinology (ESPE) Meeting in Paris, France. Thirty-eight applications were received from 20 countries and following a rigorous selection process, three awards were made to innovative projects from Australia, Brazil and Italy.

BIOPHARMA PIPELINE

as of December 31, 2016

Therapeutic area Compound	Indication	Status
Neurology		
Cladribine tablets (lymphocyte-targeting agent)	Relapsing-remitting multiple sclerosis	Registration[1]
Oncology		
Tepotinib (c-Met kinase inhibitor)	Non-small cell lung cancer	Phase II
Tepotinib (c-Met kinase inhibitor)	Hepatocellular cancer	Phase II
Tepotinib (c-Met kinase inhibitor)	Solid tumors	Phase I
M2698 (p70S6K and Akt inhibitor)	Solid tumors	Phase I
M3814 (DNA-PK inhibitor)	Solid tumors	Phase I
BeiGene-283 (BRAF inhibitor)	Solid tumors	Phase I
M7583 (BTK inhibitor)	Hematological malignancies	Phase I
Immuno-Oncology		
Avelumab (anti-PD-L1 mAb)	Merkel cell carcinoma	Registration[2]
Avelumab (anti-PD-L1 mAb)	Non-small cell lung cancer, 1st line	Phase III
Avelumab (anti-PD-L1 mAb)	Non-small cell lung cancer, 2nd line	Phase III
Avelumab (anti-PD-L1 mAb)	Gastric cancer, 1st line	Phase III
Avelumab (anti-PD-L1 mAb)	Gastric cancer, 3rd line	Phase III
Avelumab (anti-PD-L1 mAb)	Bladder cancer, 1st line	Phase III
Avelumab (anti-PD-L1 mAb)	Ovarian cancer platinum-resistant/-refractory	Phase III
Avelumab (anti-PD-L1 mAb)	Ovarian cancer, 1st line	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)	Solid tumors	Phase I
Avelumab (anti-PD-L1 mAb)	Hematological malignancies	Phase I
M9241 (NHS-IL12, cancer immunotherapy)	Solid tumors	Phase I[3]
M7824 (anti-PD-L1/TGFbeta trap)	Solid tumors	Phase I
Immunology		
Sprifermin (fibroblast growth factor 18)	Osteoarthritis	Phase II
Atacicept (anti-BLys/anti-APRIL fusion protein)	Systemic lupus erythematosus	Phase II
M2951 (BTK inhibitor)	Rheumatoid arthritis	Phase II
M2951 (BTK inhibitor)	Systemic lupus erythematosus	Phase I
M1095 (ALX-0761, anti-IL-17A/F nanobody)	Psoriasis	Phase I
Abituzumab (anti-CD51 mAb)	Systemic sclerosis with interstitial lung disease	Phase II
Biosimilars		
MSB 11022 (proposed biosimilar of adalimumab)	Chronic plaque psoriasis	Phase III

[1] As announced on July 18, 2016, the European Medicines Agency (EMA) has accepted for review the Marketing Authorization Application (MAA) of cladribine tablets for the treatment of relapsing-remitting multiple sclerosis (MS).
[2] As announced on October 31, 2016, the European Medicines Agency (EMA) has validated for review our Marketing Authorization Application (MAA) for avelumab for the proposed indication of metastatic Merkel cell carcinoma (MCC). Additionally, as announced on November 29, 2016, the U.S. Food and Drug Administration (FDA) has accepted for Priority Review the Biologics License Application (BLA) for avelumab in this indication.
[3] Sponsored by the National Cancer Institute (USA).
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.

Akt	Protein kinase B
APRIL	Proliferation-inducing ligand
BLyS	B-lymphocyte stimulator
BTK	Bruton's Tyrosine Kinase
IL	Interleukin
mAb	Monoclonal antibody
PD-L1	Programmed cell death ligand 1
PK	Protein kinase

Consumer Health

Our Consumer Health business develops and sells over-the-counter medicines and food supplements in Europe, in particular in France, Germany and the United Kingdom, and in growth markets in Latin America, the Middle East and Africa, and Southeast Asia. The focus of our research and development activities is on the continuous improvement of existing formulations as well as on the development of new products and line extensions. We are following a consumer-centric innovation approach based on intensive market research across all our key markets. Since 2014, we have been establishing cooperation agreements with independent third-party research facilities to leverage their specific capabilities and expertise for the development of new products that meet the specific needs of our consumers.

Biosimilars

In March, we announced the initiation of a global Phase III clinical study in patients with chronic plaque psoriasis, of MSB11022, a proposed biosimilar of adalimumab, a recombinant human monoclonal antibody that binds specifically to tumor necrosis factor-alpha (TNF-α). The AURIEL-Psoriasis (PsO) study is a randomized, double-blind, active-controlled trial evaluating the efficacy, safety and immunogenicity of our adalimumab biosimilar candidate MSB11022 compared with Humira® (adalimumab) in patients with moderate to severe chronic plaque psoriasis. Humira® is marketed globally by AbbVie, Inc., USA. The study is expected to recruit approximately 400 patients across Europe, Asia as well as North and Central America.

We are in advanced stages of negotiations to divest the Biosimilars business and the transaction is expected to close in 2017.

Allergopharma

Allergopharma, our allergy business, is one of the leading manufacturers of diagnostics and prescription drugs for allergen immunotherapy. With its own research department and in cooperation with research institutes and other partners, we are helping develop a better understanding of the immunological mechanism that underlies the development of allergies and are actively working on the next generation of drugs for allergen immunotherapy.

Life Science

Innovation is at the core of the value that we deliver to our customers. Our Life Science business sector has approximately 1,500 employees working in various R&D functions around the world. These teams collaborate closely with our customers to solve the toughest problems in life science by translating ideas into product innovations. To do so, we invest significantly in R&D.

2016 marked a year of diverse innovation activities that are contributing to our promise of accelerating access to health for people everywhere. We aim 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

Improving and expanding the portfolio

We launched innovations across all segments of our portfolio throughout the course of 2016. In Research Solutions, we launched the CellASIC® ONIX2 Microfluidic System for advanced live cell imaging. The system converts laboratory microscopes into powerful tools for live cell imaging to more effectively perform in-depth analysis of cellular mechanisms and behaviors in a live environment.

In Process Solutions, we updated our bioreactor system, critical for drug development, with the new Mobius® products that include a 1,000-liter single-use bioreactor, Mobius® 1000, and a 2,000-liter mixing system, Mobius® Power MIX 2000. We also expanded our state-of-the-art single-use current Good Manufacturing Practice (cGMP) facility, in France, with the addition of Mobius® 2,000-liter single-use bioreactor to facilitate accelerated drug development and delivery via continued innovation and technical expertise by offering customers a complete end-to-end solution.

The latest addition to our comprehensive excipients portfolio is Parteck® MXP, a polyvinyl alcohol-based excipient that enhances solubility of a wide range of active pharmaceutical ingredients (APIs) with poor bioavailability. The product allows customers to address solubility challenges that otherwise might have prevented promising and potentially life-changing candidates from progressing through the pipeline. As part of this portfolio, Parteck® SRP 80 was awarded for excellence in innovation by the global organization CPhI, as a functional direct compressible excipient designed for oral sustained-release formulations. It is fully synthetic for batch-to-batch and performance consistency and enhances the bioavailability of actives.

As an industry leader in filtration, we enhanced our portfolio with Viresolve® Pro Shield H, which effectively improves aggregate removal and reduces the required virus filtration area needed to process feed streams, while delivering the same high level of virus clearance customers expect. The new Viresolve® Pro Shield H is designed for use as a prefilter with Viresolve® Pro Device for more robust, cost-economic viral clearance.

In Applied Solutions we expanded our portfolio of Cerilliant® certified reference materials for applied diagnostics and testing. We introduced nine new Certified Spiking Solutions® that leverage the latest research and techniques from around the world for accurate and reliable starting materials.

Since introducing the first water filtration device in 1974, we have set the standard for reliability and convenience in sterility testing. Our new Steritest™ Symbio Pump accessories address testing challenges in various laboratory settings and enhance safety and convenience during sample handling, filtration and waste management as well as canister transport, incubation and reading.

Investing in new and disruptive technologies for the long term

Advancements in gene editing tools like CRISPR are helping to accelerate discovery and manufacturing of new treatments for difficult-to-treat conditions. We produce gene editing tools and cell lines for both faster, better drug discovery and faster, better biomanufacturing of gene-modified cell therapies. Our innovations in 2016 showcased our commitment to empowering scientists and researchers with the solutions they need to develop new tools that can improve health.

In March 2016, we announced that our CRISPR Epigenetic Activator was named to *The Scientist's* Top 10 Innovation list. The system enables the life science community to explore advanced regulatory aspects of gene expression by allowing epigenetic modification of genetic loci at both close and distal locations to a gene of interest.

Following this accomplishment, in May we announced the expansion of our Carlsbad, California facility to meet the growing demand for viral and gene therapy products. The expansion builds on our industry-leading offerings in the manufacturing and testing of innovative and complex products and will seamlessly support customers from clinical to commercial scales. The expansion incorporates single-use equipment in a flexible, scalable format for clinical and commercial bulk drug production.

In September, we launched new gene editing technology to modify CHO cell lines to be resistant to minute virus of mice (MVM), a common contamination threat that remains despite the shift to chemically defined, animal-component-free manufacturing processes. The Centinel™ technology targets genes which play a role in MVM susceptibility and exemplifies how we are addressing some of the industry's most complex challenges through the unique combination of experience and technologies.

We also introduced the Sanger Arrayed lentiviral CRISPR libraries, the first human and mouse arrayed lentiviral CRISPR libraries for knocking out and screening gene function. Recognized by *R&D Magazine* as a top 100 R&D innovation, the library allows discovery of genes involved in drug resistance, human disease and a wide variety of biological processes.

Partnering with the global scientific community

We entered into a research agreement with the International Vaccine Institute of Seoul, Korea, to help develop next-generation purification processes. Through this partnership, we are improving the manufacturing process to deliver greater yield, allowing higher recovery and purer vaccines. We will help create a more modern, scalable and robust manufacturing process so as to increase access to life-saving vaccines in developing countries.

Our customers face many challenges when it comes to the development, manufacture and delivery of vaccines. As a business committed to sharing our technological expertise in this area, we joined the DiViNe project, a European consortium of six companies working to create an integrated, cost-efficient purification program specifically tailored for vaccines that achieve higher yields while preserving product integrity. As an industry leader in chromatography, we specifically focus on simplifying the process of vaccine purification that typically relies on affinity chromatography, a method of capturing antibodies.

In addition, a signed collaboration agreement with Evotec International GmbH, Hamburg, aims to accelerate discovery workflows and eliminate the need for resource-intensive in-house assay development and screening. The collaboration allows customers to select a customized set of CRISPR and shRNA libraries and then leverage Evotec's extensive capabilities in phenotypic screening within primary and induced pluripotent stem cells and in vivo disease models. Customers can more rapidly and efficiently explore disease pathways and identify new targets.

In December, we expanded our distribution alliance with various companies of the Roche Group, Switzerland, to be the exclusive supplier of novel enzymes for polymerase chain reaction (PCR) and quantitative real-time PCR enzyme products of Kapa Biosystems, a company owned by Roche. The alliance extension gives our customers greater access to novel products through our world-class distribution channel. The agreement is a growth driver for our Life Science business sector, which offers premier brand tools for genomics, proteomics and cell analysis.

Meeting customer needs

Proving our commitment to our customer needs, we relaunched our global network of customer collaboration centers as M Lab™ Collaboration Centers. The centers provide customers with a shared, exploratory environment with scientists and engineers working to solve the toughest biomanufacturing challenges. The dynamic setting promotes customer collaboration and problem solving, from pre-clinical through full-scale production. Our scientists and engineers work closely with customers to understand biomanufacturing needs that are then realized within R&D.

In 2016, we committed to provide Provantage® End-to-End development and manufacturing services to Y-mAbs Therapeutics, Inc. in support of Y-mAbs' monoclonal antibody in late-stage clinical development for pediatric brain cancer and also to Acticor Biotech to develop a safe and effective treatment for strokes. Our Provantage® End-to-End solution is a comprehensive suite of products and services that allows biopharmaceutical companies to accelerate the progression of molecules into the clinic and toward commercialization.

Performance Materials

We are the undisputed market and technology leader in liquid crystals (LCs) and photoresist materials, which are primarily used in televisions and mobile communication applications. We are also one of the leading suppliers of OLED materials as well as decorative and functional effect pigments. Materials for integrated circuits round off the portfolio.

Display Materials

We continued to work with our customers, display manufacturers, on the further development of high-performance liquid crystal technologies. These include the multiple award-winning, energy-saving liquid crystal technology UB-FFS (Ultra-Brightness Fringe-Field Switching) for mobile applications. We are additionally testing UB-FFS for non-mobile applications. SA-VA (self-aligned vertical alignment) is the next technology, with which the first products are expected on the market in 2017. It is very eco-friendly and resource-conserving as it requires less energy and solvent in display manufacture. In addition, it is more efficient for display manufacturers because fewer process steps are needed. Since SA-VA technology can be processed at lower temperatures, it is suitable for sensitive materials such as those used in premium products or future applications including flexible displays.

In order to strengthen our position in the increasingly important Chinese market, in September we opened a research and development laboratory for display materials in Shanghai. The new R&D laboratory will focus on the development of new and improved mixtures for liquid crystal displays manufactured in China. This allows us to cover the entire value chain for our customers in China and improve our competitiveness. In addition, we have more strongly positioned liquid crystals under the licrivision™ brand as an innovative material for windows in architectural and automotive applications. We are currently concentrating on three variants: sun protection, glare protection, and privacy control where the windows switch to opaque. Subsequent to the positive resonance to multiple pilot applications for liquid crystal windows, we decided to press ahead with the development and to set up our own production plant for liquid crystal window modules. The development of smart antennas using liquid crystal technology is continuing to make good progress.

Integrated Circuit Materials

In recent years, the cost per transistor for computer chips has not declined to the same extent as in the past. This is a result of the increasingly high cost of photolithography steps, which for modern chips today already amounts to more than 50% of manufacturing costs. This offers us the opportunity to introduce novel, cost-effective materials that allow our customers to counteract this cost development with innovative processes. In spin-on dielectrics, we further strengthened our market position with high-quality, sophisticated materials. Moreover, we successfully launched new products with better performance and better specifications and qualified them in new memory chip production lines. In close contact with our customers, we are also conducting research on new dielectrics that are adapted to the lower process temperature budget of novel chip types. The integration of the former SAFC Hitech business of Sigma-Aldrich has enabled us to combine spin-on technologies with deposition processes and provide customers with both from a single source.

Pigments & Functional Materials

Meoxal® effect pigments based on aluminum platelets are distinguished by their exceptional color saturation and brilliance. We are developing new color spectra for these pigments, which are used especially in automotive and plastic coatings. For Xirallic® NXT, an improved product generation of the well-known high-tech effect pigments, further variants are also under development. The most recently launched pigments include Xirallic® NXT Leonis Gold, a gold-colored pigment with outstanding hiding power and intense glitter, and Xirallic® NXT Tigris Blue, a pure and highly chromatic blue pigment.

In technical applications, we intensified our activities in additives for 3D laser direct structuring with a focus on 3D printing of plastics. We also developed laboratory prototypes together with our partners, which were presented for the first time at the K 2016, the top trade fair for plastics, in Düsseldorf. Laser additives enable computer-controlled fabrication of three-dimensional components with integrated electronic parts and laser-assisted circuit board bonding. We also see potential in energy management. We made good progress in high-voltage technology. Within the scope of the iShield research project, which is funded by the German Federal Ministry of Education and Research (BMBF), we are collaborating with academic and industrial partners to develop novel materials to shield generators and engines. We received the Darmstadt Enterprise Innovation Award for an innovative project with our customer Siemens, in which we are producing additives for more energy-efficient generators. Iriotec® 7340 was the first very light-colored, conductive pigment that we developed to market readiness. It allows a neutral background color that is suitable for every coating color.

We successfully further developed our range of fluorosurfactants, which strongly differentiates itself from competitive products on account of its favorable ecotoxicological profile, among other things. In early 2017, Tivida® FL 3000 is to be added to our portfolio of nonionic surfactants. Even in very low concentrations, it significantly improves the flow and wetting behavior of coating systems.

Besides materials for technical applications, we are also working on innovative raw materials for cosmetics – cosmetic fillers and actives. In cooperation with the French company Agrimer, we launched the first marine active ingredient from a new genetically decoded species of algae. The product known under the brand name RonaCare® RenouMer firms the skin and supports collagen formation.

Advanced Technologies

Organic light-emitting diodes (OLEDs) are an outstanding example of our R&D activities in the Advanced Technologies business unit. We pushed ahead with their further development again in 2016.

In 2016, we realigned our strategic projects for future business fields to megatrends such as miniaturization and the Internet of Things, which are developing at a rapid pace. One of the fields of work that we have derived from these is hybrid electronics. This new generation of electronics can be used, for example, in flexible displays and innovative sensors. Another field is electronic packaging. Here we see the future in materials that can protect or encapsulate the coming generation of semiconductor elements – also for flexible applications. In both fields of work, we are concentrating on markets in which our company already holds a leading position, namely display and semiconductor materials. In addition, we are addressing interdisciplinary topics, as smart materials are also gaining importance in our Healthcare and Life Science business sectors. Sensor applications are one such example, which specifically monitor patients' temperature profiles and movements. In the fields of energy storage and thin-film transistors, we are collaborating on projects with partner companies that have introduced new solutions to the market with the help of our innovative products. We also achieved progress in the field of printable organic photovoltaics: In close collaboration with our customers, several mass-producible printing machines were commissioned in 2016. This was made possible thanks to our printing inks, with formulations specifically developed and tailored for customer processes.

People

Our employees are crucial to our success. Therefore, it is particularly important to us to recruit the right people with the right capabilities at the right time to work for our company. To support our growth and innovation course, we need a working culture that values diversity, promotes various forms of collaboration and responds flexibly to different requirements. This calls for creative solutions and curious employees who are constantly growing in terms of their professional expectations and skills. This innovative spirit is key to generating new ideas that pave the way to a successful future.

Overview of our headcount figures

As of December 31, 2016, we had 50,414 employees worldwide (2015: 49,613). In 2016, we were represented by a total of 215 legal entities with employees in 66 countries.

DISTRIBUTION OF EMPLOYEES

by region

in %

The future starts now

In a continuously changing world, qualified and creative employees are of tremendous importance. We endeavor to prepare each and every employee not just for today's demands of the workplace, but also for the opportunities and challenges of tomorrow.

A strong starting position

We are using the motto "Make great things happen" to position itself in the global job market. The aim is to convey to potential applicants a sense of what makes our company unique: an inspiring, motivating work environment in which innovations thrive; an environment in which everyone has the opportunity to apply their ideas and engagement to benefit customers and the company, while at the same time developing themselves as employees. To make our company even more attractive as an employer, in 2015 we repositioned our corporate brand. Consequently, in late 2015, we started an analysis of the impact of the new corporate brand on employer branding. It is essential to harmonize employer branding and messages with the new brand in order to position our company as an attractive and responsible employer.

When filling open positions, we concentrate on attracting employees who have potential to take on greater roles in the future. For this, we have introduced a globally uniform and binding process. It starts with an internal job posting before external channels such as job portals and recruitment agencies are used. On the one hand, the process offers employees better development opportunities, and on the other hand it minimizes the costs of external recruitment.
In order to support executives in making hiring decisions and to establish uniform quality standards, we offer interview training courses for employees with personnel responsibility. In these courses, the participants learn proper interview behaviors, targeted question techniques and how to incorporate relevant diversity aspects into the hiring decision.

We start integrating new employees before their first day of work, since a good introduction marks the beginning of a successful collaboration. In order to make the onboarding process as efficient and easy as possible for new employees, we have created a welcome website that can be accessed worldwide. Protected by a password, this website is available in eight languages and offers new employees all the information they need. Furthermore, we have set up a special room on our intranet to allow new employees to network and to inform them of important global, local and business-specific issues. In addition, each new employee is assigned an experienced colleague who supports them during their initial orientation period. Our managers are also given a detailed information pack so that they can optimally integrate their new employee into their role. This pack contains an onboarding plan, process descriptions and general information on our company as an employer.

Success through knowledge

To enhance our growth and innovation potential over the long term and ensure the necessary flexibility to allow us to respond promptly to new trends, we support the development of our more than 50,000 employees. Only by strengthening the abilities of each individual can we count on innovative and curious employees and managers in the future.

This approach starts with good training. In 2016, we again maintained a constant high vocational training rate at Darmstadt, our largest site. A total of 523 motivated young people were enrolled in apprenticeships in 23 different occupations in 2016. We give unlimited employment contracts to all apprentices working in occupations for which we have sustainable demand. On average, the post-apprenticeship hiring rate – taking voluntary terminations into account – was more than 90% over the past five years. Of course we also offer vocational training at other sites in Germany, in which a total of 53 young people participated in 2016.

We continue to promote the professional expertise of our apprentices through numerous regional and global project activities. In 2016, these included supporting a center for homeless children in Ghana.

Furthermore, through our "Start in die Ausbildung" program, we help young people to find an apprenticeship. In 2016, the number of participants was higher than in the previous year, with a total of 22 young people between the ages of 16 and 25. Although they have a school leaving qualification, they had been searching for an apprenticeship for at least one year without success.

In 2016, we established a similar program for refugees for the first time. Through linguistic, technical, cultural, and job-specific training, the "Integrating refugees through training" initiative is preparing twelve young people who were forced to flee their home countries for vocational training and thus for the labor market.

Our advanced training program for all employees comprises a range of globally aligned classroom training courses on 18 selected subjects. In 2016, more than 5,700 employees participated in these courses to prepare themselves for new opportunities and challenges. In addition to classroom training courses, we also offer digital solutions in the form of 200 e-learning and language courses. At workshops designed specifically for teams, employees are taught how to make effective use of individual skills to enhance productivity and collaboration. To enable our employees to realize their full potential, we also provide local business- and function-related offers. All of these measures are documented in globally available development plans.

Moreover, we offer our high-potential staff and senior executives a range of advanced training programs. One of the aims of the six-month International Management program is to promote global thinking among young junior executives and to strengthen their leadership competencies. In cooperation with top international universities, our Company University has been offering a multi-regional, modular program since 1999. To date, 373 members of top management have taken part. Furthermore, our company cooperates globally with universities in order to support employees who wish to study for an MBA. In 2015, we launched the Growth Markets Management program for local executives in India and Latin America, which focuses on business management and Group-specific topics. This program is also offered in China and Turkey, with participants from a variety of countries and regions such as Africa, the Middle East, Japan, and Russia. Moreover, in 2016 we ran the Managerial Foundation Program in 20 countries with 739 participants and the Advanced Management Program, which was attended by 99 experienced executives in four countries.

Shaping the future through innovation

Innovation plays a particularly important role at our company. In order to further enhance the preconditions for innovation, in 2015 we opened the modular Innovation Center in Darmstadt. This gives employees the possibility to focus on their ideas and work on projects in an environment that stimulates creativity and collaboration. After all, innovation calls for imaginative employees with adequate scope for creativity and appropriate support, which includes a suitable working environment. Offering our employees various training courses on topics such as innovative methods, creative techniques, and visualizing and testing business models is an important element of the Innovation Center. Internal project teams, start-ups from our Accelerator program as well as many other interested colleagues from various areas throughout our company benefit from this offer. Recently, the training courses were digitalized, making them available to all employees worldwide.

Driven by inspiration

Furthering the performance culture at our company to optimally support the company in its transformation and growth program is another focal point of our human resources work. In this context, differentiated compensation and advanced training opportunities are important incentives. Establishing a culture of inclusion and inspiration in which managers set an example through their attitude and behavior, as well as selecting and positioning the right employees, are crucial.

Leading by example

New ideas change the world. That is what drives us. We study things in detail, ask questions and think a step further. This approach is supported by our executives. They recognize and make use of opportunities to drive our innovation-based business model and set their sights on clear goals. At the same time, our executives set an example, for instance by living the company values and taking responsibility for their own decisions. In doing so, a differentiated feedback culture is essential in establishing a common vision through effective management. Our competency model supports our executives in further developing our business model and the related culture. The strategic competencies according to which managers and employees are to behave are purposeful, future-oriented, innovative, results-driven, collaborative, and empowering. They enable our executives to build a strong culture of collaboration based on curiosity and trust.

Fostering the skills and potential of our employees

We want our employees around the world to enjoy working at our company. We want to excite them and retain them. We therefore consider it an important part of our managerial responsibility to identify employee potential early on and foster it on an individual basis. We want to offer our employees interesting career opportunities, continuous personal and professional development as well as prospects within the company. We are thus continuously strengthening our performance and development culture to encourage a curious and innovative attitude among our workforce.

Through intensive analysis of our personnel data using a new software introduced in 2016, we can now more quickly recognize the potential of talented employees, allowing us to fill internal positions even more efficiently. We map our talent and performance management process uniformly for all employees worldwide according to the same principle and via a common IT system. We systematically combine talent recognition with employees' target agreements and performance assessments, since we are convinced that regular feedback helps all employees to grow in terms of their performance and potential. At the same time, regular individual assessments make it easier to identify employees with high potential and to further them accordingly. Clear objectives, differentiated and open feedback and individual development plans are thus important prerequisites for both personal development and business success.

In 2016, we further expanded our workforce pool to internally fill management positions when they become vacant. The vast majority of management position vacancies were filled by internal candidates again in 2016. In addition, we recruited external executives in order to add new perspectives to our long-standing in-house expertise.

Valuing performance

We value the individual contribution of each and every employee and reward them with an appropriate and competitive total compensation. For years, we have been doing this using global processes and programs that are supported by digital platforms. We also offer our executives flexible, market- and needs-oriented compensation instruments. These instruments help to make well-informed decisions and thus continue to provide comprehensible, performance- and position-based compensation.

We aim to be an attractive employer. For this reason we do not only focus on monetary compensation components. Attractive fringe and social benefits also play an important part in motivating and retaining our employees. We have based our "benefits4me" offer on three pillars, namely company benefits including the company pension, health and well-being, and services. There are different benefit packages to meet the various needs of our workforce. Established steering mechanisms ensure that this is a well-made investment in our employees.

Culture makes all the difference

An open, dynamic and inclusive corporate culture and a diverse workforce contribute significantly to our business success. Therefore, promoting diversity and inclusion as well as motivating employees to embrace cultural change are special focal areas of our human resources work.

Unity in diversity

Together with a culture of inclusion, diversity promotes innovation and improves team and individual performance. One of the strategic goals is to recognize the strengths of such a diverse workforce and to appreciate individual differences. It is important to us to create an inclusive work environment in which all employees have the possibility to realize their full potential. With respect to three of our six values, namely respect, transparency and integrity, multifaceted ideas are furthered and perspectives strengthened in order to drive innovation and to add more value. By signing the Equal Opportunity Charter of the German Mining, Chemical and Energy Industrial Union (IG BCE) in 2015 and the "Charta der Vielfalt" in 2013, we underscored our commitment to fairness and tolerance at the workplace.

In addition to the Chief Diversity Officer, who is responsible for strategically managing diversity within the company, we also established the Diversity Council in 2013, comprising high-ranking executives from all business sectors and select Group functions. Its aim is to build further active support for and progress in diversity and inclusion within the company. In 2016, the Diversity Council worked to operationalize our Diversity Framework, introduced in 2015, which bundles the diversity and inclusion strategies. It focuses on the following four topics: recruiting the right people to work for our company, developing and retaining them, promoting efficient collaboration, driving innovations and improvements, and serving customers with diverse needs. In addition, we support specific employee networks in order to foster exchange among like-minded individuals.

In September 2016, we celebrated the Global Diversity Days with a campaign entitled "The Power of Diversity", which aligned with "The Power of We" , one of our strategic corporate messages. The objective of this annual month of focus is to heighten awareness of diversity and inclusion among our workforce in global events. Globally, employees in 17 countries across six continents took part in events and shared experiences via employee platforms and social media.

People from a total of 129 different nations work for our company. Only 23.1% of our employees are German citizens, and 75.3% work outside Germany. Women currently make up 42.8% of the workforce. Since the ratio of women to men varies widely across the different regions, businesses and functions, we have set ourselves the goal of increasing the percentage of female employees wherever they are underrepresented. Here we take into account the situation that is typical for the industry as well as regional differences.

In Germany as well as several other EU countries, Japan and the United States, we are preparing ourselves for demographic change. Since the average age of our employees is slightly more than 40, the need for urgent action does not yet exist; however, we assume that this figure will continue to rise in the coming years. Our focus lies mainly on "mindfulness" as a further step to sensitize the workforce to the limits of their own physical and mental resources.

Among executives, too, inclusion and diversity play a major role. We are convinced that balanced diversity among management enhances career advancement opportunities for talented employees while also helping to provide a broad experience base within the company. In addition, it allows for differentiated decision-making, thereby making a significant contribution to the success of the company.

As a global company, we consider it highly important to have an international management team. Currently, 64.7% of our managers have a nationality other than German. Altogether, 70 different nationalities are represented in such positions. In 2011 we set our strategic goal to increase the percentage of women in management positions to 25% to 30%, which we reached in 2016. The percentage is currently 28.8% at Group level. The figures are steadily increasing across our company as a whole, but not consistently across business units and Group functions. We have set ourselves the goal for 2021 to stabilize the overall proportion of women in management positions at 30%, but continue to work on increasing the proportion in senior management positions and business units where women are still underrepresented.

The report on stipulations to promote the proportion of women in management positions at Merck KGaA, Darmstadt, Germany, pursuant to section 76 (4) and section 111 (5) of the German Stock Corporation Act, including information on the achievement of the defined targets as of December 31, 2016, can be found in the Corporate Governance section of this report.

Safety in daily work

As a responsible employer, 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. In 2010, we had set ourselves the goal of reducing the lost time injury rate to 2.5 by 2015 – with 1.5, we considerably exceeded this target value in 2015. But this still is not enough for us. We believe that nothing is worth an accident. And we have been even more ambitious in setting our goal for the future: By 2020 we intend to sustainably lower the LTIR further. In 2016 we already reached this with 1.3.

The continuous rate of improvement in recent years can be attributed in particular to the BeSafe! program, which was launched in 2010. This is a global initiative with globally harmonized standards, but also local modules that help to meet the specific safety requirements at individual sites. 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 2016, we continued to sensitize our employees to workplace hazards through numerous awareness campaigns.

Since 2010, we 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 2016, it was awarded to 61 out of 91 sites.

Flexibility in every situation

As an attractive partner and employer, we endeavor to always provide future-oriented solutions. This also applies to the way in which we work. We want our employees to achieve a good balance between their professional and personal objectives and challenges. This maintains and strengthens their motivation and performance potential for longer, enabling them to better schedule their lives to suit their own needs.

That is why we offer our employees in Germany and the United States various flexible and innovative working models. The Mywork at Merck KGaA, Darmstadt, Germany, working model, initially implemented in 2013 at the Darmstadt and Gernsheim sites in Germany for all exempt employees, aims to strengthen a culture of performance and trust within the company. In agreement with their teams and supervisors, employees can choose their working hours and location freely. Since October 2014, non-exempt employees at these sites whose positions are suitable for this working model have also been able to make use of it. 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, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Schuchardt OHG, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Versicherungsvermittlung GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck Selbstmedikation GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, and Merck Chemicals GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany. Employees can best decide for themselves, together with their respective line managers, when and how often fixed physical presence in the office is necessary for all team members. Working hours are no longer recorded or monitored. Employees must only document their hours if they exceed their standard working hours within the agreed working time framework. At the end of December 2016, a total of 4,507 employees made use of this model. In 2016, 4.7% of our employees worldwide worked part-time, 10.6% of whom are men. We believe that with these flexible working models, we are on the right track – not only to more efficient processes, but also above all to higher levels of work satisfaction and employer appeal.

We also offer our employees throughout Germany targeted and independent information, advice and assistance in finding childcare and nursing care, as well as home and garden services. At various sites, employees benefit from childcare options that we subsidize. A daycare center, which meanwhile has capacity for 150 children between the ages of one and twelve, has been operating at the Darmstadt site for 49 years. Since 2013, we have been offering expanded, year-round opening hours from 6:30 a.m. to 7 p.m., as well as needs-oriented daycare hour options of 25, 35 or 50 hours per week and, in the adjacent new building, 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 premises. In addition, a good ratio of staff to children is important to us to offer parents a safe period of supervision for their children while at the daycare center.

Ready for the future

A dedicated, satisfied workforce is key to succeeding as a global company. Only those who question structures and collaborate with others will develop positively. Honest and continuous feedback from our employees is thus absolutely essential so that we are aware of the factors that influence engagement and what the organization's strengths and weaknesses are.

Between December 2013 and June 2015, we conducted the Organizational Health Index (OHI) survey in all business units and Group functions. Based on the results, strategic focus topics were identified and initiatives derived. In 2016 we continued to anchor these topics deeper into the organization.

In order to reach all employees, a global employee survey was conducted in 23 languages in November 2016. Approximately 42,500 employees (83%) took part. Our company-wide score, which measures how engaged our employees are, is 60%. This score is comparable to other companies in the chemical and pharmaceutical industries. As of early 2017, we will be working with the results across the company.

OVERVIEW OF EMPLOYEE FIGURES

			Group Dec. 31, 2014	Group Dec. 31, 2015	Group **Dec. 31, 2016**[2]
Number of employees	global, total		39,639	49,613[2]	50,414
	by region	Asia-Pacific (APAC)	9,488	11,096[2]	10,754
		Europe	20,537	23,429[2]	24,438
		Latin America	3,883	4,352[2]	4,140
		Middle East and Africa (MEA)	639	942[2]	1,045
		North America	5,092	9,794[2]	10,037
Number of employees (FTE – full-time equivalents)	global, total		39,012.4	48,911.1[2]	49,652.7
	by region	Asia-Pacific (APAC)	9,474.4	11,068.2[2]	10,725.3
		Europe	19,946.2	22,785.7[2]	23,727.1
		Latin America	3,877.6	4,344.2[2]	4,136.5
		Middle East and Africa (MEA)	637.9	940.6[2]	1,041.8
		North America	5,076.3	9,772.4[2]	10,022.0
Number of countries			66	66[2]	66
Number of legal entities	global, total		146	211[2]	215
Number of employee nationalities	global, total		122	122[1]	129
Number of nationalities working in Germany			73	77[1]	91
Percentage of employees with German citizenship			26.6%	26.1%[1]	23.1%
Percentage of employees working outside Germany			71.8%	75.9%[2]	75.3%
Percentage of employees with a global manager			5.2%	8.1%[2]	9.7%
Percentage of women in the workforce	global, total		41.3%	41.6%[2]	42.8%
	in Germany		37.5%	38.2%[2]	38.6%
Percentage of women in upper management positions (Global Grade 14 or higher)	global, total		26.3%	26.8%[1]	28.8%[6]
	in Germany		26.1%	27.3%[1]	28.7%[6]
Percentage of executives (Global Grade 14 or higher)	global, total		5.5%	5.9%[1]	5.7%[6]
	Percentage of executives who are not German citizens		60.3%	61.0%[1]	64.7%[6]
	Number of nationalities		67	64[1]	70[6]
Number of apprentices in Germany			498[3]	506[4]	576[5]
Vocational training rate			5.4%[3]	5.3%[4]	5.1%[5]
Percentage of employees in the model (Germany) of the Mywork at Merck KGaA, Darmstadt, Germany			3,522	4,122	4,507
Percentage of employees working part-time	global, total		5.2%	4.7%[2]	4.7%
	men		10.5%	11.3%[2]	10.6%
Percentage of employees aged 17 – 29 years	global, total		14.9%	15.2%[2]	14.7%
Percentage of employees aged 30 – 49 years	global, total		64.2%	62.6%[2]	62.5%
Percentage of employees aged 50 + years	global, total		20.9%	22.2%[2]	22.8%
Average age globally			41	41.1[2]	41.3
Average age by region	Asia-Pacific (APAC)		36.6	36.7[2]	36.7
	Europe		42.5	42.4[2]	42.4
	Latin America		39.6	39.5[2]	39.9
	Middle East and Africa (MEA)		37.7	39.5[2]	39.3
	North America		44.9	44.2[2]	44.3
	Germany		43.2	43[2]	42.9
Average length of service	global, total		10.1	10.0[2]	9.9
Average length of service in Germany			14.9	14.4[2]	14.2

[1] Excluding Sigma-Aldrich.
[2] Including Sigma-Aldrich.
[3] Merck KGaA, Darmstadt, Germany, sites Darmstadt and Gernsheim (around 24% of the workforce of the entire Group in 2014).
[4] Relates only to Merck KGaA, Darmstadt, Germany, (around 19% of the workforce of the entire Group in 2015).
[5] All company sites in Germany (around 25% of the workforce of the entire Group in 2016).
[6] Not including Sigma-Aldrich legal entities in Germany or Allergopharma.

Report on Economic Position

Macroeconomic and Sector-Specific Environment

According to the most recently available figures from the International Monetary Fund (IMF), industrial countries faced dampened growth expectations in 2016. Firstly, this was due to the uncertain consequences in connection with the future exit of the United Kingdom from the European Union ("Brexit"). Secondly, economic growth in the United States was weaker than expected in the first half of the year. According to the latest IMF forecasts, global gross domestic product (GDP) increased by 3.1% in 2016, equivalent to a decline of 0.1 percentage points in comparison with 2015. As in the previous year, strong regional differences could be seen. Industrial nations registered a decline in growth to 1.6% (2015: 2.1%). At 4.2% (2015: 4.0%), emerging economies and developing countries achieved an increase in growth rates for the first time in five years. The GDP of the United States, the world's largest economy, remained behind expectations, growing only by 1.6% (2015: 2.6%). In 2015, growth of 2.8% was forecast for 2016. Growth was slowed by a continued decline in investment in the energy sector and the strong U.S. dollar, which had a dampening impact on export-oriented industrial sectors. As was the case in the United States, the eurozone also registered a decline in GDP growth to 1.7% (2015: 2.0%). By contrast, the emerging economies of Asia registered growth of 6.5% (2015: 6.6%). As in 2015, India (7.6%) and China (6.6%) were the strongest growth drivers. The industrial nations South Korea and Taiwan only generated slight increases in growth, whereas the GDP of Japan stalled at the 2015 level of 0.5%. Korea registered growth of 2.7% (2015: 2.6%) and Taiwan saw growth of 1.0% (2015: 0.6%).

In 2016, organic sales growth at our company was largely attributable to the North America and Latin America regions. While North America accounted for approximately 36% of Group-wide organic growth, Latin America also generated a high share, which amounted to 27.7%. In Latin America, all the business sectors contributed positively to organic sales growth. In North America, growth was driven by our Healthcare business sector. While the Asia-Pacific (APAC) region generated around 56% of organic growth in 2015, it only accounted for a share of roughly 12% in 2016. This was due to the declines in our Performance Materials business sector. For instance, Performance Materials sales in the Asia-Pacific region decreased organically by –6.6%.

	Development 2016[1]	Development 2015
Healthcare		
Global pharmaceutical market	6.3%	9.2%
Market for multiple sclerosis therapies[2]	7.5%	14.9%
Market for type 2 diabetes therapies[2]	11.2%	11.1%
Market for fertility treatment[2]	12.6%	10.7%
Market for the treatment of colorectal cancer[3]	–0.5%	–1.7%
Market for OTC pharmaceuticals	4.3%	4.9%
Life Science		
Market for laboratory products	2.5%	2.9%
Share of biopharmaceuticals in the global pharmaceutical market[2]	23.3%	22.3%
Performance Materials		
Growth of LC display surface area	4.6%	4.8%
Global automobile sales volumes	2.5%	1.3%
Materials for production of cosmetics	1.8%	1.5%
Semiconductor industry sales	Sales at the previous year's level	–2.3%

[1] Predicted development. Final development rates for 2016 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 IMS Health market data on the growth of indications are based on current figures, including the third quarter of 2016. 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.

Healthcare

According to the latest study published in September 2016 by the pharmaceutical market research firm IMS Health entitled "Global Market Prognosis 2016–2020", the growth of the global pharmaceutical market for 2016 is quantified at 6.3%. By comparison, in 2015, sales growth was still 9.2%. As was already the case in 2015, growth in 2016 was primarily attributable to Latin America and the United States. Whereas growth in the United States fell significantly to 6.3% (2015: 12.0%), at 13.9% the Latin American market continued to see double-digit growth (2015: 16.0%). At 5.7%, the Asia-Pacific region recorded a slight decline in growth (2015: 6.6%). Europe registered a stronger decline to 4.6% (2015: 7.0%).

Not only the growth of the pharmaceutical sector as a whole, but also in particular the development of the biopharmaceutical market are relevant for our business. According to IMS Health, the market volume of biopharmaceuticals was approximately € 208 billion in 2016. In recent years, the share of the global pharmaceutical market accounted for by these products has grown continuously and already amounted to 23.3% in 2016. Globally, the largest share, or 31.2%, was attributable to the United States.

A look at the therapeutic areas of relevance to us shows differing developments. The markets for the therapeutic areas multiple sclerosis grew by 7.5% (2015: 14.9%), type 2 diabetes[1] by 11.2% (2015: 11.1%) as well as fertility by 12.6% (2015: 10.7%). By contrast, the market for oncology drugs for the treatment of colorectal cancer declined by –0.5% (2015: –1.7%).

According to the market research firm Nicholas Hall, the growth of the global over-the-counter pharmaceutical market was 4.3% in 2016, which represents a slight decline of 0.6 percentage points in comparison with 2015. In 2016, growth was driven by the Asia-Pacific region, which generated growth of 5.5% (2015: 5.1%). As in 2015, India achieved the strongest growth of 7.7% (2015: 8.9%). At 2.2%, growth was weakest in western Europe (2015: 3.3%) and Japan (2015: 0.2%).

[1] Excluding the United States.

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 biological and chemical origin.

For the laboratory product market relevant to Research Solutions and Applied Solutions, the market research firm Frost & Sullivan expects growth of 2.5% for 2016 (2015: 2.9%). A period of heightened uncertainty in the second half of 2016 dampened growth versus 2015. Growth was primarily driven by biopharmaceutical industry customers, specifically emerging biotech start-ups. In comparison with 2015, European market growth slowed to 1.5% (2015: 1.9%), driven by a weaker euro and economic uncertainty, for instance as regards the unexpected Brexit vote. Growth of the U.S. market was 2.7% (2015: 3.0%), with the slowdown influenced by the U.S. presidential election and delay in passing a 2017 federal budget. Emerging economies delivered higher growth; however, a slowdown in China was visible, with modest improvements expected in this market over the next few years.

The demand for Process Solutions products depends heavily on the volume of biological product sales as well as the productivity of research and development activities of biopharmaceutical companies. As previously stated, the market volume for biopharmaceuticals was € 208 billion in 2016, representing a 23.3% share of the global pharmaceutical market. According to EvaluatePharma, there are more than 8,500 active biologics projects in pre-clinical and clinical development, of which monoclonal antibodies represent 28% (2015: 25%). Biosimilars are a small, but fast-growing part of the pharmaceutical market. In 2016, biosimilars sales are expected to reach US$ 1.4 billion annually before growing to US$ 8 billion in 2022.

Performance Materials

With its liquid crystals business, we are the leading producer of liquid crystal mixtures for the display industry. The dynamic growth rates of display surfaces have declined to an average of 5% in recent years according to surveys by the market researchers at IHS DisplaySearch. This growth was mainly attributable to increasing average display size amid largely stagnating sales volumes. The display industry remains a growth sector in which the leading display technology is based on liquid crystals. OLED technology, for which we also rank among the leading material suppliers, is gaining importance in the high-end display sector.

The markets for automotive coatings and cosmetics are crucial to our Pigments business. As reported by the Center of Automotive Management (CAM) in Bergisch-Gladbach, Germany, global automobile sales volumes rose by 1.3% in 2015. As in the previous years, the growth drivers were China, western Europe and the United States while significant declines in automotive sales volumes were registered particularly in Brazil and Russia. For 2016, a slight recovery in the global growth of the automotive market is expected. According to Euromonitor International, global consumption of materials used to produce cosmetics grew by 2%, with Asia reporting the highest growth rate of 4%.

The semiconductor industry is the most important sales market for the business with integrated circuit materials (IC Materials). The long-term growth of the semiconductor industry has a cyclical demand pattern. According to Gartner, a market research institute specializing in the technology and electronics markets, in 2016 the industry's sales were at the previous year's level since the growth of smartphone applications was offset by declining demand in the PC business. The decline in 2015 of – 2.3% was likewise due to the weakness of the PC business.

Review of Forecast against Actual Business Developments

Net sales

For 2016, slight organic sales growth was forecast for the Group. Owing to the acquisition of Sigma-Aldrich, which closed on November 18, 2015, we additionally expected a portfolio effect in the low double-digit percentage range. The positive organic development of net sales in our Healthcare and Life Science business sectors more than offset the slight decline in Performance Materials. Consequently, we generated a moderate organic sales increase of 3.2%. At 16.4%, the additional portfolio effect due to Sigma-Aldrich was in the low double-digit percentage range as expected. At the beginning of 2016, we had forecast a slightly negative exchange rate effect owing to the decline in the value of Latin American currencies. In the course of the year, we raised the forecast of this effect to –3% to –5%. Owing to a weakening of these dynamics and a simultaneous strengthening of the U.S. dollar in the fourth quarter, we incurred an exchange rate effect of –2.6% on our sales for 2016.

In 2016, our Healthcare business sector showed solid organic sales growth of 4.6%, thus exceeding our forecast for slight organic growth. As expected, sales growth was driven by the continued good dynamics in our growth markets as well as positive effects from the co-promotion of Xalkori® with Pfizer. Yet the Fertility franchise in North America and China as well as Rebif® performed significantly better than expected. Contrary to our original assumptions, Rebif® generated organic sales growth in North America. As forecast, a slightly negative portfolio effect of –1.1% was incurred in 2016 owing to the return of the Kuvan® rights to BioMarin Pharmaceutical, Inc.

Our Life Science business sector achieved organic sales growth of 6.3% in 2016. This was significantly stronger than the moderate organic growth we had forecast at the beginning of the year. The more dynamic business performance increasingly manifested itself in the first half of 2016. Our updated forecasts as of the second quarter of the year took this into account accordingly. All the Life Science business areas contributed to the positive development, with Process Solutions accounting for the largest proportion and benefiting from continued healthy demand from customers in the biopharmaceutical industry. In addition, the acquisition of Sigma-Aldrich was responsible for a portfolio effect of 63.1%, thus meeting the forecast we made at the beginning of the year.

As already indicated in the forecasts after the second and third quarters of 2016, our Performance Materials business sector did not meet the original expectation of slight organic growth. The destocking in the display industry, which lasted longer than expected, as well as typical price declines in liquid crystals, could not be offset by growth in the other business units. Overall, this led to an organic sales decline of –4.7% compared with 2015.

EBITDA pre exceptionals

At Group level, we increased EBITDA pre exceptionals by 23.7% to € 4,490 million in 2016, which was in line with our original forecast of an increase in the low double-digit percentage range.

Contrary to our original expectation of a decline in earnings in the low double-digit percentage range, in 2016 EBITDA pre exceptionals of our Healthcare business sector rose by 6.3% compared with 2015. The positive margin development had already started to become apparent after the second quarter following unexpectedly good sales reported for Rebif® and the Fertility franchise along with the divestment of a minority interest. Additionally, as of the second half of the year we started receiving royalty and license income for a patent granted in the United States in June 2016. Apart from the release of provisions for research projects discontinued in prior years, it became clear in the third quarter that research and development expenses would be below our conservative cost budgeting at the beginning of 2016.

For EBITDA pre exceptionals of our Life Science business sector, we had forecast a moderate increase owing to the expected organic sales growth and an additional portfolio effect in the high double-digit percentage range due to the acquisition of Sigma-Aldrich. With EBITDA pre exceptionals of € 1,652 million, equivalent to an increase of 93.0%, we met this forecast. This was due not only to the portfolio effect that corresponded to the expected amount, but also to good margin development and the faster than planned realization of the synergies from the aforementioned acquisition.

For our Performance Materials business sector, we assumed that EBITDA pre exceptionals would increase slightly. We aimed for at least the level of 2015. Owing to the significant destocking by the display industry throughout the year and the resulting negative impact on sales, we fell slightly short of this forecast. We applied maximum cost discipline to counteract this development and were able to benefit from the high degree of diversification that now characterizes Performance Materials. Since this could not fully offset the earnings impact of the decline in sales of the Display Materials business, EBITDA pre exceptionals decreased by – 2.3% to € 1,106 million. Yet the EBITDA margin pre exceptionals remained at the high level of 2015.

EBITDA pre exceptionals of Corporate and Other developed in line with our expectations. Owing to the further intensification of strategic Group initiatives, such as the new branding and projects to digitalize the Group, we expected expenses to rise significantly. With EBITDA pre exceptionals of € – 396 million in 2016, we met this forecast, which we had specified in the course of 2016 to lie between € – 370 million and € – 400 million.

Business free cash flow

In 2016, we expected business free cash flow of the Group to develop positively in the high single-digit percentage range. We exceeded this forecast with business free cash flow increasing by 20.0%. The key drivers of this were the unexpectedly high growth of EBITDA pre exceptionals of our Healthcare business sector as well as, to a smaller extent, the positive development of inventories in Performance Materials. As expected, due to the Sigma-Aldrich acquisition our Life Science business sector made a high double-digit percentage contribution to the development of business free cash flow.

	Actual results 2015 in € million	**Forecast for 2016 in the Annual Report for 2015**
Group		
		Slight organic growth
Net sales	12,845	Portfolio effect in the low double-digit percentage range
EBITDA pre exceptionals	3,630	Low double-digit percentage increase taking into account the Sigma-Aldrich portfolio effect
Business free cash flow	2,766	High single-digit percentage increase
Healthcare		
		Slight organic growth
Net sales	6,934	Slightly negative portfolio effect due to the divestment of Kuvan®
EBITDA pre exceptionals	2,002	Low double-digit percentage decline taking into consideration commercialization costs, especially for avelumab (excluding market launch costs: decline in the high single-digit to mid-teens percentage range) Negative portfolio effect in the medium double-digit million range due to the divestment of Kuvan®
Business free cash flow	1,581	Low double-digit percentage decline
Life Science		
		Moderate organic growth
Net sales	3,355	High double-digit percentage portfolio effect due to the acquisition of Sigma-Aldrich
EBITDA pre exceptionals	856	Moderate increase due to organic sales growth Additional high double-digit percentage portfolio effect due to the acquisition of Sigma-Aldrich
Business free cash flow	676	High double-digit percentage increase
Performance Materials		
Net sales	2,556	Slight organic growth
EBITDA pre exceptionals	1,132	Slight increase, yet at least at the 2015 level
Business free cash flow	931	Moderate increase
Corporate and Other		
EBITDA pre exceptionals	–360	Significant increase
Business free cash flow	–421	–

Forecast for 2016 in:			
Q1/2016 Interim Report	Q2/2016 Interim Report	Q3/2016 Interim Report	**Results 2016 in € million**
€ 14.8 – € 15.0 billion	€ 14.9 – € 15.1 billion	€ 14.9 – € 15.1 billion	15,024 (+17.0%: +3.2% Organic +16.4% Portfolio –2.6% Currency)
€ 4.1 – € 4.3 billion	€ 4.25 – € 4.4 billion	€ 4.45 – € 4.6 billion	4,490 (+23.7%)
€ 3.1 – € 3.3 billion	€ 3.14 – € 3.25 billion	€ 3.25 – € 3.36 billion	3,318 (+20.0%)
Slight organic growth, slightly negative portfolio effect due to the divestment of Kuvan®	Solid organic growth, slightly negative portfolio effect due to the divestment of Kuvan®	Solid organic growth, slightly negative portfolio effect due to the divestment of Kuvan®	6,855 (–1.1%: +4.6% Organic –1.1% Portfolio –4.6% Currency)
€ 1.8 – 1.9 billion	€ 1.95 – 2.05 billion	€ 2.1 – 2.2 billion	2,128 (+6.3%)
€ 1.4 – 1.5 billion	€ 1.49 – 1.59 billion	€ 1.59 – 1.67 billion	1,648 (+4.2%)
Organic growth in the mid-single-digit percentage range, high double-digit portfolio effect due to the acquisition of Sigma-Aldrich	Organic growth in the mid to high single-digit percentage range, portfolio effect in the high double-digit percentage range due to the acquisition of Sigma-Aldrich	Organic growth in the mid to high single-digit percentage range, portfolio effect in the high double-digit percentage range due to the acquisition of Sigma-Aldrich	5,658 (+68.6%: +6.3% Organic +63.1% Portfolio –0.8% Currency)
€ 1.62 – 1.67 billion	€ 1.62 – 1.67 billion	€ 1.64 – 1.67 billion	1,652 (+93.0%)
€ 1.22 – 1.27 billion	€ 1.18 – 1.23 billion	€ 1.18 – 1.23 billion	1,144 (+69.3%)
Organic stable	Moderate decline	Moderate decline	2,511 (–1.8%: –4.7% Organic +2.7% Portfolio +0.2% Currency)
€ 1.1 – 1.15 billion	€ 1.1 – 1.15 billion	€ 1.1 – 1.15 billion	1,106 (–2.3%)
€ 0.95 – 1.0 billion	€ 0.93 – 0.98 billion	€ 0.93 – 0.98 billion	1,011 (+8.6%)
€ –370 – –400 million	€ –370 – –400 million	€ –370 – –400 million	–396 (+10.0%)
€ –460 – –490 million	€ –460 – –490 million	€ –460 – –490 million	–485 (+15.1%)

Course of Business and Economic Position

Group

Overview of 2016

- Group net sales increase by 17.0% to € 15 billion
- Healthcare and Life Science deliver organic sales growth
- EBITDA pre exceptionals up 23.7% to around € 4.5 billion
- Group profitability (EBITDA margin pre exceptionals) rises to 29.9% (2015: 28.3%)
- Improvement in earnings per share before exceptionals by 27.5% to € 6.21
- Business free cash flow increases 20.0% to € 3.3 billion

GROUP

Key figures

			Change	
€ million	**2016**	2015	€ million	in %
Net sales	15,024	12,845	2,179	17.0%
Operating result (EBIT)	2,481	1,843	637	34.6%
Margin (% of net sales)	16.5%	14.3%		
EBITDA	4,415	3,354	1,061	31.6%
Margin (% of net sales)	29.4%	26.1%		
EBITDA pre exceptionals	4,490	3,630	861	23.7%
Margin (% of net sales)	29.9%	28.3%		
Profit after tax	1,633	1,124	509	45.3%
Earnings per share (€)	3.75	2.56	1.19	46.5%
Earnings per share pre exceptionals (€)	6.21	4.87	1.34	27.5%
Business free cash flow	3,318	2,766	552	20.0%

Development of net sales and results of operations

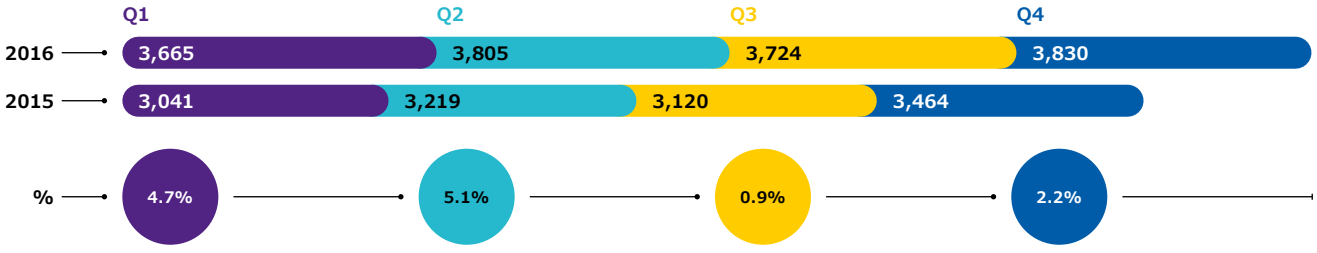
In 2016, the Group generated net sales of € 15,024 million (2015: € 12,845 million), achieving sales growth of € 2,179 million or 17.0%. This double-digit increase was driven both by very significant portfolio changes and moderate organic growth. Group sales grew organically to € 408 million or 3.2% and were generated by our Healthcare and Life Science business sectors. Portfolio changes increased net sales by € 2,109 million or 16.4%. This was mainly attributable to the acquisition of Sigma-Aldrich, which closed on November 18, 2015 (see Note [4] "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements). Negative exchange rate effects lowered net sales by € –339 million or –2.6%. These effects were primarily due to the development of Latin American currencies. The decline in the value of the British pound also had a slightly adverse effect on sales.

The development of net sales in the individual quarters as well as the respective organic growth rates in 2016 are presented in the following overview:

GROUP

Net sales and organic growth by quarter[1]

€ million / organic growth in %



[1] Quarterly breakdown unaudited.

The double-digit growth rate of Group sales was attributable to the positive contribution of our Life Science business sector, which increased its sales overall by 68.6% to € 5,658 million (2015: € 3,355 million). This was driven both by the acquisition of Sigma-Aldrich (+63.1%) and the sharp organic increase in sales (+6.3%). Consequently, the share of Group sales attributable to Life Science in 2016 rose significantly by 12 percentage points to 38% (2015: 26%). With a 45% share (2015: 54%) of Group sales, Healthcare remained our strongest business sector in terms of sales. Our Healthcare business sector delivered organic growth of 4.6%, which however was more than canceled out by negative exchange rate effects and the absence of Kuvan® sales (see Note [4] "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements). Overall, Healthcare sales declined slightly to € 6,855 million (2015: € 6,934 million). Net sales by our Performance Materials business sector decreased slightly to € 2,511 million (2015: € 2,556 million). The business sector thus generated 17% (2015: 20%) of Group sales.

GROUP

Net sales by business sector – 2016

€ million / % of net sales

GROUP

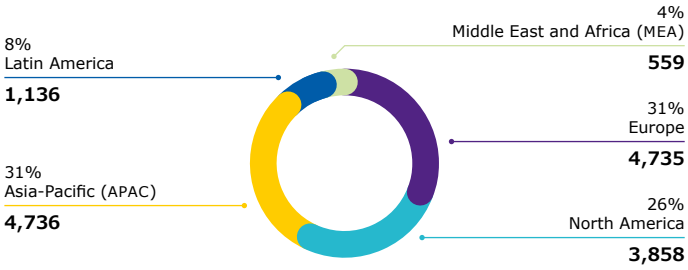
Net sales components by business sector – 2016

€ million / change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions / divestments	Total change
Healthcare	6,855	4.6%	–4.6%	–1.1%	–1.1%
Life Science	5,658	6.3%	–0.8%	63.1%	68.6%
Performance Materials	2,511	–4.7%	0.2%	2.7%	–1.8%
Group	**15,024**	**3.2%**	**–2.6%**	**16.4%**	**17.0%**

GROUP

Net sales by region – 2016

€ million/% of net sales



Driven by strong acquisition-related increases from the consolidation of Sigma-Aldrich and supported by slight organic growth, the strong year-earlier level of net sales in the Asia-Pacific region rose by 11.7% or € 495 million to € 4,736 million (2015: € 4,241 million). This positive sales development was fueled by our Healthcare and Life Science business sectors, which achieved high acquisition-related sales increases and very strong organic growth. Consequently, these two business sectors could almost compensate for the weaker Display Materials business of Performance Materials in this region. The contribution to Group sales by the Asia-Pacific region fell by two percentage points to 31% (2015: 33%).

Sales generated in Europe grew by 15.4% or € 632 million to € 4,735 million (2015: € 4,103 million). This was due to sales increases primarily in our Life Science business sector, which generated double-digit organic growth and high acquisition-related sales. In 2016, Europe contributed 31% to Group sales (2015: 32%).

With net sales of € 3,858 million (2015: € 2,723 million), North America generated the strongest sales increases in both absolute (+€ 1,135 million) and percentage (+41.7%) terms in 2016. In addition to the effect of the Sigma-Aldrich acquisition (+35.5%), this positive sales development was driven by the organic growth of our Healthcare business sector. The contribution to Group sales by North America in 2016 was 26%, representing an increase of five percentage points (2015: 21%).

In Latin America, Group sales decreased owing to exchange rate effects to € 1,136 million (2015: € 1,265 million). All business sectors contributed to organic sales growth of 8.9% in this region. The share of sales attributable to Latin America declined by two percentage points to 8% (2015: 10%).

Net sales in the Middle East and Africa region rose by 8.9% in 2016, amounting to € 559 million (2015: € 513 million). Organic sales growth of 5.7%, to which all business sectors contributed, was supported by acquisition-related effects (+5.4%). This region accounted for an unchanged 4% of Group sales.

GROUP

Net sales components by region – 2016

€ million/change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions/ divestments	Total change
Europe	4,735	1.7%	–1.4%	15.1%	15.4%
North America	3,858	5.3%	0.9%	35.5%	41.7%
Asia-Pacific (APAC)	4,736	1.2%	0.1%	10.4%	11.7%
Latin America	1,136	8.9%	–23.4%	4.2%	–10.2%
Middle East and Africa (MEA)	559	5.7%	–2.1%	5.4%	8.9%
Group	**15,024**	**3.2%**	**–2.6%**	**16.4%**	**17.0%**

The consolidated income statement of the Group is as follows:

GROUP

Consolidated Income Statement

					Change	
€ million	**2016**	**in %**	2015	in %	€ million	in %
Net sales	**15,024**	**100.0%**	**12,845**	**100.0%**	**2,179**	**17.0%**
Cost of sales	–5,201	–34.6%	–4,076	–31.7%	–1,125	27.6%
(of which: amortization of intangible assets)[1]	*(–181)*		*(–167)*		*(–15)*	*(8.8%)*
Gross profit	**9,823**	**65.4%**	**8,768**	**68.3%**	**1,054**	**12.0%**
Marketing and selling expenses	–4,526	–30.1%	–4,050	–31.5%	–477	11.8%
(of which: amortization of intangible assets)[1]	*(–1,032)*		*(–779)*		*(–253)*	*(32.5%)*
Administration expenses	–854	–5.7%	–720	–5.6%	–134	18.7%
Research and development costs	–1,976	–13.2%	–1,709	–13.3%	–266	15.6%
(of which: amortization of intangible assets)[1]	*(–4)*		*(–3)*		*(–2)*	*(58.6%)*
Other operating expenses and income	14	0.1%	–447	–3.5%	461	>100.0%
Operating result (EBIT)	**2,481**	**16.5%**	**1,843**	**14.3%**	**637**	**34.6%**
Financial result	–326	–2.2%	–357	–2.8%	30	–8.5%
Profit before income tax	**2,154**	**14.3%**	**1,487**	**11.6%**	**668**	**44.9%**
Income tax	–521	–3.5%	–368	–2.9%	–153	41.7%
Profit after tax from continuing operations	**1,633**	**10.9%**	**1,118**	**8.7%**	**514**	**46.0%**
Profit after tax from discontinued operations	**–**	**–**	**6**	**–**	**–6**	**>100.0%**
Profit after tax	**1,633**	**10.9%**	**1,124**	**8.8%**	**509**	**45.3%**
Non-controlling interests	–4	–0.0%	–9	–0.1%	5	–55.0%
Net income	**1,629**	**10.8%**	**1,115**	**8.7%**	**514**	**46.1%**

[1] Excluding amortization of internally generated or separately acquired software.

Gross profit of the Group rose by 12.0% to € 9,823 million in 2016 (2015: € 8,768 million). This double-digit rate of increase was mainly driven by our Life Science business sector, which benefited from positive business performance and the acquisition of Sigma-Aldrich. The gross margin of the Group, i.e. gross profit as a percentage of sales, declined to 65.4% (2015: 68.3%).

The increase in marketing and selling expenses as well as administration expenses was primarily due to the consolidation of Sigma-Aldrich. Owing to the termination of the co-promotion agreement with Pfizer for Rebif® in the United States at the end of 2015, marketing and selling expenses for our Healthcare business sector declined. Nevertheless, Group marketing and selling expenses increased overall due to the acquisition effects in Life Science.

In 2016, Group research and development costs increased by 15.6% to € 1,976 million. This was due mainly to the research activities in our Healthcare business sector and to the acquisition of Sigma-Aldrich. Accounting for 76% of Group R&D spending (2015: 77%), Healthcare is our most research-intensive business sector. At 13.2%, the Group research spending ratio (research and development costs as a percentage of sales) remained at the previous year's level (2015: 13.3%).

GROUP

Research and development costs by business sector – 2016

€ million / in %

In 2016, other operating expenses and income (net) showed an income balance of € 14 million; in 2015, an expense balance of € –447 million was reported. This positive development was driven in particular by the gain on the sale of the rights to Kuvan® (€ 330 million) and the divestment of a minority shareholding (€ 30 million) in our Healthcare business sector. Detailed information about the development and composition of other operating expenses and income can be found in Note [11] "Other operating income" and Note [12] "Other operating expenses" in the Notes to the Consolidated Financial Statements.

The operating result (EBIT) of the Group soared by € 637 million or 34.6% year-on-year to € 2,481 million.

In 2016, the negative financial result improved by € 30 million to € –326 million, mainly owing to lower exchange rate losses and a decrease in currency hedging expenses from Group-internal transactions. At € –270 million, the interest result contained in the financial result was on par with the previous year (2015: € –271 million) (see Note [13] "Financial result" in the Notes to the Consolidated Financial Statements).

Income tax expenses of € 521 million (2015: € 368 million) led to an effective tax rate of 24.2% (2015: 24.8%). More information about income taxes can be found in Note [14] "Income taxes" in the Notes to the Consolidated Financial Statements.

Profit after tax of discontinued operations reported in 2015 comprises the business activities of Sigma-Aldrich acquired with a view to resale (see also Note [4] "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements). Net income, i.e. profit after tax attributable to shareholders of Merck KGaA, Darmstadt, Germany, for 2016 was € 1,629 million (2015: € 1,115 million), resulting in earnings per share of € 3.75 (2015: € 2.56).

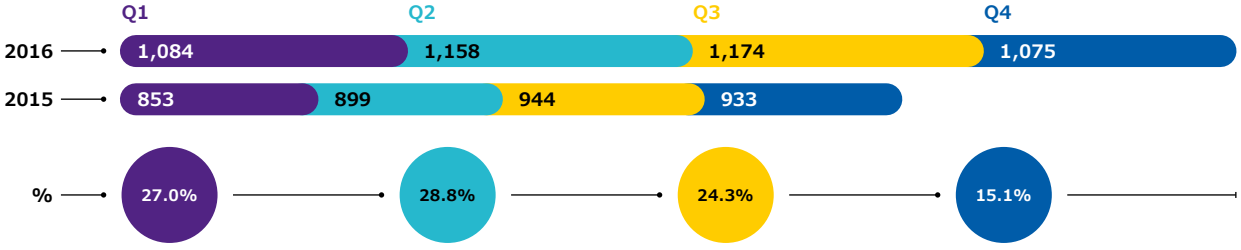
EBITDA pre exceptionals, the key financial indicator used to steer operating business, grew by € 861 million or 23.7% to € 4,490 million (2015: € 3,630 million). The resulting EBITDA margin pre exceptionals thus increased by nearly two percentage points to 29.9% (2015: 28.3%). The reconciliation of the operating result (EBIT) to EBITDA pre exceptionals is presented in the chapter entitled "Internal Management System".

The development of EBITDA pre exceptionals in the individual quarters in comparison with 2015 as well as the respective growth rates are presented in the following overview:

GROUP

EBITDA pre exceptionals and change by quarter[1]

€ million / change in %



[1] Quarterly breakdown unaudited.

The increase in Group EBITDA pre exceptionals was driven especially by our Life Science business sector, which in 2016 generated an increase of € 796 million or 93.0% to € 1,652 million (2015: € 856 million). Consequently, the share of Group EBITDA pre exceptionals accounted for by Life Science (excluding the € –396 million decline due to Corporate and Other) rose significantly to 34% (2015: 22%). Yet EBITDA pre exceptionals of our Healthcare business sector also rose by 6.3% to € 2,128 million (2015: € 2,002 million). In 2016, Healthcare generated a 43% share of this Group key indicator, thus remaining our company's most profitable business sector in absolute terms. EBITDA pre exceptionals of the Performance Materials business sector decreased slightly to € 1,106 million and did not fully reach the high year-earlier level (2015: € 1,132 million). The percentage contribution of Performance Materials to Group EBITDA pre exceptionals declined in 2016 to 23% (2015: 28%).

GROUP

EBITDA pre exceptionals by business sector – 2016

€ million / in %

Not presented: Decline in Group EBITDA pre exceptionals by € –396 million due to Corporate and Other.

Net assets and financial position

GROUP

Balance sheet structure

	Dec. 31, 2016		Dec. 31, 2015[1]		Change	
	€ million	**in %**	€ million	in %	€ million	in %
Non-current assets	**30,582**	**79.9%**	**30,737**	**80.7%**	**–155**	**–0.5%**
of which:						
Intangible assets	24,989		25,422		–433	
Property, plant and equipment	4,230		4,008		222	
Other non-current assets	1,363		1,308		55	
Current assets	**7,670**	**20.1%**	**7,344**	**19.3%**	**325**	**4.4%**
of which:						
Inventories	2,607		2,610		–3	
Trade accounts receivable	2,889		2,738		151	
Current financial assets	145		227		–82	
Other current assets	1,089		937		152	
Cash and cash equivalents	939		832		107	
Total assets	**38,251**	**100.0%**	**38,081**	**100.0%**	**170**	**0.4%**
Equity	**14,050**	**36.7%**	**12,855**	**33.8%**	**1,195**	**9.3%**
Non-current liabilities	**15,115**	**39.5%**	**15,842**	**41.6%**	**–727**	**–4.6%**
of which:						
Provisions for pensions and other post-employment benefits	2,313		1,836		477	
Other non-current provisions	834		855		–22	
Non-current financial liabilities	8,809		9,616		–807	
Other non-current liabilities	3,159		3,535		–376	
Current liabilities	**9,086**	**23.8%**	**9,384**	**24.6%**	**–298**	**–3.2%**
of which:						
Current provisions	412		536		–124	
Current financial liabilities	3,788		4,097		–309	
Trade accounts payable	2,048		1,921		127	
Other current liabilities	2,838		2,830		8	
Total liabilities and equity	**38,251**	**100.0%**	**38,081**	**100.0%**	**170**	**0.4%**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements.

The total assets of the Group amounted to € 38,251 million as of December 31, 2016. This represents an increase of € 170 million or 0.4% over December 31, 2015 (€ 38,081 million).

Despite the expansion of the operating businesses, at € 3,486 million working capital remained at the level of 2015.

GROUP

Working capital

			Change	
€ million	**Dec. 31, 2016**	Dec. 31, 2015[1]	€ million	in %
Trade accounts receivable	2,889	2,738	151	5.5%
Receivables from royalties and licenses	38	11	26	>100.0%
Inventories	2,607	2,610	–3	–0.1%
Trade accounts payable	–2,048	–1,921	–127	6.6%
Working capital	**3,486**	**3,438**	**47**	**1.4%**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements.

Net financial debt, which rose sharply in 2015 owing to the acquisition of Sigma-Aldrich, was lowered in 2016 by € 1,141 million to € 11,513 million (December 31, 2015: € 12,654 million). The composition and the development of net financial debt were as follows:

GROUP

Net financial debt

			Change	
€ million	**Dec. 31, 2016**	Dec. 31, 2015	€ million	in %
Bonds and commercial paper	9,650	9,851	–201	–2.0%
Bank loans	1,978	3,006	–1,028	–34.2%
Liabilities to related parties	758	578	180	31.1%
Loans from third parties and other financial liabilities	80	89	–10	–10.9%
Liabilities from derivatives (financial transactions)	128	184	–55	–30.2%
Finance lease liabilities	4	5	–1	–25.0%
Financial liabilities	**12,597**	**13,713**	**–1,116**	**–8.0%**
less				
Cash and cash equivalents	939	832	107	12.8%
Current financial assets	145	227	–82	–36.0%
Net financial debt	**11,513**	**12,654**	**–1,141**	**–9.0%**

GROUP

Reconciliation of net financial debt

€ million	2016	2015
January 1	**12,654**	**559**
Currency translation difference	118	–737
Dividend payments to shareholders and to E. Merck KG, Darmstadt, Germany[1]	600	568
Acquisitions[1]	156	13,482
Assumption of financial liabilities from Sigma-Aldrich	–	425
Payment from the disposal of assets held for sale and from other divestments[1]	–366	–86
Free cash flow	–1,693	–1,539
Other	44	–19
December 31	**11,513**	**12,654**

[1] According to the consolidated cash flow statement.

The strong increase in pension provisions to € 2,313 million (December 31, 2015: € 1,836 million) was mainly attributable to the required reduction in the discount rate when calculating the present value of the defined benefit obligations. The resulting actuarial losses were recognized in the Consolidated Statement of Comprehensive Income and, taking into account deferred taxes, lowered the equity of the Group as of December 31, 2016. In addition, dividend payments and the profit transfer to E. Merck KG, Darmstadt, Germany, caused equity to decline. These equity-lowering effects were more than offset by the profit after tax amounting to € 1,633 million and the development of currency translation differences from the translation of assets held in foreign currencies into euro, the reporting currency. Consequently, equity increased in 2016 by € 1,195 million to € 14,050 million (December 31, 2015: € 12,855 million) (see "Consolidated Statement of Comprehensive Income" and "Consolidated Statement of Changes in Net Equity" in the Consolidated Financial Statements). Thanks to the sharp increase in equity, the equity ratio rose by nearly three percentage points, amounting to 36.7% as of December 31, 2016 (December 31, 2015: 33.8%).

Driven by the positive development of net cash flows from operating activities, free cash flow rose by 10.0% over 2015 to € 1,693 million, despite strong investment activity. The composition as well as the development of the relevant items are presented in the following table:

GROUP

Free cash flow

			Change	
€ million	2016	2015	€ million	in %
Cash flow from operating activities according to the cash flow statement	2,518	2,195	323	14.7%
Payments for investments in intangible assets	–132	–179	47	–26.3%
Payments from the disposal of intangible assets	2	27	–26	–93.4%
Payments for investments in property, plant and equipment	–716	–514	–202	39.3%
Payments from the disposal of property, plant and equipment	21	9	12	>100.0%
Free cash flow	**1,693**	**1,539**	**155**	**10.0%**

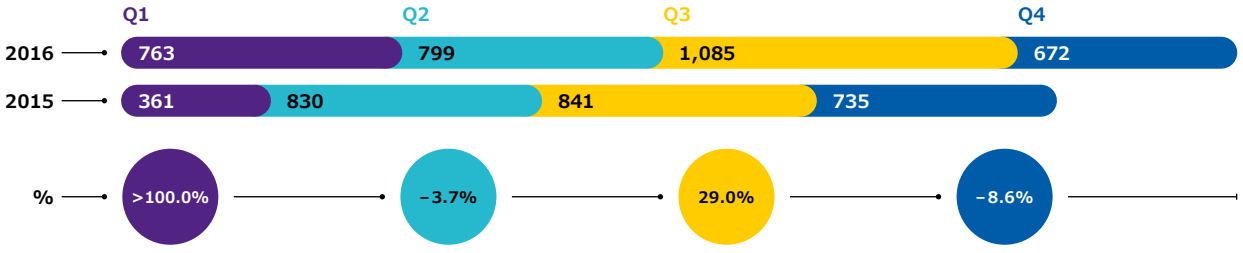
Business free cash flow of the Group rose in 2016 by 20.0% to € 3,318 million (2015: € 2,766 million). This was mainly driven by the positive development of EBITDA pre exceptionals. The composition of this financial indicator is presented in the Group management report under "Internal Management System".

The distribution of business free cash flow across the individual quarters and the percentage changes in comparison with 2015 were as follows:

GROUP

Business free cash flow and change by quarter[1]

€ million / change in %



[1] Quarterly breakdown unaudited.

GROUP

Business free cash flow by business sector – 2016

€ million / in %

Not presented: Decline in Group business free cash flow by € –485 million due to Corporate and Other.

All the business sectors contributed to the increase in Group business free cash flow in 2016. Healthcare generated business free cash flow of € 1,648 million (2015: € 1,581 million). Consequently, with a 43% share (2015: 50%) of Group business free cash flow (excluding the decline of € –485 million due to Corporate and Other) Healthcare was once again the business sector with the highest cash flows. In 2016, our Life Science business sector achieved a 69.3% increase in business free cash flow to € 1,144 million (2015: € 676 million), thus also increasing its share of Group business free cash flow to 30% (2015: 21%). Performance Materials contributed € 1,011 million (2015: € 931 million) to this Group financial indicator, equivalent to 27% (2015: 29%).

The investments in property, plant, equipment and software included in the calculation of business free cash flow as well as advance payments for intangible assets increased in 2016 by 41.1% to a total of € 859 million (2015: € 609 million). The investments in property, plant and equipment included therein amounted to € 722 million in 2016 (2015: € 564 million), € 332 million of which was attributable to strategic investment projects each with a project volume of more than € 2 million; the remainder was attributable to smaller capital spending projects.

In 2016, strategic investments of € 110 million were made to expand the Darmstadt site. Of this amount, € 39 million was used to upgrade global headquarters; the projects include an Innovation Center, a Visitor Center and an employee cafeteria, among other things. Moreover, OLED production capacity in our Performance Materials business sector was expanded with an investment of € 14 million in order to meet growing market demand. In our Healthcare business sector, investments included € 21 million in a new laboratory building for pharmaceutical research and € 10 million in a new packaging center.

Globally, our Healthcare business sector made significant strategic investments in a production facility in Nantong, China (€ 39 million), a new packaging plant at the Aubonne site in Switzerland (€ 16 million), an expansion of the existing filling plant at the Bari site in Italy (€ 11 million), and a new production unit for the Allergopharma business in Reinbek, Germany (€ 10 million).

In 2016, the outlooks for our long-term credit ratings were upgraded by the two rating agencies Moody's and Standard & Poor's. Our company currently has a rating of "A" with a stable

outlook (2015: "A" with a negative outlook) from Standard & Poor's and a "Baa1" rating with a stable outlook (2015: "Baa1" with a negative outlook) from Moody's. In 2016, the rating agency Scope began covering our credit rating and issued our company an "A-" rating 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 is as follows:

GROUP

Key balance sheet figures

in %		Dec. 31, 2016	Dec. 31, 2015[1]	Dec. 31, 2014	Dec. 31, 2013	Dec. 31, 2012
Equity ratio	Equity / Total assets	36.7%	33.8%	45.4%	53.2%	48.1%
Asset ratio	Non-current assets / Total assets	79.9%	80.7%	59.7%	64.5%	69.4%
Asset coverage	Equity / Non-current assets	45.9%	41.8%	76.0%	82.4%	69.4%
Finance structure	Current liabilities / Liabilities (total)	37.5%	37.2%	46.5%	40.0%	40.6%

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements.

Overall assessment of business performance and economic situation

For us, 2016 was another very successful year. The very good performance of operating business confirms our strategy. Despite growing global uncertainties, we reached or exceeded the objectives we had set for 2016. Group net sales showed profitable growth, reaching a new record level of € 15,024 million (2015: € 12,845 million). This was the outcome of both the company's own strengths and acquisitions. EBITDA pre exceptionals rose by 23.7% to € 4,490 million (2015: € 3,630 million), growing even more strongly than net sales, which increased in 2016 by 17.0%. Thanks to internal financing strength, we succeeded in lowering net financial debt from the Sigma-Aldrich acquisition by € 1,141 million.

Our three business sectors made significant progress in 2016. Healthcare advanced its pharmaceutical pipeline and achieved important milestones towards the market launch of new medicines. In 2016, Life Science generated a strong organic sales increase of 6.3%, thus growing faster than the market. The business sector was very successful in realizing the synergies from the Sigma-Aldrich integration in 2016. We made better progress than originally expected both in leveraging cost synergies and in realizing sales synergies. Our Performance Materials business sector again demonstrated its sound earnings resilience in 2016. Future-oriented investments further boosted the innovative strength of this business sector. Among other things, an OLED materials production unit was commissioned in Darmstadt in 2016. In addition, Performance Materials sustainably secured its market leadership in Display Materials.

Our solid accounting and finance policy is reflected by the very good key balance sheet figures. The equity ratio, which improved to 36.7% as of December 31, 2016, is at a very good level. The rapid reduction of net financial debt, which rose massively in 2015 owing to the acquisition of Sigma-Aldrich, remains a key priority. This is also reflected by the improved assessments of the two rating agencies Standard & Poor's ("A" with a stable outlook; 2015: "A" with a negative outlook) and Moody's ("Baa1" with a stable outlook; 2015: "Baa1" with a negative outlook). In 2016, the rating agency Scope began covering the Group's credit rating and issued our company an "A-" rating with a stable outlook.

Against the backdrop of the solid net assets and financial position as well as the earnings strength of the businesses, we assess the economic position of the Group very positively. The excellent condition we are in offers a superb foundation for the achievement of further sustainable and profitable growth.

Healthcare

HEALTHCARE

Key figures

€ million	2016	2015	Change € million	Change in %
Net sales	6,855	6,934	–79	–1.1%
Operating result (EBIT)	1,593	1,097	497	45.3%
Margin (% of net sales)[1]	23.2%	15.8%		
EBITDA	2,425	1,970	454	23.0%
Margin (% of net sales)[1]	35.4%	28.4%		
EBITDA pre exceptionals	2,128	2,002	126	6.3%
Margin (% of net sales)[1]	31.0%	28.9%		
Business free cash flow	1,648	1,581	67	4.2%

Development of net sales and results of operations

In 2016, our Healthcare business sector generated organic sales growth of 4.6%. Negative exchange rate effects of –4.6% and a negative portfolio effect of –1.1% led to an overall decline in net sales of –1.1% to € 6,855 million (2015: € 6,934 million). Nearly all the franchises contributed to the business sector's organic growth. In particular, products to treat infertility (Gonal-f®), thyroid disorders (Euthyrox®), growth disorders (Saizen®), and the strategic core brand Neurobion® from the Consumer Health business performed well in 2016. Erbitux®, the business sector's second-largest product in terms of sales, also generated slight organic sales growth. Only Rebif®, the top-selling drug within Healthcare, sustained a slight organic decline. The negative exchange rate effects were mainly due to the development of Latin American currencies. However, the decline in the value of the British pound against the euro also contributed slightly to the exchange rate effects. The negative portfolio effect was attributable to the return of the rights to Kuvan® to BioMarin Pharmaceutical, Inc., USA, at the beginning of 2016.

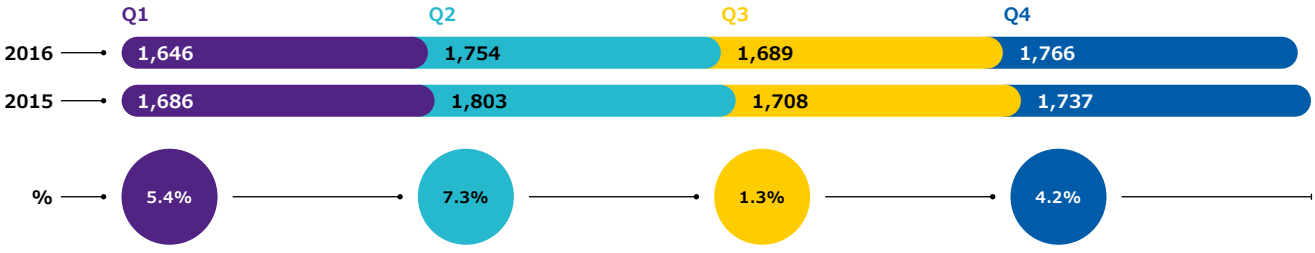
Commission income, which is also included in net sales, rose to € 178 million in 2016 (2015: € 103 million). The increase was driven in particular by profit-sharing from the co-commercialization of Xalkori® with Pfizer, Inc., USA. The agreement reached with Bristol-Myers Squibb Company, USA, in 2013 on the co-promotion of Glucophage® in China continued to have a positive effect on commission income.

The development of sales in the individual quarters as well as the respective organic growth rates in 2016 are presented in the following overview:

HEALTHCARE

Net sales and organic growth by quarter[1]

€ million/organic growth in %

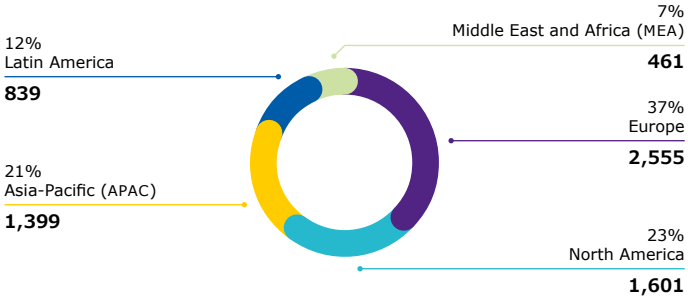


[1] Quarterly breakdown unaudited.

HEALTHCARE

Net sales by region – 2016

€ million/% of net sales of the business sector



Europe, which remained our Healthcare business sector's largest region accounting for 37% of net sales (2015: 39%), registered an organic sales decline of –2.5%. Consequently, net sales totaled € 2,555 million (2015: € 2,729 million). The organic decline was driven in particular by the continued difficult competitive situation for both Rebif® and Erbitux®. Furthermore, negative exchange rate effects of –1.6% and a portfolio effect of –2.3% resulted in an overall decline in net sales of –6.4%.

In North America, the second-largest region in terms of sales, organic growth of 11.1% led to net sales of € 1,601 million (2015: € 1,430 million). This development was mainly driven by the double-digit organic growth of Gonal-f®, a hormone used in the treatment of infertility, due to the favorable competitive situation that we benefited from throughout 2016. Organic and currency-related sales growth of Rebif® as well as organic sales growth of Saizen® continued to have a positive effect on the performance of sales in this region. North America's contribution to net sales of our Healthcare business sector thus increased to 23% (2015: 21%).

In the Asia-Pacific region, organic sales growth of 9.4% was recorded in 2016. This development was mainly attributable to higher sales of Gonal-f® and Euthyrox®, higher commission income from the co-promotion of Glucophage® with Bristol-Myers Squibb in China, as well as the growth of the Consumer Health business. In 2016, this region's share of the business sector's net sales further increased to 21% (2015: 19%).

Sales in Latin America amounted to € 839 million in 2016 and were thus below the previous year's level (2015: € 1,022 million). Positive organic growth of 7.7% could not offset the negative foreign exchange impact of –25.5%. Organic growth was generated by all franchises, in particular with Rebif®, Erbitux® and Euthyrox®, as well as in the Consumer Health business with the strategic brand Neurobion®. Overall, Asia-Pacific's contribution to the net sales of our Healthcare business sector declined to 12% (2015: 15%).

In 2016, the Middle East and Africa region achieved organic sales growth of 5.5%, with net sales totaling € 461 million (2015: € 450 million). Double-digit organic growth in particular with Rebif®, Erbitux®, Concor®, and Euthyrox® compensated for the organic decline in sales of Glucophage® and negative exchange rate effects of –1.8%.

HEALTHCARE

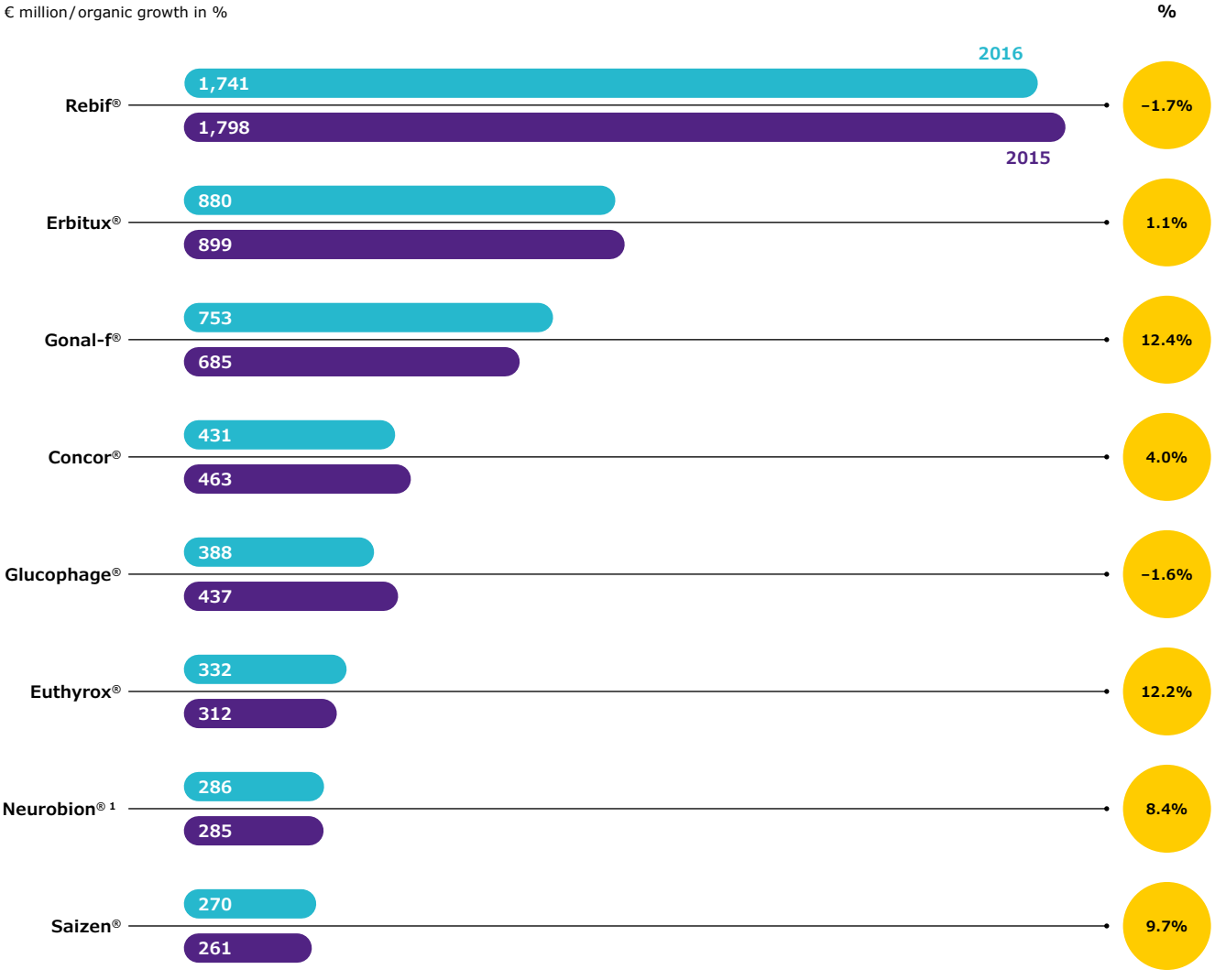
Net sales components by region – 2016

€ million/change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions/ divestments	Total change
Europe	2,555	–2.5%	–1.6%	–2.3%	–6.4%
North America	1,601	11.1%	0.8%	–	11.9%
Asia-Pacific (APAC)	1,399	9.4%	–1.2%	–0.8%	7.4%
Latin America	839	7.7%	–25.5%	–0.1%	–17.9%
Middle East and Africa (MEA)	461	5.5%	–1.8%	–1.2%	2.4%
Healthcare	**6,855**	**4.6%**	**–4.6%**	**–1.1%**	**–1.1%**

Net sales and organic growth rates of the key products developed in 2016 as follows:

HEALTHCARE

Product sales and organic growth



[1] Previous year's figure has been adjusted.

Sales of the drug Rebif®, which is used to treat relapsing forms of multiple sclerosis, only sustained a slight organic sales decline of –1.7% in 2016 despite continued competitive pressure from oral formulations. Including negative exchange rate effects of –1.5%, sales totaled € 1,741 million (2015: € 1,798 million).

The North America region, which generated 61% of Rebif® sales (2015: 58%) and is the largest market for this product, delivered organic growth of 2.1%. This was primarily due to favorable price developments in the United States in 2016, which slightly offset the decline in volumes.

In Europe, which accounts for 30% of sales (2015: 34%) and is our Healthcare business sector's second largest region, sales saw a significant organic decline of –12.2% to € 524 million (2015: € 605 million). This development was due in particular to the difficult competitive situation and the associated decline in volumes.

Together, the remaining regions Latin America, Middle East and Africa, and Asia-Pacific generated € 145 million (2015: € 151 million) in Rebif® sales, equivalent to a 9% share (2015: 8%).

In 2016, sales of the oncology drug Erbitux® totaled € 880 million (2015: € 899 million). Organic growth of 1.1% was fully canceled out by negative foreign exchange effects of – 3.2%.

In Europe, which accounted for 54% of Erbitux® sales (2015: 55%) and is thus the top-selling region for this product, sales decreased organically by – 3.4%. The organic decline was mainly attributable to the challenging competitive situation as well as mandatory price reductions in several countries. Including negative foreign exchange effects of –1.9%, sales in Europe declined to € 470 million (2015: € 496 million).

In the Asia-Pacific region, which accounted for a 32% (2015: 29%) share of net sales, Erbitux® sales increased to € 280 million (2015: 265 million). Here, both organic growth of 2.8% and currency tailwinds of 2.8% had a positive effect on the development of sales.

In Latin America, sales declined to € 73 million (2015: € 87 million) despite double-digit organic growth of 14.5%. This was due to negative foreign exchange effects of – 30.4%, which were predominantly attributable to the development of the Argentinian peso against the euro.

The Middle East and Africa region generated double-digit organic growth of 13.2%, with sales amounting to € 56 million (2015: € 50 million).

HEALTHCARE

Product sales and organic growth of Rebif® and Erbitux® by region – 2016

		Total	Europe	North America	Asia-Pacific (APAC)	Latin America	Middle East and Africa (MEA)
Rebif®	€ million	1,741	524	1,071	14	64	67
	Organic growth in %	–1.7%	–12.2%	2.1%	–11.7%	20.2%	15.3%
	% of sales	100%	30%	61%	1%	4%	4%
Erbitux®	€ million	880	470	–	280	73	56
	Organic growth in %	1.1%	– 3.4%	–	2.8%	14.5%	13.2%
	% of sales	100%	54%	–	32%	8%	6%

In 2016, our Healthcare business sector generated organic sales growth of 12.4% with Gonal-f®, the leading recombinant hormone used in the treatment of infertility. Taking negative foreign exchange effects of – 2.5% into account, sales of this product rose to € 753 million (2015: € 685 million). This development was mainly driven by organic growth of 47.7% in North America, as a consequence of the continued favorable competitive situation from which we benefited throughout 2016. Likewise, sales rose organically in the Asia-Pacific region by 9.6%, which more than offset the – 3.5% organic decline in sales in Europe. The other products in the Fertility portfolio also developed positively.

Sales by the Endocrinology franchise, which mainly consists of products to treat growth disorders, amounted to € 404 million and were thus lower than the previous year's level (2015: € 461 million). This decrease in sales was primarily due to the return of the rights to Kuvan® to BioMarin Pharmaceutical, which was reflected in the portfolio effect of –15.8% and canceled out organic growth of 6.7%. The growth hormone Saizen®, which is the top-selling product in the franchise, delivered organic growth of 9.7%, resulting in net sales of € 270 million (2015: € 261 million).

Sales by the General Medicine franchise (including CardioMetabolic Care), which commercializes products to treat cardiovascular diseases and diabetes, among other things, declined to € 1,720 million (2015: € 1,791 million[1]). Organic growth of 4.2% was canceled out by negative foreign exchange effects of –7.9%. In particular Euthyrox®, a drug to treat thyroid disorders, showed solid performance with organic growth of 12.2%. Including currency headwinds of –5.9%, this led to sales of € 332 million (2015: € 312 million), which were mainly driven by performance in the Chinese market. Product sales of Glucophage® fell owing to an organic decline of –1.6% and negative exchange rate effects of –9.4%. However, commission income for Glucophage® rose, amounting to € 106 million (2015: € 86 million), which corresponded to an organic increase of 24.3% and was also driven by performance in China. Concor® delivered organic growth of 4.0% in 2016. Currency headwinds of –10.9% were responsible for the year-on-year decline in sales to € 431 million (2015: € 463 million).

The Consumer Health business with over-the-counter pharmaceuticals posted organic sales growth of 3.4% in 2016. Owing to negative exchange rate effects, net sales declined to € 860 million (2015: € 905 million[1]). In particular, the strategic brand Neurobion® contributed to organic growth.

The results of operations developed as follows:

HEALTHCARE

Results of operations

					Change	
€ million	**2016**	**in %**	2015	in %	€ million	in %
Net sales	**6,855**	**100.0%**	**6,934**	**100.0%**	**–79**	**–1.1%**
Cost of sales	–1,377	–20.1%	–1,442	–20.8%	66	–4.6%
(of which: amortization of intangible assets)[2]	*(–1)*		*(–1)*		*(–)*	*(–1.6%)*
Gross profit	**5,478**	**79.9%**	**5,491**	**79.2%**	**–13**	**–0.2%**
Marketing and selling expenses	–2,587	–37.7%	–2,801	–40.4%	214	–7.6%
(of which: amortization of intangible assets)[2]	*(–565)*		*(–566)*		*(–)*	*(–0.1%)*
Administration expenses	–270	–3.9%	–259	–3.7%	–10	4.0%
Research and development costs	–1,496	–21.8%	–1,310	–18.9%	–186	14.2%
(of which: amortization of intangible assets)[2]	*(–1)*		*(–1)*		*(–)*	*(1.4%)*
Other operating expenses and income	468	6.8%	–24	–0.3%	492	>100.0%
Operating result (EBIT)	**1,593**	**23.2%**	**1,097**	**15.8%**	**497**	**45.3%**
Depreciation/amortization/impairment losses/ reversals of impairment losses	831	12.1%	874	12.6%	–42	–4.9%
(of which: exceptionals)	*(71)*		*(90)*		*(–19)*	*(–21.0%)*
EBITDA	**2,425**	**35.4%**	**1,970**	**28.4%**	**454**	**23.0%**
Restructuring costs	12		30		–18	–59.7%
Integration costs/IT costs	18		1		17	>100.0%
Gains/losses on the divestment of businesses	–330		–		–330	–
Acquisition-related exceptionals	–		–		–	–
Other exceptionals	3		–		3	–
EBITDA pre exceptionals	**2,128**	**31.0%**	**2,002**	**28.9%**	**126**	**6.3%**

[2] Excluding amortization of internally generated or separately acquired software.

In 2016, the gross profit of our Healthcare business sector amounted to € 5,478 million (2015: € 5,491 million), thus remaining stable at the previous year's level despite the slight decline in sales. The resulting gross margin increased slightly to 79.9% (2015: 79.2%).

Marketing and selling expenses decreased to € 2,587 million (2015: € 2,801 million), which was primarily due to the termination of the co-promotion agreement with Pfizer for Rebif® in the United States at the end of 2015.

[1] The previous year's figures have been adjusted due to product transfers from Biopharma to Consumer Health in India and Latin America as of January 1, 2016.

The ratio of research and development spending to net sales rose to 21.8% (2015: 18.9%), reflecting higher R&D costs of € 1,496 million in 2016 (2015: € 1,310 million). The increase was due to projects in clinical development, in particular in immuno-oncology among other things as part of the avelumab program. In addition, work on early-stage projects was intensified. The release of provisions for the follow-on costs of discontinued R&D projects had a positive effect. In 2016, provisions amounting to € 57 million were released. These were originally set up in connection with the termination of clinical development projects in previous years, for example evofosfamide.

The changes in other operating income and expenses mainly reflect items eliminated in the calculation of EBITDA pre exceptionals. Other operating expenses and income included, among other things, the impairment loss on the co-commercialization right for Xalkori® (€ 71 million) as well as the gain from returning the rights to Kuvan® to BioMarin Pharmaceutical (€ 330 million) and the divestment of a minority shareholding (€ 30 million). In addition, royalty and license income for Avonex® and Plegridy® (both Biogen Inc.) reported under other operating income rose by € 47 million in comparison with 2015 owing to a patent granted at the end of June 2016 in the United States.

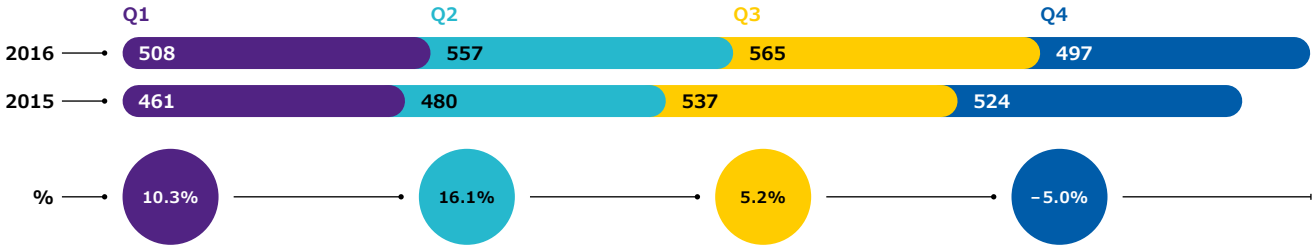
Overall, Healthcare generated an increase in EBITDA pre exceptionals to € 2,128 million (2015: € 2,002 million). The resulting EBITDA margin pre exceptionals was 31.0% (2015: 28.9%).

The development of EBITDA pre exceptionals in the individual quarters in comparison with 2015 is presented in the following overview:

HEALTHCARE

EBITDA pre exceptionals and change by quarter[1]

€ million/change in %



[1] Quarterly breakdown unaudited.

Development of business free cash flow

In 2016, business free cash flow of our Healthcare business sector amounted to € 1,648 million (2015: € 1,581 million). The increase in this key figure was primarily due to the rise in EBITDA pre exceptionals. Higher capital spending, driven in particular by investments at the Darmstadt site, reduced business free cash flow.

HEALTHCARE

Business free cash flow

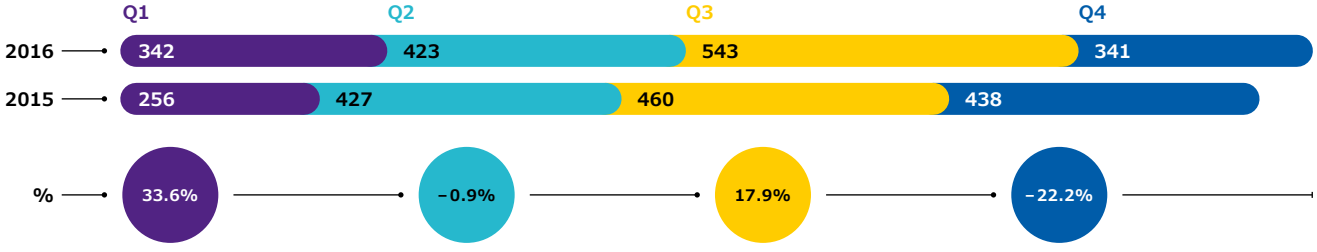
			Change	
€ million	**2016**	2015	€ million	in %
EBITDA pre exceptionals	2,128	2,002	126	6.3%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–348	–289	–59	20.4%
Changes in inventories	–38	–27	–11	40.5%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–94	–105	11	–10.2%
Business free cash flow	**1,648**	**1,581**	**67**	**4.2%**

The development of business free cash flow in the individual quarters in comparison with 2015 is presented in the following overview:

HEALTHCARE

Business free cash flow and change by quarter[1]

€ million / change in %



[1] Quarterly breakdown unaudited.

Life Science

LIFE SCIENCE

Key figures

€ million	2016	2015	Change € million	Change in %
Net sales	5,658	3,355	2,303	68.6%
Operating result (EBIT)	556	301	256	85.0%
Margin (% of net sales)	9.8%	9.0%		
EBITDA	1,378	674	704	>100.0%
Margin (% of net sales)	24.4%	20.1%		
EBITDA pre exceptionals	1,652	856	796	93.0%
Margin (% of net sales)	29.2%	25.5%		
Business free cash flow	1,144	676	468	69.3%

Development of sales and results of operations

In 2016, Life Science posted organic sales growth of 6.3%. In addition to organic growth, sales increased by 63.1% or € 2,119 million due to the acquisition of Sigma-Aldrich whereas foreign exchange had a slightly negative impact of –0.8% or € –28 million. Taking these effects into account, Life Science net sales increased overall by 68.6% to € 5,658 million in 2016 (2015: € 3,355 million).

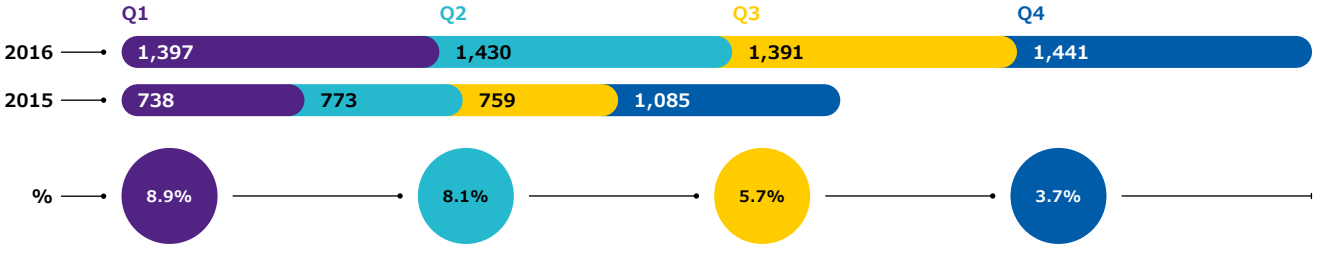
All three business areas contributed favorably to the organic growth of our Life Science business sector in 2016. In particular, the Process Solutions business area generated double-digit organic sales growth of 10.5%, thanks to high demand across the portfolio. Applied Solutions continued to perform well, posting organic growth of 4.3%. Research Solutions generated an organic increase of 1.2%.

The development of sales in the individual quarters are presented in the following overview:

LIFE SCIENCE

Net sales and organic growth by quarter[1]

€ million/organic growth in %

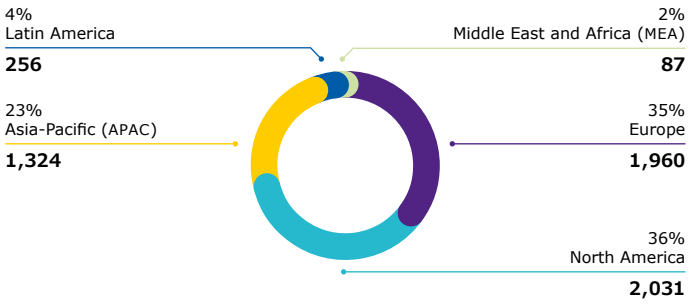


[1] Quarterly breakdown unaudited.

LIFE SCIENCE

Net sales by region – 2016

€ million/% of net sales of the business sector



From a geographic perspective, all regions – with the exception of North America – contributed positively to the organic sales growth of Life Science.

In Europe, sales increased organically by 11.0%, with the Process Solutions and Research Solutions business areas generating double-digit organic growth of 16.9% and 10.4%, respectively, while Applied Solutions posted moderate organic growth of 3.2%. Overall, sales in Europe increased to € 1,960 million (2015: € 1,168 million), which in addition to organic growth included a sales increase of € 677 million due to the Sigma-Aldrich acquisition, corresponding to an overall contribution of 35% (2015: 35%) of Life Science net sales in 2016.

North America was our Life Science business sector's largest geographic market, accounting for 36% (2015: 33%) of net sales. The organic sales decline of –1.3% in North America was primarily attributable to Research Solutions and soft market demand in the region. By contrast, Applied Solutions and Process Solutions contributed positively to organic growth. Overall, sales in North America rose to € 2,031 million (2015: € 1,098 million), which in addition to organic growth includes an acquisition-related increase of € 936 million due to Sigma-Aldrich as well as a slightly positive exchange rate effect.

Within Asia-Pacific, sales grew organically by 8.1%, with all businesses contributing favorably. Growth was primarily driven by Process Solutions. Overall, sales in Asia-Pacific rose to € 1,324 million (2015: € 831 million), which in addition to organic growth includes an acquisition-related sales increase of € 420 million due to the acquisition of Sigma-Aldrich, representing an overall contribution of 23% (2015: 25%) to Life Science net sales in 2016.

In Latin America, Life Science reported double-digit organic growth of 12.7%, primarily driven by the Applied Solutions business area. In addition to organic growth, the acquisition-related sales contribution by Sigma-Aldrich increased sales by € 55 million to € 256 million (2015: € 203 million). Currency headwinds of –13.9% lowered sales growth. Latin America accounted for 4% (2015: 6%) of Life Science net sales in 2016.

The Middle East and Africa (MEA) region posted strong organic sales growth of 6.9%. Net sales for the region grew to € 87 million (2015: € 55 million) and included a sales increase of € 31 million due to the acquisition of Sigma-Aldrich.

LIFE SCIENCE

Net sales components by region – 2016

€ million/change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions/ divestments	Total change
Europe	1,960	11.0%	–1.2%	58.0%	67.8%
North America	2,031	–1.3%	1.0%	85.2%	84.9%
Asia-Pacific (APAC)	1,324	8.1%	0.7%	50.5%	59.3%
Latin America	256	12.7%	–13.9%	26.9%	25.7%
Middle East and Africa (MEA)	87	6.9%	–4.5%	57.4%	59.8%
Life Science	**5,658**	**6.3%**	**–0.8%**	**63.1%**	**68.6%**

The Process Solutions business area, which markets products and services for the pharmaceutical production value chain, generated organic sales growth of 10.5%. Including the acquisition-related sales increase (€ 505 million), net sales amounted to € 2,146 million (2015: € 1,492 million). The share of sales generated by Process Solutions represented 38% (2015: 45%) of Life Science net sales. All Process Solutions businesses contributed to this strong performance.

The Research Solutions business area, which provides products and services to support life science research for pharmaceutical, biotechnology and academic research laboratories, posted slight organic growth of 1.2% in 2016. Research Solutions suffered weak demand in the Biology business and faced a difficult market environment in North America. However, including Sigma-Aldrich acquisition-related sales (€ 1,239 million), sales increased to € 2,055 million (2015: € 814 million) representing 36% (2015: 24%) of Life Science sales.

The Applied Solutions business area generated organic sales growth of 4.3% with its broad range of products for researchers and scientific laboratories. Taking the Sigma-Aldrich acquisition-related sales into account (€ 374 million), net sales amounted to € 1,457 million (2015: € 1,050 million). The sales performance of Applied Solutions was primarily driven by the Analytical and Biomonitoring portfolios.

LIFE SCIENCE

Net sales components by business area[1] – 2016

€ million/change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions/ divestments	Total change
Process Solutions	2,146	10.5%	–0.5%	33.9%	43.8%
Research Solutions	2,055	1.2%	–1.0%	152.3%	152.6%
Applied Solutions	1,457	4.3%	–1.1%	35.6%	38.8%

[1]The business areas were restructured in the context of the Sigma-Aldrich acquisition.

The results of operations developed as follows:

LIFE SCIENCE

Results of operations

					Change	
€ million	**2016**	**in %**	2015	in %	€ million	in %
Net sales	**5,658**	**100.0%**	**3,355**	**100.0%**	**2,303**	**68.6%**
Cost of sales	–2,679	–47.4%	–1,483	–44.2%	–1,197	80.7%
(of which: amortization of intangible assets)[1]	*(–63)*		*(–51)*		*(–12)*	*(23.6%)*
Gross profit	**2,978**	**52.6%**	**1,872**	**55.8%**	**1,106**	**59.1%**
Marketing and selling expenses	–1,706	–30.1%	–1,038	–31.0%	–667	64.2%
(of which: amortization of intangible assets)[1]	*(–453)*		*(–197)*		*(–256)*	*(>100.0%)*
Administration expenses	–248	–4.4%	–151	–4.5%	–96	63.8%
Research and development costs	–260	–4.6%	–197	–5.9%	–62	31.5%
(of which: amortization of intangible assets)[1]	*(–1)*		*(–1)*		*(–)*	*(1.0%)*
Other operating expenses and income	–209	–3.7%	–185	–5.5%	–24	13.3%
Operating result (EBIT)	**556**	**9.8%**	**301**	**9.0%**	**256**	**85.0%**
Depreciation/amortization/impairment losses/ reversals of impairment losses	822	14.5%	373	11.1%	448	>100.0%
(of which: exceptionals)	*(27)*		*(1)*		*(26)*	*(>100.0%)*
EBITDA	**1,378**	**24.4%**	**674**	**20.1%**	**704**	**>100.0%**
Restructuring costs	1		7		–6	–83.5%
Integration costs/IT costs	122		43		79	>100.0%
Gains/losses on the divestment of businesses	–		–		–	–
Acquisition-related exceptionals	150		132		18	14.0%
Other exceptionals	–		–		–	–
EBITDA pre exceptionals	**1,652**	**29.2%**	**856**	**25.5%**	**796**	**93.0%**

[1]Excluding amortization of internally generated or separately acquired software.

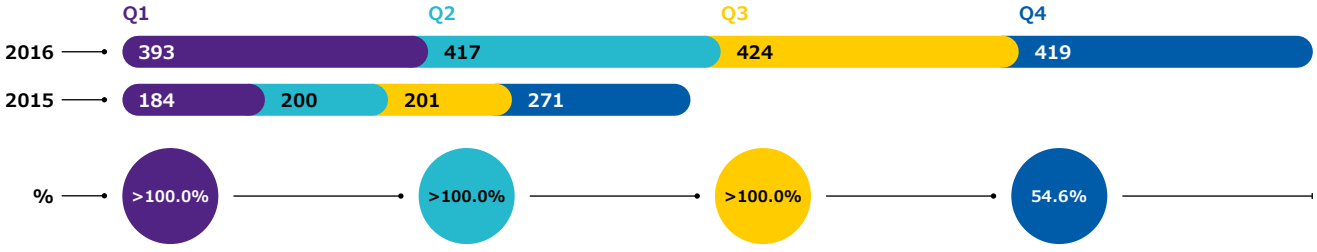
Throughout 2016, the primary focus for our Life Science business sector was the integration of Sigma-Aldrich. Gross profit rose by 59.1% to € 2,978 million (2015: € 1,872 million). This tremendous increase was mainly attributable to strong organic sales growth and the acquisition of Sigma-Aldrich. The increases in marketing and selling expenses, administration expenses and R&D costs in 2016 were mainly due to the consolidation of Sigma-Aldrich. As Life Science continues to integrate Sigma-Aldrich, spending is being closely monitored and there is a strong focus on the execution of synergy initiatives. In comparison with 2015, the operating result (EBIT) of Life Science rose by € 256 million to € 556 million. After eliminating depreciation and amortization, and adjusting for exceptionals, the key financial indicator EBITDA pre exceptionals rose by 93.0% to € 1,652 million (2015: € 856 million). This reflects the strong performance of both legacy life science businesses of our company and Sigma-Aldrich.

The development of EBITDA pre exceptionals in the individual quarters in comparison with 2015 is presented in the following overview:

LIFE SCIENCE

EBITDA pre exceptionals and change by quarter[1]

€ million / change in %



[1] Quarterly breakdown unaudited.

Development of business free cash flow

In 2016, the business free cash flow of our Life Science business sector amounted to € 1,144 million, which was 69.3% more than in 2015. This very strong increase was primarily due to the positive development of EBITDA pre exceptionals and was partially offset by higher capital spending.

LIFE SCIENCE

Business free cash flow

			Change	
€ million	**2016**	2015[1]	€ million	in %
EBITDA pre exceptionals	1,652	856	796	93.0%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–313	–150	–163	>100.0%
Changes in inventories	5	–840	845	>100.0%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–64	–375	311	–82.8%
Adjustments first-time consolidation of Sigma-Aldrich	–146	1,185	–1,331	>100.0%
Adjustments first-time consolidation of BioControl Systems	10	–	10	>100.0%
Business free cash flow	**1,144**	**676**	**468**	**69.3%**

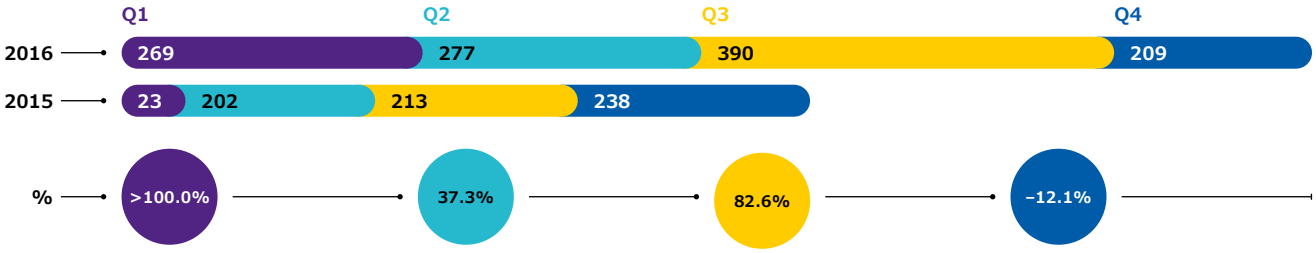
[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements.

The development of business free cash flow in the individual quarters in comparison with 2015 is presented in the following overview:

LIFE SCIENCE

Business free cash flow and change by quarter[1]

€ million/change in %



[1] Quarterly breakdown unaudited.

Performance Materials

PERFORMANCE MATERIALS

Key figures

€ million	**2016**	2015	Change € million	Change in %
Net sales	2,511	2,556	–45	–1.8%
Operating result (EBIT)	823	878	–55	–6.3%
Margin (% of net sales)	32.8%	34.4%		
EBITDA	1,077	1,120	–43	–3.9%
Margin (% of net sales)	42.9%	43.8%		
EBITDA pre exceptionals	1,106	1,132	–26	–2.3%
Margin (% of net sales)	44.1%	44.3%		
Business free cash flow	1,011	931	80	8.6%

Development of net sales and results of operations

In 2016, net sales of our Performance Materials business sector decreased by –1.8% to € 2,511 million (2015: € 2,556 million). This was mainly due to organic declines in sales (–4.7%) as Display Materials did not reach the level of 2015. The acquisition-related growth from the SAFC Hitech business of Sigma-Aldrich acquired in November 2015 (2.7%) only partially offset the organic decline in sales. Exchange rate effects of 0.2% had only a slight influence on sales in 2016.

The Display Materials business unit, consisting of the Liquid Crystals business and complementary materials, represented more than 50% of the overall net sales of Performance Materials. This business unit saw a significant organic decrease in sales, but continued to defend its market leadership position. The sales decline in 2016 is based on a strong preceding year with consistently high demand for display materials. Despite signs of a recovery, demand remained at a lower level in 2016, among other things as a result of destocking by display industry customers. An exception was the energy-saving UB-FFS technology, which generated double-digit growth along with record sales in the fourth quarter.

The Integrated Circuit Materials (ICM) business unit generated strong organic sales growth, to which all businesses contributed. Particularly high growth rates were generated in the businesses with dielectric materials and deposition materials for chip production. In addition, sales of materials for chemical-mechanical planarization (CMP) of silicon wafers developed well.

The Pigments & Functional Materials business unit generated solid organic growth in 2016. Xirallic® pigments, which are used particularly in automotive coatings, as well as cosmetic actives and technical functional materials contributed significantly to the sales increase.

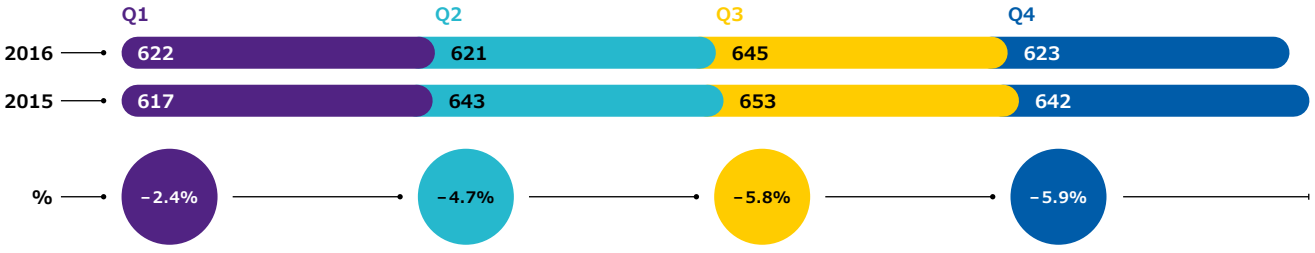
Growth in the Advanced Technologies business unit was fueled by double-digit sales increases in OLED materials.

The development of sales in the individual quarters as well as the respective organic growth rates in 2016 are presented in the following overview:

PERFORMANCE MATERIALS

Net sales and organic growth by quarter[1]

€ million / organic growth in %

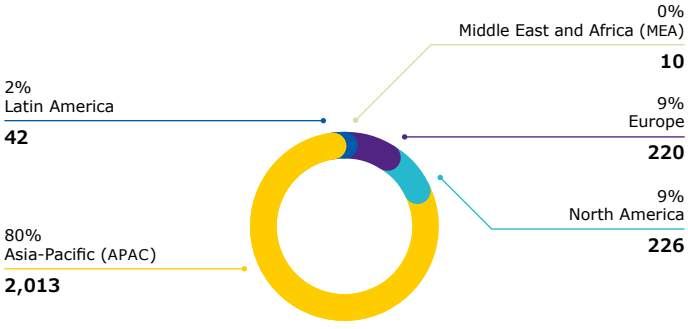


[1] Quarterly breakdown unaudited.

PERFORMANCE MATERIALS

Net sales by region – 2016

€ million / % of net sales of the business sector



With an 80% share (2015: 82%), the Asia-Pacific region once again accounted for the vast majority of the business sector's net sales. This is due to the concentration of customers for display and integrated circuit materials in Asia. In this region, sales declined to € 2,013 million (2015: € 2,107 million). Organically, sales decreased by –6.6% owing to the performance of the Display Materials business unit. The increases in sales of IC and OLED materials and of Pigments & Functional Materials could not compensate for this.

In North America, the double-digit increase in sales to € 226 million was fueled by the SAFC Hitech business of Sigma-Aldrich (2015: € 194 million). Organically, sales reached the previous year's level. The slight growth in Pigments & Functional Materials was canceled out by declines in the other business units.

In Europe, Performance Materials generated sales of € 220 million (2015: € 206 million). The organic sales increase of 5.2% was generated by functional materials and Xirallic® pigments in the Pigments & Functional Materials business unit as well as by process materials in the IC Materials business unit.

Since they account for a low proportion of sales, the two regions Latin America and Middle East and Africa (MEA) played a subordinate role. Whereas Latin America continued to show double-digit organic growth at a low overall level, the sales improvement in the Middle East and Africa region was primarily acquisition-related.

PERFORMANCE MATERIALS

Net sales components by region – 2016

€ million/change in %	Net sales	Organic growth	Exchange rate effects	Acquisitions/ divestments	Total change
Europe	220	5.2%	–0.4%	2.0%	6.9%
North America	226	–0.3%	0.9%	15.7%	16.3%
Asia-Pacific (APAC)	2,013	–6.6%	0.6%	1.6%	–4.5%
Latin America	42	21.0%	–16.8%	–	4.3%
Middle East and Africa (MEA)	10	8.0%	–2.6%	23.5%	28.8%
Performance Materials	**2,511**	**–4.7%**	**0.2%**	**2.7%**	**–1.8%**

The results of operations developed as follows:

PERFORMANCE MATERIALS

Results of operations

					Change	
€ million	**2016**	**in %**	2015	in %	€ million	in %
Net sales	**2,511**	**100.0%**	**2,556**	**100.0%**	**–45**	**–1.8%**
Cost of sales	–1,145	–45.6%	–1,151	–45.1%	7	–0.6%
(of which: amortization of intangible assets)[1]	*(–118)*		*(–115)*		*(–3)*	*(2.4%)*
Gross profit	**1,366**	**54.4%**	**1,404**	**54.9%**	**–38**	**–2.7%**
Marketing and selling expenses	–233	–9.3%	–208	–8.1%	–25	12.0%
(of which: amortization of intangible assets)[1]	*(–13)*		*(–16)*		*(3)*	*(–16.2%)*
Administration expenses	–61	–2.4%	–63	–2.5%	3	–4.1%
Research and development costs	–213	–8.5%	–197	–7.7%	–16	8.0%
(of which: amortization of intangible assets)[1]	*(–2)*		*(–1)*		*(–2)*	*(>100.0%)*
Other operating expenses and income	–37	–1.5%	–58	–2.3%	21	–36.3%
Operating result (EBIT)	**823**	**32.8%**	**878**	**34.4%**	**–55**	**–6.3%**
Depreciation/amortization/impairment losses/ reversals of impairment losses	254	10.1%	242	9.5%	12	4.8%
(of which: exceptionals)	*(16)*		*(–)*		*(16)*	*(>100.0%)*
EBITDA	**1,077**	**42.9%**	**1,120**	**43.8%**	**–43**	**–3.9%**
Restructuring costs	1		2		–1	–70.7%
Integration costs/IT costs	26		15		11	73.0%
Gains/losses on the divestment of businesses	–		–6		6	>100.0%
Acquisition-related exceptionals	3		1		2	>100.0%
Other exceptionals	–		–		–	–
EBITDA pre exceptionals	**1,106**	**44.1%**	**1,132**	**44.3%**	**–26**	**–2.3%**

[1] Excluding amortization of internally generated or separately acquired software.

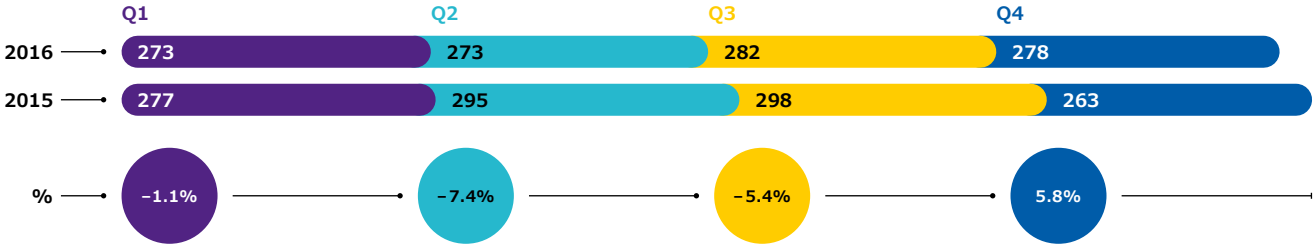
In 2016, gross profit was € 38 million below the previous year's level, leading to a gross margin of 54.4% (2015: 54.9%). The operating result (EBIT) decreased by € 55 million to € 823 million in 2016 (2015: € 878 million). Apart from the sales-related decline in gross profit, the main reasons for the decrease were higher marketing and selling expenses as well as additional research costs attributable to the SAFC Hitech business from the Sigma-Aldrich acquisition. EBITDA pre exceptionals amounted to € 1,106 million, which was € 26 million lower than in the previous year (2015: € 1,132 million). Yet the EBITDA margin pre exceptionals of 44.1% almost reached the good year-earlier level (2015: 44.3%).

The development of EBITDA pre exceptionals in the individual quarters in comparison with 2015 is presented in the following overview:

PERFORMANCE MATERIALS

EBITDA pre exceptionals and change by quarter[1]

€ million/change in %



[1] Quarterly breakdown unaudited.

Development of business free cash flow

In 2016, the business free cash flow of our Performance Materials business sector increased to € 1,011 million (2015: € 931 million). This improvement was mainly attributable to significant inventory reductions, which more than offset the decline in EBITDA pre exceptionals.

PERFORMANCE MATERIALS

Business free cash flow

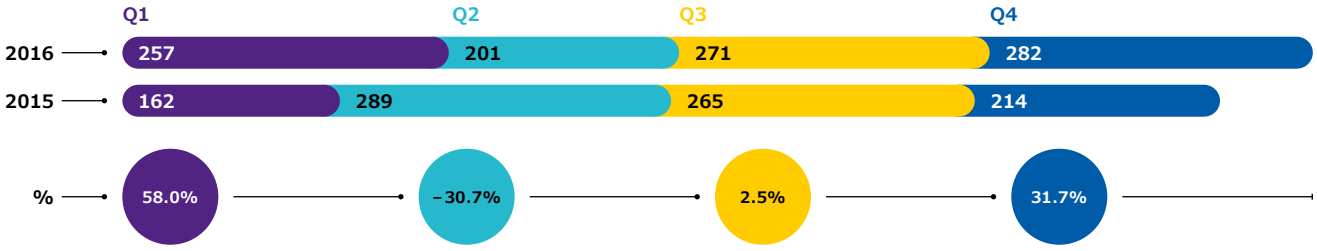
			Change	
€ million	**2016**	2015	€ million	in %
EBITDA pre exceptionals	1,106	1,132	–26	–2.3%
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–109	–109	–	–
Changes in inventories	35	–83	119	>100.0%
Changes in trade accounts receivable as well as receivables from royalties and licenses	–19	–34	15	–44.7%
Adjustments first-time consolidation of Sigma-Aldrich	–3	25	–28	>100.0%
Business free cash flow	**1,011**	**931**	**80**	**8.6%**

The development of business free cash flow in the individual quarters in comparison with 2015 is presented in the following overview:

PERFORMANCE MATERIALS

Business free cash flow and change by quarter[1]

€ million / change in %



[1] Quarterly breakdown unaudited.

Corporate and Other

Corporate and Other comprises Group administration expenses for 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.

CORPORATE AND OTHER

Key figures

			Change	
€ million	**2016**	2015	€ million	in %
Operating result (EBIT)	–492	–432	–60	13.8%
EBITDA	–465	–411	–54	13.1%
EBITDA pre exceptionals	–396	–360	–36	10.0%
Business free cash flow	–485	–421	–64	15.1%

In 2016, administration expenses reported under Corporate and Other amounted to € 276 million (2015: € 246 million). Other operating expenses (net) rose to € –207 million (2015: € –180 million), particularly as a result of higher expenses from exceptionals, for example costs of special IT projects or environmental protection measures for businesses divested in prior years. Consequently, in 2016 the operating result (EBIT) amounted to € –492 million (2015: € –432 million) and EBITDA was € –465 million (2015: € –411 million). Adjusted for exceptionals, EBITDA pre exceptionals totaled € –396 million (2015: € –360 million). The increase in negative EBITDA pre exceptionals and higher capital spending had a significant impact on the development of business free cash flow, which amounted to € –485 million in 2016 (2015: € –421 million).

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

We are part of a complex, global business world and are 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. 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 corporate bodies on an ad hoc basis.

For reporting risks with a potential negative impact on our EBIT, a 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, 2016. 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 in relation to sales, EBITDA pre exceptionals 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 IFRS (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 of 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, reimbursement and approval

In our Healthcare business sector, the known trend towards increasingly restrictive requirements in terms of drug pricing, reimbursement and approval 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 and new approvals. 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 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 as well as 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 and Brazil, 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 imminent exit from the European Union ("Brexit") gives rise to risks such as the decline in the value of the British pound, weaker economic activity in the United Kingdom, regulatory changes, and the creation of trade barriers such as import duties, which could have an impact on our profitability. To analyze these risks and to counteract them in a timely and targeted manner, an internal working group has been set up. 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 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 increasingly being used in more and more large-area displays, such as televisions. High-quality lighting applications, for example for automobiles, offer further growth potential for OLEDs. In order to make the mass production of large-area OLED displays more efficient, we have been cooperating since the end of 2012 with Seiko Epson Corporation to enable printing processes for OLED displays. To support the expected market growth, we invested around € 30 million in a new OLED production unit at the Darmstadt site in order to expand our production capacities for ultra-high-purity OLED materials for applications in modern displays and lighting systems.

Moreover, within the framework of partnerships with display manufacturers, start-ups and universities, progress has been made in the realization of free-form displays. To expand our activities in the field of quantum materials, a material supply and licensing agreement for cadmium-free quantum materials was entered into with Nanoco. These eco-friendly quantum materials complement our portfolio for the display industry with products that extend the color range and further reduce the power consumption of displays.

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, e.g. liquid crystal windows (LCWs) or mobile antennas. With the acquisition of our long-standing cooperation partner Peer+ B.V., we are further advancing the development of the future-oriented market for LCWs. Thanks to licrivision™ technology, LCWs create new architectural possibilities. Through continuously variable brightness control, they can for example increase a building's energy efficiency.

To drive forward the market penetration of liquid crystal windows, we are investing around € 15 million in the construction of a production facility for window modules. Production of liquid crystal window modules is scheduled to start at the end of 2017. 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 still take a few years. New application opportunities for liquid crystals could have medium- to long-term positive effects on the financial indicators of our Performance Materials business sector.

Opportunities from the launch of our new branding

In October 2015, we relaunched our branding and since then have been using this new visual appearance externally. Our new branding reflects our transformation into a science and technology company while at the same time ensuring that we operate uniformly under our corporate brand worldwide, with the exception of the United States and Canada.

Through this step, we remain uniformly visible and continue to heighten our recognition value. The endeavored strengthening of the brand can lead to new business opportunities and stronger customer ties with positive effects on business.

Opportunities from leveraging the e-commerce and distribution platform

With the acquisition of Sigma-Aldrich we have gained access to the leading life science e-commerce platform. Our customers are already benefiting from an offering 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. This could cause our net sales to develop better than expected.

Risk due to increased competition and customer technology changes

In our 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 our Life Science and Performance Materials business sectors, risks are posed not only by cyclical business fluctuations but also, particularly with respect to liquid crystals, by changes in the technologies used or customer sourcing strategies. We use close customer relationships and in-house further developments as well as 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, e.g. our MSdialog platform, the Accelerator program, which is being driven by our Innovation Center, is one component of our innovation strategy. The program comprises support for and access to start-up companies that offer innovative digital solutions in the fields of healthcare, life science and performance materials. With the Merck Venture Investment Fund, we are also strengthening our collaboration with and access to highly innovative start-ups. The expansion of these activities could lead to new market opportunities for us. In the medium term, these could have a positive impact on the development of our sales.

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 our Healthcare business sector. In the course of portfolio management, we regularly evaluate and, if necessary, refocus research areas and all R&D pipeline projects.

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 our Healthcare business sector. By investing jointly and combining our strengths and expertise, in cooperation with Pfizer we aim to maximize the potential value of the investigational compound avelumab (MSB0010718C), an anti-PD-L1 antibody developed by our company. Multiple studies in various phases of clinical development are currently underway within the

scope of the alliance. The first regulatory submission for avelumab to treat metastatic Merkel cell carcinoma was validated by the European Medicines Agency in October 2016 and accepted by the U.S. Food and Drug Administration (FDA) for priority review in November 2016. In addition, we are driving research projects forward in therapeutic areas of importance to us, for instance immunology. Another one of our investigational compounds, cladribine for the treatment of multiple sclerosis, was submitted for regulatory review to the European Medicines Agency in July 2016. Owing to the relatively long cycles in active ingredient development, we expect positive effects on sales of our Healthcare business sector in the medium to long term. Depending on the registration status, initial sales of avelumab and cladribine could already materialize in 2017. By contrast, expenses currently being incurred particularly in the research and development units of our Healthcare business sector are already reflected in the latest plans. The same applies to the pro rata recognition of deferred income from Pfizer's upfront payment.

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. Furthermore, there is the risk that the regulatory authorities either do not grant or delay approval, which can have an impact on earnings. Additionally, there is the danger 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. 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.

Risks and opportunities of product quality and availability

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). 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 take 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 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 critical negative impact on the net assets, financial position and results of operations. Therefore, we rate this 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 of precursor products for some of our main products. 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.

Damage and product liability risks
Further risks include the risk of operational failures due to 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 economical to do so, the Group limits its damage risks with insurance coverage, the nature and extent of which is constantly adapted to current requirements. 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 is therefore classified as a medium risk.

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 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 ("Merck KGaA, Darmstadt, Germany, 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, as well as on regional aspects in particular. Group Security 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 the 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, we are investing € 90 million in China to further expand the pharmaceutical manufacturing facility commissioned in November 2016, as well as a further € 80 million in a manufacturing plant for our Life Science business sector. Moreover, we are strengthening our engagement in Africa through strategic investments and alliances. We are also pushing expansion in selected regions, as for instance with the opening of our office in Ivory Coast in October 2016. 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 exceptionals.

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. 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 multi-currency revolving credit facility of € 2 billion with a term until 2020, 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” under “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 "Derivative financial instruments" 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 under "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

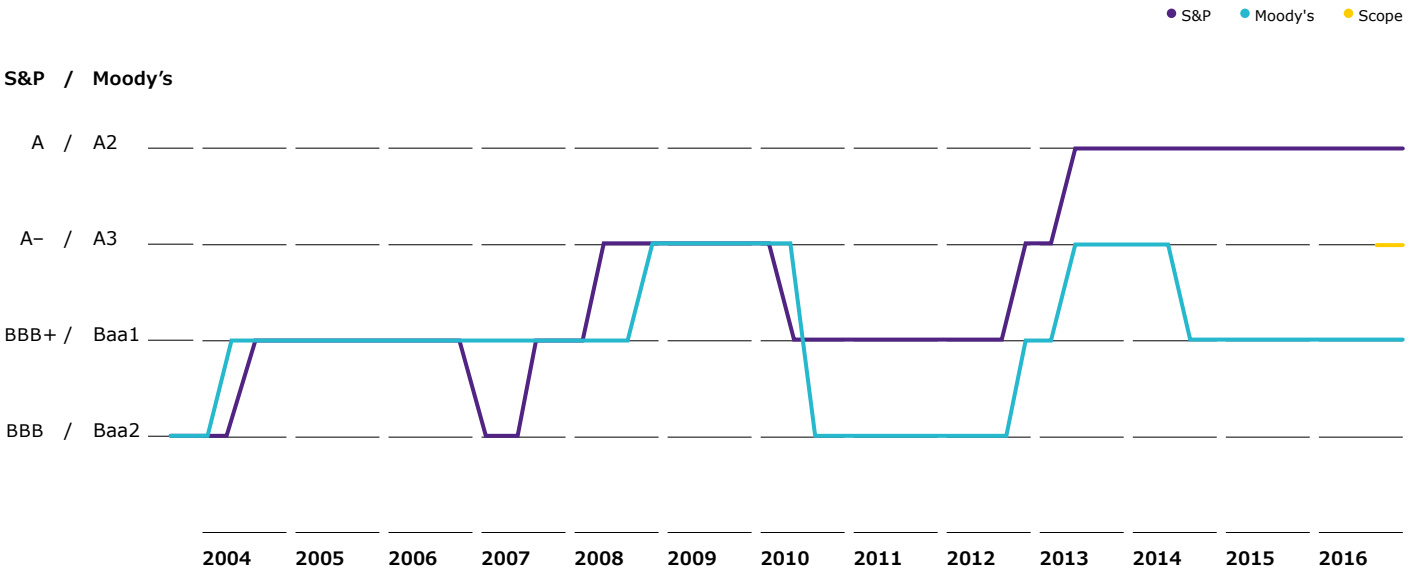
We have commitments in connection with pension obligations. The present value of defined benefit obligations can be significantly increased or reduced by changes in the relevant valuation parameters, for example the interest rate or future salary increases. Pension obligations are regularly assessed 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 under "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 to be 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 and Moody's, and since 2016 also by 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.

REPORT ON RISKS AND OPPORTUNITIES

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, 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. of the United States, 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 in the United States with Biogen Inc. (Massachusetts, USA) ("Biogen"). Biogen claims that the sale of Rebif® in the United States infringes on a Biogen patent. The disputed patent was granted to Biogen in 2009 in the United States. 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. A Markman hearing took place in January 2012, leading to a decision in the first quarter of 2016 that accelerated the litigation. A first-instance ruling is now expected for September 2017. In parallel, the parties are involved in court-ordered mediation proceedings that have not yet officially ended but have not led to an agreement to date. We have taken appropriate accounting measures.

Potentially critical negative impacts of the litigation on the financial position cannot be ruled out.

In our 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 infringes on 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 two cases were already successful in first-instance proceedings. The competitor has meanwhile filed two patent infringement lawsuits and appeals in the case of the nullity actions. We are prepared for a confrontation in this issue and have taken appropriate precautionary accounting measures. Nevertheless, a potentially critical negative impact of the litigation on the financial position cannot be ruled out.

Risks due to antitrust and other government proceedings

Raptiva®: In December 2011, the federal state of São Paulo 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. 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.

The risk reported in 2015 on government investigations regarding compliance with foreign exchange transfer restrictions no longer exists from the perspective of the Group.

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 GlaxoSmithKline companies 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. Given the latest decision, we classify this 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 demographic challenges. 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 us, such as the failure of central IT systems, the disclosure of confidential research and business development data, the manipulation of IT systems in chemical process control, or an increased burden or adverse impact on IT systems as a result of virus attacks. The Group has an information protection management system based on ISO 27001 as well as safety guidelines comprising organizational and technical standards in place.

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. This also applies to the failure of a data center. To achieve the required service quality, we use a quality management system certified to ISO 9001.

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 medium risks owing to likely and substantial 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, for instance for the current integration of Sigma-Aldrich. 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, for instance through indemnity clauses and guarantee commitments. 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

Although the number of risks reported is higher than the specific opportunities identified, we consider the distribution of risks and opportunities to be balanced. A balanced overall view is also supported by the fact that net sales and business success are built on a diverse range of pharmaceutical and chemical products for a variety of industries. As the markets differ in their structure and economic cycles, this diversification helps to lower risk.

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 resulted as the assessment of the individual risks has of course altered 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 risks.

The overall view of the risk situation of the Group, which is derived from the summary of the risks described on the basis of their impact and probability of occurrence, leads to the assessment that the risks are not of a nature to threaten the existence of the Group as a going concern. We are confident that we will continue to successfully master the challenges arising from the above risks in the future as well.

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 Merck Venture Investment 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 our key performance indicators – net sales, EBITDA pre exceptionals 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 2017 of the development of the Group and its three business sectors: Healthcare, Life Science and Performance Materials. The forecast covers our key performance indicators as in the previous year, namely net sales, EBITDA pre exceptionals and business free cash flow. Apart from the divestment of the business in Pakistan as well as the acquisition of BioControl Systems, Inc., USA, (BioControl) in our Life Science business sector, our forecast does not include any further portfolio changes. We are in advanced stages of negotiations to divest the Biosimilars business and the transaction is expected to close in 2017. The research and development expenses of this business amounted to around € 130 million in 2016.

Forecast for the Group

€ million	Actual results 2016	Forecast for 2017	Key assumptions
Net sales	15,023.5	– Slight to moderate organic growth – Neutral exchange rate effect	– Slight organic growth in Healthcare – Solid organic growth of Life Science slightly above market growth – Slight organic growth in Performance Materials – Neutral exchange rate effect due to positive €/US$ development and negative exchange rate developments in various growth markets
EBITDA pre exceptionals	4,490.4	– About stable compared with 2016; this comprises a slightly positive or negative percentage fluctuation around the previous year's level	– In Healthcare rising research and development expenses – Further realization of synergies from the integration of Sigma-Aldrich in Life Science – Slight sales recovery and active cost management in Performance Materials
Business free cash flow	3,318.2	– Single-digit percentage decline	– Higher investments in property, plant and equipment as well as in digitalization initiatives

Net sales

For the Group, we expect slight to moderate organic sales growth in 2017 compared with the previous year. Exchange rate changes are predicted to lead to a neutral exchange rate effect in 2017 for the Group as a whole. This forecast is based on a €/US$ exchange rate in the range of 1.06 – 1.10, representing a positive currency effect for 2017 in comparison with 2016. By contrast, we continue to assume a further weakening of the currencies in several of our key growth markets, for instance in Latin America. Owing to the current political and macroeconomic developments, overall exchange rate volatility for 2017 is likely to remain high.

For our Healthcare business sector, we forecast a slight increase in organic sales in 2017. This will continue to be driven mainly by the strong dynamics in our growth markets, which should offset the market environment for Rebif®, which remains challenging, and continuous price pressure in numerous markets. In addition, we expect organic sales growth to benefit slightly from the full takeover of the commercialization of the antidiabetic agent Glucophage® in China from Bristol-Myers Squibb Company, USA, (BMS) as of the beginning of 2017.

In our Life Science business sector, for 2017 we predict solid organic growth of net sales slightly above expected market growth. Process Solutions should once again contribute to this to a considerable extent.

For our Performance Materials business sector, we expect slight organic growth of net sales in 2017 compared with 2016. We anticipate volume increases in all business units. In the Liquid Crystals business, however, we cannot rule out that the initial signs of a normalization in our market shares from the very high level of previous years will continue.

EBITDA pre exceptionals

EBITDA pre exceptionals is our key financial indicator to steer operating business. For the Group as a whole, we assume that in 2017 EBITDA pre exceptionals will remain about stable compared with 2016; this encompasses a slightly positive or negative percentage fluctuation around the previous year's level.

For our Healthcare business sector, we expect a high single-digit percentage decline in EBITDA pre exceptionals compared with 2016, particularly owing to further increases in research and development expenses for our pipeline.

For our Life Science business sector, in 2017 we expect growth of EBITDA pre exceptionals in the high single-digit to low teens percentage range compared with 2016 due to good organic sales performance. The continued realization of synergies as planned from the Sigma-Aldrich acquisition will also contribute to this.

The recovery in the display market, which became visible towards the end of 2016, as well as the broadened earnings base and high cost discipline in our Performance Materials business sector are factors which lead us to assume that in 2017 we will see slightly higher EBITDA pre exceptionals compared with the level of 2016.

In 2017, the expenses reported under Corporate and Other are expected to improve slightly in comparison with 2016.

Business free cash flow

For the business free cash flow of the Group, we predict a single-digit percentage decline in 2017, driven by higher investments in property, plant and equipment and digitalization projects.

Forecast for our Healthcare business sector

€ million	Actual results 2016	Forecast for 2017	Key assumptions
Net sales	6,855.0	– Slight organic growth	– Organic sales increases in growth markets offset continued decline in Rebif® sales – Continued price pressure in Europe and also in the Asia-Pacific as well as Middle East and Africa regions – Full takeover of the commercialization of the antidiabetic agent Glucophage® in China from BMS contributes slightly to sales growth – Low negative portfolio effect due to the divestment of the business in Pakistan, which generated sales in the mid double-digit million range in 2016
EBITDA pre exceptionals	2,127.9	– High single-digit percentage decrease in EBITDA pre exceptionals compared with 2016	– Continued rise in research and development spending due to further pipeline development, particularly in immuno-oncology – Negative product mix effect due to the decline in sales of Rebif® – Absence of exceptional income recorded in 2016, such as the release of provisions for research projects discontinued in prior years and the divestment of a minority interest – Royalty income for Avonex® due to a patent granted in the United States in 2016 – Contractually agreed one-time payment as compensation for future royalty payments
Business free cash flow	1,648.1	– Low double-digit percentage decline	– Decline in EBITDA pre exceptionals – Continued investments in property, plant and equipment as well as digitalization within the scope of strategic initiatives

Net sales

For our Healthcare business sector, we forecast slight organic sales growth in 2017. Developments in our growth markets in the Latin America, Middle East and Africa, as well as Asia-Pacific regions are expected to contribute to this growth to a large extent. Likewise, we assume that the full takeover of the commercialization of the antidiabetic agent Glucophage® in China from BMS as of the beginning of 2017 will have a slightly positive influence on our sales. These positive effects should offset the continued expected decline in sales of Rebif® as well as sustained price pressure in Europe, Asia-Pacific, as well as in the Middle East and Africa region. Furthermore, we predict that our Consumer Health business will also contribute to the positive organic sales development. We assume that the divestment in the fourth quarter of 2016 of our business in Pakistan, which generated sales in the mid double-digit million range, will lead to a slight portfolio-related sales decline in 2017. Beyond this, our forecast does not reflect any further changes to our portfolio in 2017.

EBITDA pre exceptionals

For 2017, we forecast a decline in EBITDA pre exceptionals of our Healthcare business sector in the high single-digit percentage range compared with 2016. This will once again be mainly driven by research and development spending for the further development of our pipeline. Here we are investing heavily in our research projects in immuno-oncology, for example. We also expect further intensive research activities in other areas, for example in the four oncology research and development programs in-licensed in January 2017 from Vertex Pharmaceuticals Inc., USA. Moreover, we assume that our product mix will develop unfavorably owing to the expected decline in sales of our highly profitable product Rebif®. In 2017, there will be an absence of positive one-time effects that we realized in 2016. These include, among other things, the divestment of a minority interest as well as the release of provisions for research projects discontinued in previous years. In our estimation, royalty income from a patent granted in the interferon segment in the United States in 2016 will increase earnings. In addition, we entered into a contractual agreement in February 2017, under which we will receive a one-time payment of US$ 123 million (€ 114 million based on the exchange rate on February 6, 2017) as compensation for future royalty payments. Despite the resulting absence of regular license and royalty income, this will lead to an improvement in EBITDA pre exceptionals in the mid to high double-digit million euro range in 2017. However, these positive effects will only partially offset the aforementioned negative developments.

Business free cash flow

In 2017, we expect a low double-digit percentage decline in the business free cash flow of our Healthcare business sector. Apart from the expected decline in EBITDA pre exceptionals, continued investments in property, plant and equipment as well as digitalization initiatives are likely to contribute to this.

Forecast for our Life Science business sector

€ million	Actual results 2016	Forecast for 2017	Key assumptions
Net sales	5,657.9	– Solid organic growth, and thus slightly above expected market growth of around +4% per year	– Process Solutions likely to remain the strongest driver of growth – Research Solutions and Applied Solutions also to contribute positively to organic sales growth albeit to a lesser extent – Low positive portfolio effect due to the acquisition of BioControl, which generated sales of US$ 34 million in 2015
EBITDA pre exceptionals	1,652.3	– Growth over 2016 in the high single-digit to low teens percentage range	– Positive development due to the expected sales growth – Realization of synergies as planned from the Sigma-Aldrich acquisition amounting to an additional € 80 million compared with 2016
Business free cash flow	1,144.0	– Increase in the twenties percentage range	– Higher EBITDA pre exceptionals – Improved management of inventories

Net sales

For our Life Science business sector, we forecast solid organic growth of net sales in 2017, thus slightly exceeding expected market growth of around 4% per year. We expect that all the business areas will contribute positively to this. The Process Solutions business area is likely to remain the strongest driver of organic growth in 2017. Yet the Research Solutions and Applied Solutions business areas should also contribute to the positive development. Additionally, we expect that initial sales synergies in the course of the advancing Sigma-Aldrich integration will make a positive contribution to organic sales growth. At the end of 2016 we acquired the company BioControl, which generated sales of around US$ 34 million in 2015. The first-time consolidation is likely to lead to a low, positive portfolio effect in 2017.

EBITDA pre exceptionals

EBITDA pre exceptionals of our Life Science business sector is forecast to grow in 2017 in a high single-digit to low teens percentage range compared with 2016. This is in line with the expected development of sales. Furthermore, in 2017 we will continue to pursue with high priority the realization of synergies as planned from the acquisition of Sigma-Aldrich. Having already realized cost synergies of around € 105 million in 2016, we expect additional synergies of around € 80 million in 2017.

Business free cash flow

For business free cash flow of our Life Science business sector, we forecast an increase in the twenties percentage range. In particular, the development of EBITDA pre exceptionals will contribute to this. Moreover, we expect that improved management of inventories will have a positive effect on business free cash flow.

Forecast for our Performance Materials business sector

€ million	Actual results 2016	Forecast for 2017	Key assumptions
Net sales	2,510.7	– Slight organic growth	– Volume increases in all businesses driven, among other things, by a recovery in the display market visible since the end of 2016 – Continued price decline typical for the Liquid Crystals business
EBITDA pre exceptionals	1,106.4	– Slight increase	– Recovery in the display market, broadened earnings base and active cost management could more than offset the continued price decline in liquid crystals
Business free cash flow	1,010.7	– Low double-digit percentage decrease	– Higher investments in property, plant and equipment as well as in digitalization initiatives

Net sales

We forecast slight organic sales growth in our Performance Materials business sector in 2017 compared with 2016. All businesses are likely to contribute positively to this through volume increases. The recovery in the display market, which became visible towards the end of 2016, should have a positive effect on the Liquid Crystals business. Here we cannot rule out, however, that the initial signs of a normalization in our market shares from the very high level of previous years will continue. In addition, the typical price pressure in the Liquid Crystals business is likely to continue also in 2017 and impact our organic sales growth.

EBITDA pre exceptionals

The recovery in the display market, which became visible towards the end of 2016, as well as the broadened earnings base with meanwhile four strong business units and active cost management should offset the continued price decline in liquid crystals. Consequently, for our Performance Materials business sector we forecast slightly higher EBITDA pre exceptionals in 2017 compared with the previous year's level.

Business free cash flow

For our Performance Materials business sector, we forecast a low double-digit percentage decline in business free cash flow. In particular, we assume higher investments in plant, property and equipment as well as in digitalization initiatives.

Summary

For 2017, we expect the Group to see slight to moderate organic sales growth, to which all business sectors are forecast to contribute. As regards exchange rates, overall we expect a neutral effect on our sales, with a slightly positive €/US$ development and negative exchange rate developments in various growth markets.

EBITDA pre exceptionals of the Group should remain about stable compared with 2016; this encompasses a slightly positive or slightly negative percentage fluctuation around the previous year's level. In our Healthcare business sector we continue to expect rising research and development expenses for the further development of the pipeline as well as a negative product mix effect. We estimate that our Life Science business sector will see organic growth slightly above the market and continue the realization of synergies from the acquisition of Sigma-Aldrich with high priority. In our Performance Materials business sector, the broadened earnings base and high cost discipline are expected to help offset the typical price decline in liquid crystals.

Business free cash flow of the Group could decline in the single-digit percentage range owing to higher investments in property, plant and equipment as well as in digitalization projects.

Report in accordance with section 315 (4) of the German Commercial Code (HGB)

The following information is provided in accordance with section 315 (4) of the German Commercial Code 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. 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, 2016 no shareholders owned direct or indirect investments exceeding more than 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 only be a general partner not holding an equity interest 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. The resolutions of the General Meeting are, not withstanding any statutory provisions to the contrary, 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 specify the authorized share capital.

The Executive Board is authorized, with the approval of the Supervisory Board and of E. Merck KG, Darmstadt, Germany, to increase the share capital on one or several occasions until April 26, 2018 by up to a total of € 56,521,124.19 by issuing new shares against cash and/or contributions in kind (Authorized Capital).
The Executive Board is authorized to exclude, with the approval of the Supervisory Board, the statutory subscription right of the limited liability shareholders in the case of capital increases against cash contributions if the issue price of the new shares is not significantly lower than the stock exchange price of already listed shares carrying the same rights, as defined in section 203 (1) and (2) and section 186 (3) sentence 4 of the German Stock Corporation Act (AktG), at the time when the Executive Board finally fixes the issue price, and if the proportion of the share capital represented by the new shares for which the subscription right is excluded does not exceed 10% of the share capital available at the time of the resolution of the Annual General Meeting or – if this amount is lower – of the share capital available at the time of exercising this authorization. This upper limit (10% of the share capital) shall be reduced by the prorated amount of shares that are sold during the term of the authorized capital under exclusion of shareholders' subscription rights pursuant to section 71 (1) no. 8 sentence 5 and section 186 (3) sentence 4 of the German Stock Corporation Act, as well as shares that must be issued to redeem option or convertible bonds, as long as the bonds have been issued during the term of this authorization under exclusion of subscription rights. In addition, with the approval of the Supervisory Board, the subscription right of the shareholders 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 to participate in a capital increase by issuing shares or freely transferable share subscription rights and to enable E. Merck KG, Darmstadt, Germany, to exercise its right pursuant to Article 33 of the Articles of Association to convert its equity interest into share capital. Moreover, with the approval of the Supervisory Board, the subscription right of the shareholders can be excluded as far as this is necessary, in order to grant subscription rights for new shares to holders of warrants and convertible bonds issued by the company or its subsidiaries, to the extent to which they would be entitled after exercising their option and conversion rights or fulfilling their option and conversion obligations.

Lastly, with the approval of the Supervisory Board, the subscription right of the shareholders can be excluded in order to exclude fractional amounts from the subscription right.

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 the conversion obligations 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 May 9, 2014 to May 8, 2019, utilize their option or conversion rights or, to fulfill their conversion obligation insofar as they are obliged to fulfill their conversion 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 reports of the Group and Merck KGaA, Darmstadt, Germany, for 2016 are being filed with the electronic German Federal Gazette (elektronischer Bundesanzeiger) and are available on the website of the German company register.

Statement on Corporate Governance

The Statement on Corporate Governance according to section 289a HGB is contained in the section "Corporate Governance" of this Annual Report. It is also published on our website (www.emdgroup.com → investors → corporate governance).

Changes to accounting and measurement principles and disclosure changes

Due to the first-time application of the provisions of the German Accounting Directive Implementation Act (BilRUG), an adjustment was made to certain items of the previous year's income statement. This applies to net sales and the corresponding cost of materials, as well as other operating income and expenses. The previous year's figures in the income statement have been adjusted accordingly and are presented in the following table:

€ million	2015 Pre adjustment	Adjustment	2015 Adjusted
Sales	3,888	778	4,666
Other income	966	–778	188
Cost of materials	–956	–464	–1,420
Personnel expenses	–1,123	–	–1,123
Depreciations, amortization, write-downs and impairment losses	–280	–	–280
Other operating expenses	–2,050	464	–1,586
Investment result/Write-downs of financial assets	339	–	339
Financial result	–175	–	–175
Profit from ordinary activities	**609**	–	**609**
Profit transfers	–373	–	–373
Taxes	–116	–	–116
Profit after profit transfers and taxes/Net income	**120**	–	**120**

Business Development

In 2016, Merck KGaA, Darmstadt, Germany, sales declined to € 4,465 million (2015: € 4,666 million). The decrease of € 201 million was due to our Performance Materials business sector. By contrast, our Healthcare and Life Science business sectors slightly increased their sales:

			Change	
€ million	**2016**	2015[1]	€ million	in %
Healthcare	2,232	2,217	15	0.7%
Life Science	710	698	12	1.7%
Performance Materials	1,407	1,637	–230	–14.1%
Other sales	116	114	2	1.8%
Total sales	**4,465**	**4,666**	**–201**	**–4.3%**

[1] Previous year's figures have been adjusted.

Other sales mainly included intragroup cross-charging for IT services and other administration services.

The share of sales with other Group companies (Group sales) declined in 2016 to 91.0% (2015: 93.6%).

			Change	
€ million	**2016**	2015[1]	€ million	in %
Group sales	4,063	4,366	–303	–6.9%
Sales to third parties	402	300	102	34.0%
Total	**4,465**	**4,666**	**–201**	**–4.3%**

[1] Previous year's figures have been adjusted.

At 89.4% (2015: 89.2%), the share of exports in 2016 was nearly at the previous year's level.

			Change	
€ million	**2016**	2015[1]	€ million	in %
Outside Germany	3,990	4,163	–173	–4.2%
Germany	475	502	–27	–5.4%
Total	**4,465**	**4,666**	**–201**	**–4.3%**

[1] Previous year's figures have been adjusted.

The increase in sales by our Healthcare business sector was primarily attributable to the cross-charging of research and development services to Group companies. Excluding intragroup cross-charging, net sales would have declined. This was mainly attributable to declines in the sales of cardiovascular medicines (–25.3%) and the oncology drug Erbitux® (–2.5%). Net sales of cardiovascular medicines decreased mainly in the Asia-Pacific and Latin America regions. This was primarily the result of intensive inventory build-ups by customers in the fourth quarter of 2015. Net sales of products for the treatment of thyroid disorders were flat (+0.9%) in nearly all regions.

In 2016, sales of our Performance Materials business sector were lower than in the previous year. The decrease was due to weaker business of the Display Materials business unit, which generated lower sales particularly in the Asia-Pacific region. The Advanced Technologies (+13.7%) and Pigments & Functional Materials (+3.5%) business units maintained their level of sales primarily in Europe and expanded their sales in Asia-Pacific.

All the business areas of our Life Science business sector generated sales growth. The increases were mainly attributable to the Asia-Pacific region, whereas slight sales declines were registered in Latin America. In particular, the Applied Solutions business area generated higher sales (+3.4%), with sales in Europe increasing by 3.9%.

Results of operations

			Change	
€ million	**2016**	2015[1]	€ million	in %
Sales	4,465	4,666	–201	–4.3%
Other income	185	188	–3	–1.6%
Cost of materials	–1,488	–1,420	–68	4.8%
Personnel expenses	–1,055	–1,123	68	–6.1%
Depreciation, amortization, write-downs and impairment losses	–176	–280	104	–37.1%
Other operating expenses	–1,726	–1,586	–140	8.8%
Investment result/Write-downs of financial assets	659	339	320	94.4%
Financial result	–243	–175	–68	–38.9%
Profit from ordinary activities	**621**	**609**	**12**	**2.0%**
Profit transfers	–400	–373	–27	7.2%
Taxes	–65	–116	51	44.0%
Profit after profit transfers and taxes/Net income	**156**	**120**	**36**	**30.0%**

[1] Previous year's figures have been adjusted.

In comparison with 2015, other income reflected higher income from increases in inventories of internally generated production materials and lower gains from disposals of fixed assets and exchange rate changes.

The cost of materials increased slightly in relation to sales (33.3%; 2015: 30.4%).

Despite the increase in the headcount, personnel expenses declined. The main reason for this were lower pension expenses in comparison with 2015 as a result of applying the amended, legally stipulated discount rate for the calculation of pension provisions. The difference resulting from this change amounted to € 224 million and is barred from distribution by law.

Depreciation, amortization, write-downs and impairment losses decreased mainly owing to the decline of € 97 million in impairment losses. In 2015, impairment losses amounting to € 105 million were recognized on intangible assets owing to the termination of development projects. In 2016, impairment losses of this magnitude were not required.

Other operating expenses increased mainly as a result of the intensification of IT activities as well as from the disposal of an intragroup investment.

The investment result improved mainly due to a higher dividend payment amounting to € 500 million (2015: € 270 million) from Merck Holding GmbH, Gernsheim, a subsidiary of Merck KGaA, Darmstadt, Germany.

The majority of the funds required for the Sigma-Aldrich acquisition were borrowed at the end of 2015. The interest expenses incurred thereby were paid over the full fiscal year, thus increasing the negative financial result.

Net assets and financial position

ASSETS

			Change	
€ million	**Dec. 31, 2016**	Dec. 31, 2015	€ million	in %
Fixed assets	**17,563**	**17,770**	**–207**	**–1.2%**
Intangible assets	250	227	23	10.1%
Tangible assets	1,003	921	82	8.9%
Financial assets	16,310	16,622	–312	–1.9%
Current assets	**1,504**	**1,280**	**224**	**17.5%**
Inventories	635	617	18	2.9%
Trade accounts receivable	291	213	78	36.6%
Receivables and other assets	576	450	126	28.0%
Cash and cash equivalents	2	–	2	–
Prepaid expenses	**28**	**27**	**1**	**3.7%**
	19,095	**19,077**	**18**	**0.1%**

LIABILITIES

			Change	
€ million	**Dec. 31, 2016**	Dec. 31, 2015	€ million	in %
Net equity	**5,290**	**5,268**	**22**	**0.4%**
Provisions	**1,034**	**930**	**104**	**11.2%**
Provisions for pensions and other post-employment benefits	80	5	75	–
Other provisions	954	925	29	3.1%
Liabilities	**12,769**	**12,878**	**–109**	**–0.8%**
Financial obligations	1,500	1,500	–	–
Trade accounts payable	260	289	–29	–10.0%
Other liabilities	11,009	11,089	–80	–0.7%
Deferred income	**2**	**1**	**1**	**100.0%**
	19,095	**19,077**	**18**	**0.1%**

The net assets and financial position of Merck KGaA, Darmstadt, Germany, barely changed in comparison with the previous year. With total assets remaining almost constant, the equity ratio of 27.7% did not change.

An intragroup divestment of Merck Performance Materials Co. Ltd., Taiwan, a subsidiary of Merck KGaA, Darmstadt, Germany, led to a decline in financial assets in 2016.

At the Darmstadt site, the One Global Headquarters construction project made notable progress. This significantly contributed to the increase in tangible assets.

Current assets rose by € 224 million mainly owing to higher receivables from intragroup supply relationships with affiliates as well as higher tax receivables.

The increase in other provisions by € 29 million was primarily attributable to higher provisions for outstanding invoices. This compared with lower provisions for financial risks from development projects. Pension provisions rose owing to the increase in the present value of defined benefit obligations and the greater number of employees. At the same time, however, they were lowered by the effect of the statutory requirement to adjust the discount rate.

The decrease in other liabilities resulted primarily from intragroup profit transfers pursuant to profit and loss transfer agreements.

Research and Development

In 2016, research and development spending on projects for Merck KGaA, Darmstadt, Germany, and other Group companies totaled € 751 million (2015: € 782 million). A large portion was also incurred by companies outside the Group. In Darmstadt, Healthcare mainly focuses on oncology as well as autoimmune and inflammatory diseases. The decline of € 126 million in R&D spending by our Healthcare business sector was reflected in the decline of € 31 million in overall R&D spending (–4.0%). At the same time, our Healthcare business sector accounted for 64.3% (2015: 77.8%) and thus the largest proportion of research and development spending. Our Performance Materials business sector focuses its research activities on developing new and improved basic materials and mixtures for LC displays, as well as for innovative OLED applications. To strengthen the Pigments business, new effect pigments for the automotive, cosmetics and printing ink sectors have been developed. In our Life Science business sector, research activities focused in particular on technologies for laboratory and life science applications and new developments were driven forward. These included improved test kits, chromatography methods, substrates for separating active substances, and innovations in the fields of microbiology and hygiene monitoring.

			Change	
€ million	**2016**	2015	€ million	in %
Healthcare	483	609	–126	–20.7%
Life Science	39	38	1	2.6%
Performance Materials	223	130	93	71.5%
Other R&D spending that cannot be allocated to the individual business sectors	6	5	1	20.0%
Total	**751**	**782**	**–31**	**–4.0%**

The ratio of research and development spending to sales was 16.8% (2015: 16.8%). Overall, the average number of employees working in research and development was 2,320. Merck KGaA, Darmstadt, Germany, is one of the main research sites of the Group, accounting for 38.0% (2015: 45.7%) of total Group research and development spending. This decrease was due on the one hand to lower research and development costs of Merck KGaA, Darmstadt, Germany, and on the other hand to higher research and development costs of the Group.

Dividend

For 2016, we are proposing to the General Meeting the payment of a dividend of € 1.20 per share.

Personnel

As of December 31, 2016, Merck KGaA, Darmstadt, Germany, had 9,988 employees, a slight increase over the previous year (2015: 9,537).

Average number of employees by functional area:

Average number of employees during the year	**2016**	2015
Production	3,270	3,114
Administration	2,359	2,254
Research	2,320	2,186
Logistics	624	583
Engineering	619	555
Sales and marketing	434	409
Other	118	348
Total	**9,744**	**9,449**

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 developments in 2016 from the previously reported guidance:

In the forecast for 2016 given in the annual financial statements of Merck KGaA, Darmstadt, Germany, for 2015, we expected sales to be at the previous year's level. The effects of BilRUG were not included in the forecast. With the exception of our Healthcare business sector, the reclassifications pursuant to BilRUG were not of material significance to the development of sales.

For our Healthcare and Performance Materials business sectors we anticipated a slight decline in sales.

The cross-charging of research and development costs to Group companies led to an increase in sales by our Healthcare business sector. The expected decline in 2016 occurred with sales of the oncology drug Erbitux® (−2.5%) and with cardiovascular medicines (−25.3%). Sales of products to treat thyroid disorders were at the level we had forecast (+0.9%).

For our Performance Materials business sector, we anticipated a decline in sales owing to continued high competitive pressure on liquid crystals. This development occurred and led to a significant decline in sales of the Display Materials business unit (−23.3%). The Advanced Technologies (+13.7%) and Pigments & Functional Materials (+3.5%) business units increased their respective sales; however, the sales of our Performance Materials business sector declined overall by 14.1%.

In contrast to expectations, the increase in sales by our Life Science business sector (+1.7%) could not compensate for the decrease in sales by the other business sectors.

In the annual financial statements for 2015, a decline in net income for 2016 was forecast.

Net income was mainly impacted by a decline in sales and higher financing costs in connection with the acquisition of Sigma-Aldrich. By contrast, pension expenses, which declined owing to the application of the legally stipulated discount rate for the measurement of pension provisions, had a positive effect on net income. Overall, net income increased owing to higher investment income. The financial resources for the company continue to be provided by Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany.

Forecast 2017

For fiscal 2017, slight increases in sales are expected for all three business sectors: Healthcare, Performance Materials and Life Science.

The financing costs of the Sigma-Aldrich acquisition will continue to adversely affect net income. Nevertheless, owing to positive investment income and dividend payments from subsidiaries, we expect net income to increase slightly. The financial resources for the company will be provided by Merck Financial Services GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany. Currently no risks can be identified that could jeopardize the continued existence of Merck KGaA, Darmstadt, Germany.

The internal control system for the accounting process in accordance with section 289 (5) of the German Commercial Code (HGB)

The annual financial statements of Merck KGaA, Darmstadt, Germany, are prepared by Merck Accounting Solutions & Services Europe GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany, an independent legal entity within the Group. The financial statement process of Merck KGaA, Darmstadt, Germany, is based on the accounting provisions of the German Commercial Code (HGB) with due consideration of key processes and uniform deadlines. The objective of the internal control system for the accounting process is to implement controls that will provide the security needed to ensure that financial statements are prepared in compliance with the relevant accounting laws and standards. It covers measures designed to ensure the complete, correct and timely conveyance and presentation of information that is relevant for the preparation of the financial statements. The accounting processes are monitored via a stringent internal control system that ensures accounting accuracy as well as compliance with the relevant legal regulations.

The main rules and tools used are as follows:

- Accounting guidelines based on Group-wide guidelines. These Group-wide accounting guidelines are the responsibility of Group Accounting and are available to all employees of the relevant units via the company's intranet. Detailed account allocation instructions are provided here for all major transactions. These guidelines include, for example, clear requirements for the inventory valuation process and transfer pricing within intragroup supply relationships.
- Clearly defined segregation of tasks and assignment of responsibilities to the units involved in the accounting process. Through corresponding organizational measures, we ensure that in the accounting system duties are segregated between the booking of transactions and the review and approval of transactions. These measures include the power of disposition approved by the Executive Board in relation to authorizing contracts and credit notes, as well as consistently implementing a dual-control principle.
- Involvement of external experts as needed, for example for the valuation of pension obligations
- Use of suitable, largely uniform IT finance systems and the application of detailed authorization concepts to limit user rights on a need-to-have basis, taking into account principles concerning the segregation of duties
- System-based IT controls as well as manual, process-integrated controls, particularly within the scope of the accounting process
- Consideration of risks recorded and assessed by the risk management system in the annual financial statements insofar as this is required by existing accounting rules

The management of the respective department is responsible for the implementation of these rules and utilization of the tools.

The annual financial statements of Merck KGaA, Darmstadt, Germany, are the responsibility of the Chief Financial Officer, who is a member of the Executive Board of Merck KGaA, Darmstadt, Germany. This responsibility is laid down in the rules of procedure of the Executive Board.

All the structures and processes described are subject to constant review by Group Internal Auditing. The Executive Board determines the structures and processes that are to be audited in an annual audit plan.

The results of these audits are dealt with regularly in meetings of the Executive Board, the Supervisory Board, as well as the Finance Committee of E. Merck KG, Darmstadt, Germany.

Subsequent Events

On January 11, 2017, we announced a licensing agreement with Vertex Pharmaceuticals Inc., Boston, USA, (Vertex). Within the scope of this agreement, Vertex will transfer to us the worldwide development and commercialization of four research and development programs that represent novel approaches to the treatment of cancer. In return, our company will make an upfront payment of US$ 230 million (€ 218 million based on the exchange rate on January 11, 2017). In addition, we are obligated to pay royalties on future product sales.

On February 6, 2017, we entered into a contractual agreement according to which our company will receive a one-time payment as compensation for future royalty and license payments. As a consequence of this agreement, in 2017 our company will receive cash inflows of US$ 123 million (€ 114 million based on the exchange rate on February 6, 2017), which will be recognized as income in our Healthcare business sector.

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 or results of operations.

Corporate Governance

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Corporate Governance

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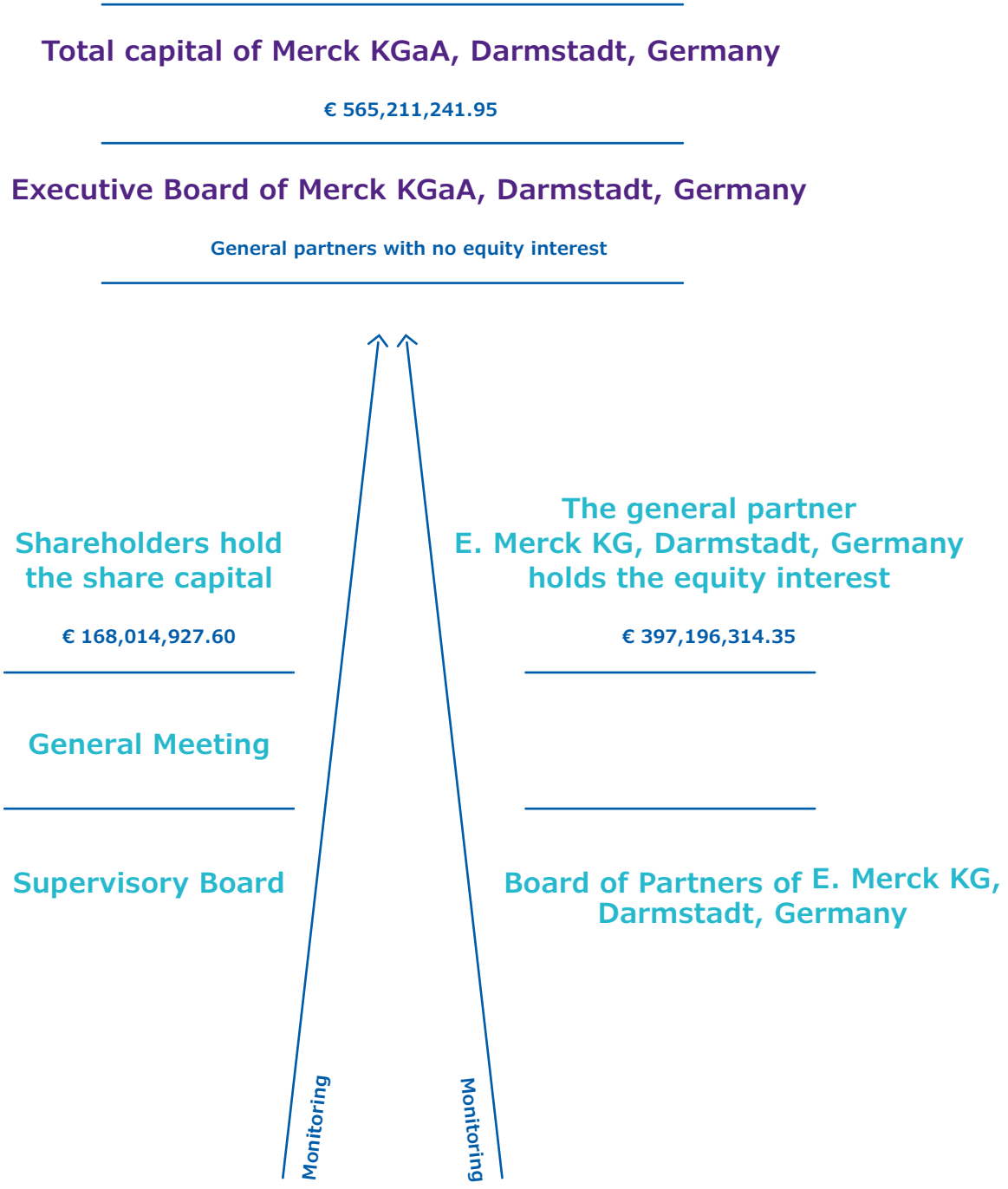
3

Capital structure and corporate bodies of Merck KGaA, Darmstadt, Germany



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.

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 page 175 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 last version dated May 5, 2015, the intent and meaning of which are applied, were complied with in the period between the last Declaration of Conformity issued on March 4, 2016 with three exceptions. In the future, the recommendations of the Code will again be adhered to with three exceptions. Further details can be found on page 159.

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, and exercises its influence accordingly. 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-first General Meeting of Merck KGaA, Darmstadt, Germany, was held on April 29, 2016 in Frankfurt am Main, Germany. At 61.92%, the proportion of share capital represented at the meeting was slightly lower than in the previous year. In 2015, the proportion of share capital represented was 64.32%.

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 March 4, 2016, we have complied with the recommendations of the Government Commission of the German Corporate Governance Code in the version dated May 5, 2015 published in the official section of the German Federal Gazette with the following exceptions:

Contrary to section 4.2.5 para 3 sentence 2 of the German Corporate Governance Code, the model tables only show the current service costs; any past service costs are shown in the footnotes. The chosen reporting serves better comparability with other companies and thus the transparency and understandability of the Compensation Report aimed for by the code (see section 4.2.5 para 1 sentence 3 of the German Corporate Governance Code).

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.

Contrary to section 5.4.1 para 2 sentence 1 of the German Corporate Governance Code, no age limit or regular limit on the length of Supervisory Board membership is taken into account when proposing candidates for election to the Supervisory Board pursuant to the published objectives of the Supervisory Board. The age and length of membership of Supervisory Board members are not criteria for their qualifications and competence. Moreover, we do not wish to forego the many years of experience of Supervisory Board members. Crucial to the successful work of the Supervisory Board is a good balance among Supervisory Board members in terms of age and length of membership.

Contrary to section 7.1.2 sentence 4 of the German Corporate Governance Code, owing to the way in which the German legal holidays fall, the interim report for the first quarter was only made publicly accessible slightly after the allotted 45-day time limit from the end of the reporting period. In fiscal 2017, the allotted 45-day time limit for publication of the interim report for the first quarter will also be slightly exceeded again for the same reason.

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 deviations from section 4.2.5 para 3 sentence 2 (model tables), from section 5.3.2 (audit committee), section 5.4.1 para 2 sentence 1 (age limit, regular limit on length of membership), and section 7.1.2 sentence 4 (publication deadline), the company will comply with the recommendations of the Code in the version dated May 5, 2015."

Darmstadt, February 24, 2017

For the Executive Board	For the Supervisory Board
s. Stefan Oschmann	**s. Wolfgang Büchele**

Compensation report

(The Compensation Report is part of the audited Notes to the Consolidated Financial Statements).

Compensation of members of the Executive Board of Merck KGaA, Darmstadt, Germany

As the world's oldest pharmaceutical and chemical company, we have always attached great importance to responsible governance and entrepreneurship. This continues to be reflected in the members of the Executive Board of Merck KGaA, Darmstadt, Germany, who, unlike management board members of German stock corporations, are not employed officers of the company. 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-based compensation from E. Merck KG, Darmstadt, Germany. Therefore, 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. Irrespective of this, Merck KGaA, Darmstadt, Germany, has decided to disclose the individual compensation of each Executive Board member in the following report.

Unlike publicly listed German stock corporations, at Merck KGaA, Darmstadt, Germany, 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. E. Merck KG, Darmstadt, Germany, has transferred the execution of this right to its Personnel Committee. Among other things, the Personnel Committee is responsible for the following decisions: contents of contracts with Executive Board members, granting of loans and advance salary payments, approval for taking on honorary offices, board positions and other sideline activities, as well as the division of responsibilities within the Executive Board of Merck KGaA, Darmstadt, Germany. The compensation system defined by the Personnel Committee for Executive Board members takes into account various aspects relevant to compensation, including the responsibilities and duties of the individual Executive Board members and their status as personally liable partners, their individual performance, the economic situation, performance and prospects of the company as well as normal compensation levels (by way of peer comparison) and the rewards structure otherwise in place in the company. The relationship between Executive Board compensation and the compensation of top management and the workforce as a whole is taken into account, also in a multiyear assessment. The Personnel Committee regularly commissions an independent compensation consultant to review the appropriateness of the compensation.

Features of the compensation system until December 31, 2016

The features of the compensation system of the Executive Board of Merck KGaA, Darmstadt, Germany, aim for a sustainable increase in the value of the company and performance-oriented governance. The compensation paid to the Executive Board members of Merck KGaA, Darmstadt, Germany, in fiscal 2016 comprises fixed compensation components, performance-related variable compensation components and additions to pension provisions. Benefits in kind and other benefits are additionally granted.

Fixed compensation

Fixed compensation is paid in the form of 12 equivalent monthly installments. The table on page 162 provides an overview of the amount of the fixed compensation paid in 2015 and 2016.

Variable compensation

Variable compensation is based on the three-year rolling average of profit after tax of the Group of E. Merck KG, Darmstadt, Germany. The Personnel Committee of E. Merck KG, Darmstadt, Germany, decides at its own or equitable discretion whether to consider exceptional factors of particular importance. From the net income determined in this manner, the members of the Executive Board receive individually fixed per mille rates based on the net income of the Group of E. Merck KG, Darmstadt, Germany.

Additionally, in exceptional cases the Personnel Committee of E. Merck KG, Darmstadt, Germany, which is responsible for the compensation of the Executive Board, may grant one-time payments voluntarily and at its own or equitable discretion.

Long-term variable compensation (Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany)

In 2012, a long-term variable compensation component known as the Long-Term Incentive Plan was added to the variable compensation of the members of the Executive Board. Under the Long-Term Incentive Plan the members of the Executive Board 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 total value defined for the respective person and the average closing price of shares in Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 of the respective fiscal year (reference price). In order to participate in the Plan, members of the Executive Board must personally own an investment in shares in Merck KGaA, Darmstadt, Germany, equivalent to 10% of their respective fixed annual compensation, taking into account the equity interest held in E. Merck KG, Darmstadt, Germany, as a personally liable general partner. It is not permitted to sell these shares during the performance cycle. After termination of the three-year performance

cycle, the number of MSUs to be granted then is determined based on the development of two key performance indicators (KPIs). These are:

a) the performance of the share price of Merck KGaA, Darmstadt, Germany, compared to the DAX® with a weighting of 70%, and
b) the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 30%.

Depending on the development of the KPIs, at the end of the respective performance cycle the members of the Executive Board are granted between 0% and 150% of the MSUs they could be eligible to receive.

Based on the number of MSUs granted, the members of the Executive Board receive a cash payment at a defined point in time in the year following the expiration of the three-year performance cycle. The value of an MSU corresponds to the average closing price of shares in Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 after the performance cycle. Since fiscal 2016, the payment amount has been reduced to twice the reference price. The members of the Executive Board invest 50% of the payment amount in shares in Merck KGaA, Darmstadt, Germany. One-third of these shares may be sold at the earliest one year after termination of the performance cycle, another third after two years, and another third after three years.

In fiscal 2016, the following total values were specified for members of the Executive Board, which resulted in the respective number of MSUs they were eligible to receive based upon the definitive reference price of shares in Merck KGaA, Darmstadt, Germany, (60 trading days preceding January 1, 2016) of € 87.92: Stefan Oschmann € 2.0 million (22,748 MSUs), Karl-Ludwig Kley € 1.5 million (17,061 MSUs), Udit Batra € 1.7 million (19,336 MSUs), Kai Beckmann € 1.43 million (16,265 MSUs), Walter Galinat € 1.15 million (13,081 MSUs), Belén Garijo Lopez € 1.7 million (19,336 MSUs), Marcus Kuhnert € 1.32 million (15,014 MSUs), and Bernd Reckmann € 1.0 million (11,374 MSUs).

For fiscal 2016, the following maximum amounts for the respective variable compensation components apply. For the members of the Executive Board who are active beyond 2016, reduced maximum amounts have been agreed for the variable compensation components and new limits for direct compensation (sum of fixed and variable compensation) have been introduced.

	One-time payment (€ thousand)	Variable compensation (€ thousand)	Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany (€ thousand)	**Maximum amount fixed and variable compensation (€ thousand)**
Stefan Oschmann	2,000	3,700	5,638	9,800
Karl-Ludwig Kley	2,000	8,000	4,500	11,100
Udit Batra	1,500	2,800	4,263	8,000
Kai Beckmann	1,500	2,400	3,575	8,000
Walter Galinat	1,500	2,200	3,300	8,000
Belén Garijo Lopez	1,500	3,000	4,675	8,000
Marcus Kuhnert	1,500	2,200	3,300	8,000
Bernd Reckmann	1,500	6,000	3,000	9,200

Additional benefits

The members of the Executive Board also receive additional benefits, mainly contributions to insurance policies, personal security expenses, as well as a company car, which they are entitled to use privately. Overall, the value of other additional benefits totaled € 166 thousand in 2016 (2015: € 252 thousand). Of this amount, in 2016 € 24 thousand was attributable to Stefan Oschmann (2015: € 25 thousand); € 14 thousand to Karl-Ludwig Kley (2015: € 148 thousand); € 4 thousand to Udit Batra; € 31 thousand to Kai Beckmann (2015: € 25 thousand); € 50 thousand to Walter Galinat; € 6 thousand to Belén Garijo Lopez (2015: € 6 thousand); € 20 thousand to Marcus Kuhnert (2015: € 20 thousand); and € 17 thousand to Bernd Reckmann (2015: € 28 thousand).

Total compensation

Accordingly, the following total compensation results for the members of the Executive Board of Merck KGaA, Darmstadt, Germany, broken down by performance-independent and performance-related components:

		Performance-independent components		Performance-related components			Total	Expense recorded in the period for share-based compensation[4]
				Without a long-term incentive effect	With a long-term incentive effect			
		Fixed compensation	Additional benefits	Variable compensation[1]	Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany			
		(€ thousand)	(€ thousand)	(€ thousand)	Number of MSUs[2] (units)	Time value[3] (€ thousand)	(€ thousand)	(€ thousand)
Current members								
Stefan Oschmann	2016	1,267	24	3,278	22,748	1,549	6,118	2,279
	2015	1,200	25	4,161	13,418	1,316	6,702	1,973
Karl-Ludwig Kley (until August 31, 2016)	2016	867	14	2,756	17,061	1,162	4,799	2,847
	2015	1,300	148	4,464	20,127	1,974	7,886	2,959
Udit Batra (since April 30, 2016)	2016	667	4	1,398	19,336	1,316	3,385	648
	2015	0	0	0	0	0	0	0
Kai Beckmann	2016	1,000	31	2,238	16,265	1,107	4,376	2,062
	2015	1,000	25	3,411	13,418	1,316	5,752	1,973
Walter Galinat (since April 30, 2016)	2016	533	50	1,098	13,081	891	2,572	438
	2015	0	0	0	0	0	0	0
Belén Garijo Lopez	2016	1,067	6	2,683	19,336	1,316	5,072	840
	2015	1,000	6	3,411	13,418	1,316	5,733	383
Marcus Kuhnert	2016	800	20	1,956	15,014	1,022	3,798	1,518
	2015	800	20	2,411	13,418	1,316	4,547	687
Bernd Reckmann (until April 29, 2016)	2016	400	17	1,353	11,374	774	2,544	1,898
	2015	1,200	28	4,411	13,418	1,316	6,955	1,973
Total	**2016**	**6,601**	**166**	**16,760**	**134,215**	**9,137**	**32,664**	**12,530**
	2015	**6,500**	**252**	**22,269**	**87,217**	**8,554**	**37,575**	**9,948**

[1] The one-time payment for 2015 granted to Bernd Reckmann is included in the variable compensation component for 2015.

[2] Number of the potential MSUs subject to target achievement. For details see page 160/161. The actual number of MSUs to be granted after the expiration of the three-year performance cycle may deviate from this.

[3] 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 only made on a specified date after the expiration of a 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 in Merck KGaA, Darmstadt, Germany, and the DAX® index in accordance with the remaining term of the LTIP tranche. The dividend payments incorporated into the valuation model orient towards medium-term dividend expectations.

[4] In accordance with IFRS the expense recorded for 2016 includes the values for the 2014, 2015 and 2016 LTIP tranches. In accordance with IFRS the expense recorded for 2015 includes the values for the 2013, 2014 and 2015 LTIP tranches.

Pension provisions

The individual contractual pension obligations grant the members of the Executive Board entitlement to a life-long old-age or surviving dependents' pension (with the exception of Udit Batra) in the event of reaching the individual contractually agreed age limit, permanent disability or death. As an alternative to an old-age pension, upon reaching the age limit specified in their individual contracts, the members of the Executive Board have been offered the possibility to receive their pension entitlement in the form of a one-time lump-sum payment calculated in accordance with actuarial principles.

The amount of the old-age pension is determined by a percentage share of pensionable compensation defined by the Personnel Committee.

A defined contribution pension plan has been agreed with Udit Batra. Within the scope of this agreement, a certain pension contribution is paid annually into an internal benefit account and interest is paid on this at standard market interest rates. Upon reaching the individual contractually agreed age limit, the amount in the benefit account is paid out in ten annual installments. In the event of permanent disability or death, the amount in the benefit account, which may be topped up, is disbursed as a one-time payment.

The pensionable compensation and pension entitlement are presented in the following table.

	Pensionable compensation (€ thousand)	Percentage entitlement
Stefan Oschmann	750	60
Karl-Ludwig Kley	900	70
Kai Beckmann	400	51
Walter Galinat	490	65
Belén Garijo Lopez	400	52
Marcus Kuhnert	300	42
Bernd Reckmann	650	66

Owing to his appointment as Chairman of the Executive Board, the pensionable compensation and percentage entitlement of Stefan Oschmann for 2016 were increased by € 100 thousand and 5%, respectively. The percentage entitlement increases as of 2017 until retirement by two percentage points per year of service up to 70%.

The percentage entitlement increases up until retirement by two percentage points per year of service up to 70% for Kai Beckmann and Bernd Reckmann. Their pension entitlement was thus accordingly increased in 2016.

As of 2016, the percentage entitlement increases up until retirement by two percentage points per year of service up to 70% for Belén Garijo Lopez and Marcus Kuhnert. Their pension entitlements were thus increased accordingly in 2016.

A defined contribution pension entitlement exists for Udit Batra comprising a pro rata annual payment to his benefit account for 2016. A percentage entitlement does not exist. Corresponding data is therefore not provided.

The pension provisions and the service cost are presented in the following table.

	Current service cost		
(€ thousand)	**2016**	2015	Amount of pension provisions as of Dec. 31, 2016
Stefan Oschmann[1]	852	953	8,584
Karl-Ludwig Kley	–	1,607	14,424
Udit Batra[2]	254	–	254
Kai Beckmann	205	230	5,948
Walter Galinat	157	–	6,857
Belén Garijo Lopez	688	672	1,501
Marcus Kuhnert	315	353	868
Bernd Reckmann	346	375	11,320
Total	**2,817**	**4,190**	**49,756**

[1] For 2016, in addition to the current service costs amounting to € 852 thousand, there are past service costs of € 3,506 thousand (total service cost: € 4,358 thousand) due to the increase in the pensionable compensation and percentage entitlement in connection with the appointment of Stefan Oschmann as Chairman of the Executive Board.

[2] The amount of the pension provision corresponds to the balance of the benefit account for a defined-contribution pension plan.

The surviving dependents' pension grants the spouse a lifelong surviving dependents' pension amounting to 60% of the pension entitlement, and dependent children either a half-orphan's or an orphan's pension maximally until the age of 25.

In Udit Batra's case, the pension agreement for surviving dependents provides for the payment of the amount in the benefit account, which may be topped up, in the form of a one-time payment.

Benefits in the event of termination of duties as an Executive Board member

The employment contracts of Karl-Ludwig Kley, Stefan Oschmann, Kai Beckmann, Bernd Reckmann, and Udit Batra each contain a post-contractual non-competition clause. An amount equal to 50% of the average contractual benefits paid to the respective Executive Board member within the past 12 months prior to leaving the company shall be provided as compensation for each year of the two-year non-competition period. During the period of the non-competition clause, other employment income and pension payments will be credited to 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 cease to apply. For 2016, Karl-Ludwig Kley received non-competition compensation of € 936 thousand.

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 this and existing pension obligations, no further obligations exist in the event of the termination of the contractual relationships of the Executive Board members.

Miscellaneous

The members of the Executive Board do not receive additional compensation for serving on the boards of Group companies.

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 recommendations of the German Corporate Governance Code.

Payments to former Executive Board members and their surviving dependents

Payments to former members of the Executive Board or their surviving dependents (pension payments and compensation for non-competition) amounted to € 11,850 thousand in 2016 (2015: € 11,908 thousand). Pension provisions totaling € 143,073 thousand exist for the pension entitlements of this group of persons (2015: € 111,812 thousand).

Features of the compensation system as of January 1, 2017

Within the scope of regularly reviewing the appropriateness of the compensation and the compensation system of the Executive Board, the Personnel Committee of E. Merck KG, Darmstadt, Germany, identified a need for change. The changes will be implemented as of January 1, 2017 in order to conform with the new organizational positioning and even more with the principles of sustainable, performance-oriented corporate governance. The new compensation structure is based on the recommendation of an independent compensation consultant.

Variable compensation

In order to take the individual performance of Executive Board members better into account, in the future the Personnel Committee can adjust the variable compensation based on the three-year rolling average of profit after tax of the Group of E. Merck KG, Darmstadt, Germany, by a discretionary factor in the range of 0.7 to 1.3.

Long-term variable compensation (Long-Term Incentive Plan of Merck KGaA, Darmstadt, Germany)

Under the Long-Term Incentive Plan the members of the Executive Board continue to be potentially eligible in each fiscal year 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 continues to depend on the total value defined for the respective person and the average closing price of shares in Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 of the respective fiscal year (reference price).

In the future, the Long-Term Incentive Plan will be modified as a further component of variable compensation. The number of key performance indicators (KPIs) will be increased by one to a total of three. The new KPIs with their respective weighting are:

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) the development of the EBITDA pre margin during the performance cycle as a proportion of a defined target value with a weighting of 25%.
c) the development of organic sales growth of the Group during the performance period as a proportion of a defined target value with a weighting of 25%.

Depending on the development of the KPIs, after the end of the respective performance period the members of the Executive Board are granted between 0% and 150% of the MSUs they could be eligible to receive.

Based on the MSUs granted, the members of the Executive Board 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 corresponds to the average closing price of shares in Merck KGaA, Darmstadt, Germany, in Xetra® trading during the last 60 trading days prior to January 1 after the end of the performance period. Since fiscal 2016, the payment amount has been reduced to twice the reference price.

In addition, the obligation to invest in shares in Merck KGaA, Darmstadt, Germany, is decoupled from the Long-Term Incentive Plan and being replaced in the future by a separate Share Ownership Guideline. This obligates the members of the Executive Board to invest 100% of their fixed annual compensation permanently in shares in Merck KGaA, Darmstadt, Germany. On account of his position as Chairman of the Executive Board, for Stefan Oschmann a higher amount of 200% of his fixed annual compensation applies.

Pension agreements

As of January 1, 2017, for the Executive Board members Kai Beckmann, Belén Garijo, and Marcus Kuhnert the individual contractual pension agreements will be changed from defined benefit to defined contribution pension agreements. Within the scope of these defined contribution agreements, a certain pension contribution is paid annually into an internal 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, the amount in the benefit account is paid out either in ten annual installments or optionally in the form of a one-time payment. In the event of permanent disability or death, the amount in the benefit account, which may be topped up, is disbursed as a one-time payment. In addition, the vested amount from the former defined benefit pension agreement is credited to the benefit account.

Due to already existing pension agreements and many years of service with the company, there will be no such change to the pension agreements of Stefan Oschmann and Walter Galinat, respectively.

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 2016, including additional benefits and the achievable minimum and maximum values of the variable compensation components, as well as the allocation of the respective compensation components for fiscal 2016.

BENEFITS GRANTED DURING THE FISCAL YEAR

	Stefan Oschmann				Karl-Ludwig Kley			
	Executive Board Chairman				Executive Board member			
					Left on: August 31, 2016			
Benefits granted	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)
Fixed compensation	1,200	1,267	1,267	1,267	1,300	867	867	867
Additional benefits	25	24	24	24	148	14	14	14
Total	**1,225**	**1,291**	**1,291**	**1,291**	**1,448**	**881**	**881**	**881**
Short-term variable compensation	4,161	3,278	–	3,700	4,464	2,756	–	8,000
Long-term variable compensation								
LTI 2015 (Jan. 1, 2015 – Dec. 31, 2017)	1,316	–	–	–	1,974	–	–	–
LTI 2016 (Jan. 1, 2016 – Dec. 31, 2018)	–	1,549	–	5,638	–	1,162	–	4,500
Total	**6,702**	**6,118**	**1,291**	**10,629**	**7,886**	**4,799**	**881**	**13,381**
Current service cost[1]	953	852	852	852	1,607	–	–	–
Total compensation	**7,655**	**6,970**	**2,143**	**11,481**	**9,493**	**4,799**	**881**	**13,381**

	Udit Batra				Kai Beckmann			
	Executive Board member				Executive Board member			
	Joined on: April 30, 2016							
Benefits granted	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)
Fixed compensation	–	667	667	667	1,000	1,000	1,000	1,000
Additional benefits	–	4	4	4	25	31	31	31
Total	**–**	**671**	**671**	**671**	**1,025**	**1,031**	**1,031**	**1,031**
Short-term variable compensation	–	1,398	–	2,800	3,411	2,238	–	2,400
Long-term variable compensation								
LTI 2015 (Jan. 1, 2015 – Dec. 31, 2017)	–	–	–	–	1,316	–	–	–
LTI 2016 (Jan. 1, 2016 – Dec. 31, 2018)	–	1,316	–	4,263	–	1,107	–	3,575
Total	**–**	**3,385**	**671**	**7,734**	**5,752**	**4,376**	**1,031**	**7,006**
Current service cost	–	254	254	254	230	205	205	205
Total compensation	**–**	**3,639**	**925**	**7,988**	**5,982**	**4,581**	**1,236**	**7,211**

[1] For 2016, in addition to the current service costs for Stefan Oschmann amounting to € 852 thousand, there are past service costs of € 3,506 thousand (total service cost: € 4,358 thousand) due to the increase in the pensionable compensation and percentage entitlement in connection with his appointment as Chairman of the Executive Board.

	Walter Galinat				Belén Garijo Lopez			
	Executive Board member				Executive Board member			
	Joined on: April 30, 2016							
Benefits granted	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)
Fixed compensation	–	533	533	533	1,000	1,067	1,067	1,067
Additional benefits	–	50	50	50	6	6	6	6
Total	**–**	**583**	**583**	**583**	**1,006**	**1,073**	**1,073**	**1,073**
Short-term variable compensation	–	1,098	–	2,200	3,411	2,683	–	3,000
Long-term variable compensation								
LTI 2015 (Jan. 1, 2015 – Dec. 31, 2017)	–	–	–	–	1,316	–	–	–
LTI 2016 (Jan. 1, 2016 – Dec. 31, 2018)	–	891	–	3,300	–	1,316	–	4,675
Total	**–**	**2,572**	**583**	**6,083**	**5,733**	**5,072**	**1,073**	**8,748**
Current service cost	–	157	157	157	672	688	688	688
Total compensation	**–**	**2,729**	**740**	**6,240**	**6,405**	**5,760**	**1,761**	**9,436**

	Marcus Kuhnert				Bernd Reckmann			
	Executive Board member				Executive Board member			
					Left on: April 29, 2016			
Benefits granted (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2016 (min.)** (€ thousand)	**2016 (max.)** (€ thousand)
Fixed compensation	800	800	800	800	1,200	400	400	400
Additional benefits	20	20	20	20	28	17	17	17
Total	**820**	**820**	**820**	**820**	**1,228**	**417**	**417**	**417**
Short-term variable compensation[1]	2,411	1,956	–	2,200	4,411	1,353	–	6,000
Long-term variable compensation								
LTI 2015 (Jan. 1, 2015 – Dec. 31, 2017)	1,316	–	–	–	1,316	–	–	–
LTI 2016 (Jan. 1, 2016 – Dec. 31, 2018)	–	1,022	–	3,300	–	774	–	3,000
Total	**4,547**	**3,798**	**820**	**6,320**	**6,955**	**2,544**	**417**	**9,417**
Current service cost	353	315	315	315	375	346	346	346
Total compensation	**4,900**	**4,113**	**1,135**	**6,635**	**7,330**	**2,890**	**763**	**9,763**

[1] The one-time payment 2015 granted to Bernd Reckmann is included in the variable compensation components for 2015.

ALLOCATION FOR THE YEAR UNDER REVIEW

	Stefan Oschmann		Karl-Ludwig Kley		Udit Batra	
	Executive Board Chairman		Executive Board member		Executive Board member	
			Left on: August 31, 2016		Joined on: April 30, 2016	
Allocation	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)
Fixed compensation	1,200	1,267	1,300	867	–	667
Additional benefits	25	24	148	14	–	4
Total	**1,225**	**1,291**	**1,448**	**881**	**–**	**671**
Short-term variable compensation	4,161	3,278	4,464	2,756	–	1,398
Long-term variable compensation						
LTI 2012 (Jan. 1, 2012 – Dec. 31, 2014)	3,043	–	4,565	–	–	–
LTI 2013 (Jan. 1, 2013 – Dec. 31, 2015)	–	2,290	–	3,435	–	–
Other	–	–	–	–	–	–
Total	**8,429**	**6,859**	**10,477**	**7,072**	**–**	**2,069**
Current service cost[1]	953	852	1,607	–	–	254
Total compensation	**9,382**	**7,711**	**12,084**	**7,072**	**–**	**2,323**

	Kai Beckmann		Walter Galinat		Belén Garijo Lopez	
	Executive Board member		Executive Board member		Executive Board member	
			Joined on: April 30, 2016			
Allocation	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)
Fixed compensation	1,000	1,000	–	533	1,000	1,067
Additional benefits	25	31	–	50	6	6
Total	**1,025**	**1,031**	**–**	**583**	**1,006**	**1,073**
Short-term variable compensation	3,411	2,238	–	1,098	3,411	2,683
Long-term variable compensation						
LTI 2012 (Jan. 1, 2012 – Dec. 31, 2014)	3,043	–	–	–	–	–
LTI 2013 (Jan. 1, 2013 – Dec. 31, 2015)	–	2,290	–	–	–	292
Other	–	–	–	–	–	–
Total	**7,479**	**5,559**	**–**	**1,681**	**4,417**	**4,048**
Current service cost	230	205	–	157	672	688
Total compensation	**7,709**	**5,764**	**–**	**1,838**	**5,089**	**4,736**

	Marcus Kuhnert		Bernd Reckmann		Matthias Zachert [3]	
	Executive Board member		Executive Board member		Executive Board member	
			Left on: April 29, 2016			
Allocation	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)	**2015** (€ thousand)	**2016** (€ thousand)
Fixed compensation	800	800	1,200	400	–	–
Additional benefits	20	20	28	17	–	–
Total	**820**	**820**	**1,228**	**417**	**–**	**–**
Short-term variable compensation[2]	2,411	1,956	4,411	1,353	–	–
Long-term variable compensation						
LTI 2012 (Jan. 1, 2012 – Dec. 31, 2014)	–	–	3,043	–	2,280	–
LTI 2013 (Jan. 1, 2013 – Dec. 31, 2015)	–	–	–	2,290	–	–
Other	–	–	–	–	–	–
Total	**3,231**	**2,776**	**8,682**	**4,060**	**2,280**	**–**
Current service cost	353	315	375	346	–	–
Total compensation	**3,584**	**3,091**	**9,057**	**4,406**	**2,280**	**–**

[1] For 2016, in addition to the current service costs for Stefan Oschmann amounting to € 852 thousand, there are past service costs of € 3,506 thousand (total service cost: € 4,358 thousand) due to the increase in the pensionable compensation and percentage entitlement in connection with his appointment as Chairman of the Executive Board.

[2] The one-time payment for 2015 granted to Bernd Reckmann is included in the variable compensation component for 2015.

[3] Matthias Zachert left the Executive Board on March 31, 2014.

Compensation of 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 this amount and the Vice Chairman receives one and a half times this amount. In addition, 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	
€	**2016**	2015	**2016**	2015	**2016**	2015
Wolfgang Büchele (Chairman)	94,000.00	94,000.00	3,000.00	3,750.00	97,000.00	97,750.00
Michael Fletterich (Vice Chairman)	70,500.00	70,500.00	3,000.00	3,750.00	73,500.00	74,250.00
Crocifissa Attardo	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Mechthild Auge	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Gabriele Eismann	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
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	3,750.00	50,000.00	50,750.00
Siegfried Karjetta	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Albrecht Merck	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Dietmar Oeter	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Alexander Putz	47,000.00	47,000.00	2,250.00	3,750.00	49,250.00	50,750.00
Helga Rübsamen-Schaeff	47,000.00	47,000.00	2,250.00	3,750.00	49,250.00	50,750.00
Karl-Heinz Scheider[1]	23,500.00	47,000.00	1,500.00	3,750.00	25,000.00	50,750.00
Gregor Schulz	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Theo Siegert	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Tobias Thelen	47,000.00	47,000.00	3,000.00	3,750.00	50,000.00	50,750.00
Veit Ulshöfer[2]	23,500.00	–	1,500.00	–	25,000.00	–
Total	**822,500.00**	**822,500.00**	**46,500.00**	**58,500.00**	**869,000.00**	**881,000.00**

[1] Until June 30, 2016.
[2] Since July 1, 2016.

As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Wolfgang Büchele received an additional payment of € 140,000 for performing this function in 2016 (2015: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Michaela Freifrau von Glenck received an additional payment of € 80,000 for performing this function in 2016 (2015: € 80,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Siegfried Karjetta received an additional payment of € 140,000 for performing this function in 2016 (2015: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Albrecht Merck received an additional payment of € 120,000 for performing this function in 2016 (2015: € 120,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Helga Rübsamen-Schaeff received an additional payment of € 150,000 for performing this function in 2016 (2015: € 150,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Gregor Schulz received an additional payment of € 140,000 for performing this function in 2016 (2015: € 140,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Theo Siegert received an additional payment of € 150,000 for performing this function in 2016 (2015: € 150,000).
As a member of corporate bodies of E. Merck KG, Darmstadt, Germany, Tobias Thelen received an additional payment of € 140,000 for performing this function in 2016 (2015: € 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, 2016, the members of the Executive Board and of the Supervisory Board either directly or indirectly held 114,447 shares of Merck KGaA, Darmstadt, Germany. Their total ownership represents 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 → Investors → Corporate Governance → Directors' Dealings.

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 dialogue 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 dialogue. 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 315a (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 2016. 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, 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 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.

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 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, 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 principles for dealings with business associates, general partners, colleagues and employees, as well as the communities in which we operate. 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.

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 follow our principles. While supplier management ensures compliant behavior of suppliers, global business partner risk management organizes 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 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.

In 2014, we began appointing compliance officers for the various business sectors. In particular, they are responsible for business-specific compliance input. 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 approval and documentation processes 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. From 2014 to 2016, a focus of the Compliance organization's activities was on integrating the AZ Electronic Materials and Sigma-Aldrich companies into our compliance management.

Within the scope of the global compliance program, a high degree of importance is attached to regular compliance seminars of the Compliance Training Plan of Merck KGaA, Darmstadt, Germany, 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, 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 members from various Group 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 and reporting these, both within the subsidiary abroad and to the Group functions. Group Compliance 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, as well as 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 page 127.

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 our company require the approval of the Supervisory Board. In fiscal 2016, 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 concerns and environmental protection issues. To this end, we integrate precautionary measures into our planning processes. 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 2006 puts even more emphasis than before on overall responsibility for products, supply chains and the community. We signed this expanded version of Responsible Care for the entire Group in February 2007. In addition, our company was one of the first companies in 2014 to sign the new version of the Responsible Care Global Charter, which is currently being rolled out by our company internationally. 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 regulatory requirements, 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 (since April 30, 2016; Vice Chairman until April 29, 2016)	no board positions
Karl-Ludwig Kley Darmstadt, Chairman (until April 29, 2016; member of the Executive Board until August 31, 2016)	(a) – Bertelsmann SE & Co. KGaA, Gütersloh (until May 2016) – Bertelsmann Management SE, Gütersloh (until May 2016) – BMW AG, Munich (Vice Chairman) – Deutsche Lufthansa AG, Cologne – E.ON SE, Essen (since June 8, 2016) (b) – Verizon Communications Inc., Wilmington, Delaware (USA)
Udit Batra Wellesley, Massachusetts, (USA), CEO Life Science (since April 30, 2016)	(b) – EMD Millipore Corporation, Billerica, Massachusetts, (USA)
Kai Beckmann Darmstadt, Chief Administration Officer	(a) – Bundesdruckerei GmbH, Berlin (since April 28, 2016)
Walter Galinat Eppertshausen, CEO Performance Materials (since April 30, 2016)	no board positions
Belén Garijo Lopez Frankfurt am Main, CEO Healthcare	(b) – Banco Bilbao Vizcaya Argentaria S. A., Bilbao, Spain – L'Oréal S.A., Clichy, France
Marcus Kuhnert Königstein im Taunus, Chief Financial Officer	no board positions
Bernd Reckmann Seeheim-Jugenheim, CEO Life Science and Performance Materials (until April 29, 2016)	(a) – Zschimmer & Schwarz GmbH & Co KG Chemische Fabriken, Lahnstein

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 twice a month.

Supervisory Board

Member	Memberships of (a) other statutory supervisory boards and (b) comparable German and foreign supervisory bodies of corporations
Wolfgang Büchele Munich, Chairman of the Supervisory Board of Merck KGaA, Darmstadt, Germany	b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1] – Kemira Oyj, Helsinki, Finland
Michael Fletterich Gernsheim, Chairman of the Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim, Vice Chairman	no board positions
Crocifissa Attardo Darmstadt, Full-time member of the Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	b) – BKK of Merck KGaA, Darmstadt, Germany
Mechthild Auge Wehrheim, Full-time member of the Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	no board positions
Gabriele Eismann Seeheim-Jugenheim, Senior Operational Product Manager	no board positions
Edeltraud Glänzer Hannover, Vice Chairperson of IG Bergbau, Chemie, Energie (IG BCE), Hannover	(a) – B. Braun Melsungen AG, Melsungen – Solvay Deutschland GmbH, Hannover (Vice Chairperson) (until October 15, 2016) – Evonik Industries AG, Essen (Vice Chairperson) (since May 19, 2016)
Michaela Freifrau von Glenck Zurich, Switzerland, Retired teacher	no board positions
Siegfried Karjetta[2] Darmstadt, Physician	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Albrecht Merck Schriesheim, Commercial Director of the Castel Peter Winery, Bad Dürkheim	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Dietmar Oeter Seeheim-Jugenheim, Vice President Corporate Quality Assurance	no board positions
Alexander Putz Michelstadt, Full-time member of the Works Council of Merck KGaA, Darmstadt, Germany, Darmstadt/Gernsheim	no board positions
Helga Rübsamen-Schaeff Langenburg, Chairperson of the Advisory Board of AiCuris Anti-infective Cures GmbH, Wuppertal	(a) – 4SC AG, Martinsried – Supervisory Board of Bonn University Hospital (b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Karl-Heinz Scheider Gross-Zimmern, Retiree (until June 30, 2016)	no board positions
Gregor Schulz Umkirch, Pediatrician	(b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1]
Theo Siegert Düsseldorf, Managing Partner of de Haen-Carstanjen & Söhne, Düsseldorf	(a) – E.ON SE, Düsseldorf – Henkel AG & Co KGaA, Düsseldorf (b) – E. Merck KG, Darmstadt, Germany, Darmstadt[1] – 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 (since July 1, 2016)	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 catalogue 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) of the German Stock Corporation Act (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 as and when necessary. 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" 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 independent 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 and the composition and procedures of its committees are described in the following.

The Board of Partners has nine members.

Member	Memberships of (a) other 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	(a) – Fortas AG, Rösrath (Chairman) (b) – Oras Invest Ltd, Helsinki, Finland – Travel Asset Group Ltd., London, United Kingdom (Chairman)
Wolfgang Büchele Munich, Chairman of the Supervisory Board of Merck KGaA, Darmstadt, Germany	(a) – Merck KGaA, Darmstadt, Germany (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 Anti-infective 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, Düsseldorf	(a) – Merck KGaA, Darmstadt, Germany – E.ON SE, Düsseldorf – 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

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 and other business documents, and the 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 to be approved, 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 meets at least 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 confer the responsibility for 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. These are Johannes Baillou (Chairman), Wolfgang Büchele, Theo Siegert, 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, as well as 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 Committee has four members. These are Theo Siegert (Chairman), Johannes Baillou, Wolfgang Büchele, and Tobias 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 by 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 reports. 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. These are Helga Rübsamen-Schaeff (Chairperson), Johannes Baillou, Siegfried Karjetta, and Gregor Schulz.

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 our Healthcare, Life Science and 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) AktG (German Stock Corporation Act)

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.

For the implementation of the German "Law on equal participation of women and men in management positions" (section 76 (4) AktG), in September 2015 the Executive Board of Merck KGaA, Darmstadt, Germany, had set the target for the percentage of positions held by women on the first and second management levels below the Executive Board at 21% each. The targets corresponded to the status quo at that time. The deadline set for reaching the targets was December 31, 2016.

On December 31, 2016, the percentage of positions held by women on the first management level was actually 16% and on the second level 24%. The percentage for the first management level was thus below the target set. The lower percentage of positions held by women on the first management level was mainly

due to personnel changes on the level of the Executive Board itself and the resulting change in the group of persons on the first management level, as well as to organizational changes (two women relocated to our sites outside Germany) and turnover (one woman left the company), which affected the number and percentage of management positions held by women on this level.

By contrast, at currently 24%, the percentage of positions held by women on the second management level significantly exceeded the target of 21% as a result of successful hirings/promotions of women. This creates a solid basis for future appointments on the first level.

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 below the Executive Board as follows:

- First management level below the Executive Board: 21% of positions held by women
- Second management level 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 30% of management positions held by women (managers, experts and project managers in roles 4 and above*) by 2021.

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 on 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 does not have a management board comparable to that of a stock corporation with personnel authority of the supervisory board, but has an executive board consisting of personally liable general partners (see also page 175 et seq. for the description of Supervisory Board procedures).

* Our company is changing its employee grading from Global Grades to a role-based approach. The relevant group continues to represent approximately 6% of the entire workforce; see the section entitled “Unity in diversity” on page 86 et seq.).

Report of the Supervisory Board

The Supervisory Board again properly executed its duties in 2016 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 2016, 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, as well as 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 2016. At these meetings, the Supervisory Board intensely discussed the reports of the Executive Board and company developments and strategic issues together with the Executive Board.

At the meeting held on March 4, 2016, the Executive Board first reported on business performance during 2015. In addition, the Supervisory Board intensively addressed the annual financial statements and consolidated financial statements for 2015 and the corresponding management reports. The auditor explained the audit report. The Executive Board reported on the financial statements. Furthermore, the Supervisory Board resolved upon the report and the objectives of the Supervisory Board with respect to its composition, the Declaration of Conformity with the German Corporate Governance Code as well as 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 presented the plans for fiscal 2016. The Supervisory Board took note of the written risk report. Further topics were the report of Group Internal Auditing, the resolution on the revised version of the rules of procedure of the Supervisory Board and of Article 9 (1) of the Articles of Association of Merck KGaA, Darmstadt, Germany (personally liable general partners with an equity interest).

The meeting held on May 13, 2016 focused on current business developments in the first quarter of 2016. 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 report of the Group Compliance Officer, the report of the Group Data Privacy Officer and the implications of the Market Abuse Regulation for Supervisory Board members.

At its meeting on July 29, 2016, the Supervisory Board focused intensively on the report of the Executive Board on business performance in the second quarter of 2016. 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 2016. No risks that threaten the continued existence of the company were identified. In addition, the new legal situation according to the German Audit Reform Act (AReG) and the German Audit Oversight Reform Act (APAReG) as well as the consequences on non-audit services and auditor rotation were addressed.

At its fourth meeting on November 11, 2016, the Supervisory Board dealt with the report of the Executive Board on the third quarter of 2016. Additional topics of focus were the 2016 status reports of Group Internal Auditing and on compliance and data protection as well as the report of the Research and Development Committee Healthcare. Furthermore, the Group Executive Conference and our current strategic direction were reported on and discussed. In addition, for 2017 the Supervisory Board approved the engagement of KPMG AG Wirtschaftsprüfungsgesellschaft, Berlin, to provide consulting services in the area of Global Mobility Services as well as support in setting up a relevant IT system.

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 state-

ments of Merck KGaA, Darmstadt, Germany, in accordance with German Auditing Standards. For the consolidated financial statements prepared in accordance with International Financial Reporting Standards, as well as the combined management report, the auditors issued the unqualified auditor's report reproduced in the Annual Report of the Group. In addition, the auditor audited the calculation of the participation of Merck KGaA, Darmstadt, Germany, in the profits of E. Merck KG, Darmstadt, Germany, in accordance with Article 27 (2) of the Articles of Association. 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, and the proposal by the Executive Board for the appropriation of the net retained profit were presented and distributed to the Supervisory Board, together with the auditor's reports.

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.

The discussion of the relevant agenda item at the Supervisory Board's meeting on February 24, 2017 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. 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 and the combined management report of Merck KGaA, Darmstadt, Germany, and the Group prepared by the Executive Board, as well as the report presented by the auditor in accordance with Article 27 (2) of the Articles of Association. Following its own examination of the situation, 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 2016.

After addressing corporate governance topics in detail, the Executive Board and Supervisory Board resolved to adopt and issue the updated Declaration of Conformity on February 14, 2017 (Executive Board) and on February 24, 2017 (Supervisory Board) and jointly issued it on February 24, 2017 in accordance with section 161 of the German Stock Corporation Act. The statement is permanently available on the website of Merck KGaA, Darmstadt, Germany (www.emdgroup.com → Investors → Corporate Governance). 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 158 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 newly elected on November 11, 2014 did not convene in fiscal 2016. No report is given on the work of further committees.

Personnel matters

With the exception of Helga Rübsamen-Schaeff, who was excused and absent from the meeting on March 4, 2016, and Alexander Putz, who was excused and absent from the meeting on May 13, 2016, all the Supervisory Board members attended all the Supervisory Board meetings. On June 30, 2016, Karl-Heinz Scheider resigned as a member of the Supervisory Board owing to his retirement and was replaced on July 1, 2016 by Veit Ulshöfer as a substitute member of the Supervisory Board.

Darmstadt, February 24, 2017

The Supervisory Board of Merck KGaA, Darmstadt, Germany

Wolfgang Büchele
Chairman

Objectives of the Supervisory Board with respect to its composition

Initial situation

According to section 5.4.1 (2) and (3) of the German Corporate Governance Code, the Supervisory Board shall specify concrete objectives regarding its composition which, while considering the specifics of the enterprise, take into account the international activities of the enterprise, potential conflicts of interest, the number of independent Supervisory Board members, an age limit to be specified for Supervisory Board members and a regular limit on the length of Supervisory Board membership to be specified, as well as diversity.

General notes on the composition of the Supervisory Board

The Supervisory Board of Merck KGaA, Darmstadt, Germany, currently consists of 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, 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 remaining 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 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.

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 with respect to its composition and reports on the status of their implementation below.

Expertise and diversity

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, due consideration shall be given in individual cases to the extent to which different, yet complementary professional profiles, career and life experiences, as well as appropriate representation of both genders can benefit the work of the Supervisory Board. Additionally, the Supervisory Board shall support the Executive Board in its efforts to increase diversity within the company.

In-depth knowledge of the fields relevant to the company

The Supervisory Board shall have at least four members with in-depth knowledge and experience of fields that are important to the company, including at least one expert for the Healthcare and Life Science/Performance Materials sectors, respectively.

Our company is currently meeting this objective for the composition of the Supervisory Board. At present, the Supervisory Board has more than four members who have in-depth knowledge and experience of 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. This includes both Supervisory Board members who were or still are management board members or directors in such companies, as well as Supervisory Board members who have gained experience in supervisory bodies of German and/or foreign companies of this size.

Family-owned company

The Supervisory Board shall have at least one member who has experience in managing medium- or large-sized family owned companies.

The Supervisory Board currently has multiple members who have the appropriate management experience in family-owned companies of this size.

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 Europe, covering a wide range of 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. This corresponds to 37.5% of the Supervisory Board. When nominating candidates for election to the Supervisory Board or making proposals for delegation, the Supervisory Board shall examine whether the percentage of women can be increased by suitable candidates.

The Supervisory Board currently consists of 37.5% women, which it considers a satisfactory percentage. This is based on both the percentage of women in management 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 adequate 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, normally all employee representatives should be independent within the meaning of the Code. In any case, at least four of the shareholder representatives on the Supervisory Board should 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 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 currently met. 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 bodies.

Moreover, no one shall be proposed for election to the Supervisory Board who simultaneously serves on a body of or advises a major competitor of the company, or owing to another function, e.g. advisor to major contract partners of the company, could potentially become involved in a conflict of interest. No Supervisory Board member serves on a body of or advises a major competitor. No Supervisory Board member performs a function that could lead to a lasting conflict of interest.

No age limit or maximum length of membership

An age limit or a regular limit on the length of membership for Supervisory Board members is not specified since age and length of membership are not criteria for qualifications and expertise. Moreover, we do not wish to forego the many years of experience of Supervisory Board members. Crucial to the successful work of the Supervisory Board is a good balance among Supervisory Board members in terms of age and length of membership.

The achievement of the aforementioned objectives shall be pursued initially until 2018, taking into account applicable law within the scope of elections and re-elections, delegations as well as court appointments of replacement members if these become necessary. All Supervisory Board members will correspondingly influence those eligible to elect or delegate. Taking into consideration the aforementioned criteria and in accordance with its duties under German stock corporation law, the Supervisory Board proposes to the General Meeting the candidates it believes to be best suited in each case and will continue to do so in the future.

Every year, the Supervisory Board will provide information in the Annual Report on the status of implementing its objectives.

Consolidated Financial Statements

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Consolidated Financial Statements

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To download the tables in the Consolidated Financial Statements as Excel files, please use the following link: ar2016.emdgroup.com/downloads

Consolidated Income Statement

€ million	Note	2016	2015
Net sales	→ 7	**15,024**	**12,845**
Cost of sales	→ 8	–5,201	–4,076
(of which: amortization of intangible assets)[1]		*(–181)*	*(–167)*
Gross profit		**9,823**	**8,768**
Marketing and selling expenses	→ 9	–4,526	–4,050
(of which: amortization of intangible assets)[1]		*(–1,032)*	*(–779)*
Administration expenses		–854	–720
Research and development costs	→ 10	–1,976	–1,709
(of which: amortization of intangible assets)[1]		*(–4)*	*(–3)*
Other operating income	→ 11	996	471
Other operating expenses	→ 12	–981	–917
Operating result (EBIT)		**2,481**	**1,843**
Financial result	→ 13	–326	–357
Profit before income tax		**2,154**	**1,487**
Income tax	→ 14	–521	–368
Profit after tax from continuing operations		**1,633**	**1,118**
Profit after tax from discontinued operations		**–**	**6**
Profit after tax		**1,633**	**1,124**
of which: attributable to shareholders of Merck KGaA, Darmstadt, Germany (net income)		1,629	1,115
of which: attributable to non-controlling interests	→ 24	4	9
Earnings per share (in €)	→ 15		
basic		3.75	2.56
– thereof: from continuing operations		3.75	2.55
– thereof: from discontinued operations		–	0.01
diluted		3.75	2.56
– thereof: from continuing operations		3.75	2.55
– thereof: from discontinued operations		–	0.01

[1] Excluding amortization of internally generated or separately acquired software.

Consolidated Statement of Comprehensive Income

€ million	Note	2016	2015
Profit after tax		**1,633**	**1,124**
Items of other comprehensive income that will not be reclassified to profit or loss in subsequent periods:			
Remeasurement of the net defined benefit liability			
Changes in remeasurement	→ 25	–424	161
Tax effect		79	–45
Changes recognized in equity		–344	115
		–344	115
Items of other comprehensive income that may be reclassified to profit or loss in subsequent periods:			
Available-for-sale financial assets			
Fair value adjustments		49	18
Reclassification to profit or loss		–31	–11
Tax effect		1	–2
Changes recognized in equity		19	5
Derivative financial instruments			
Fair value adjustments		–90	725
Reclassification to profit or loss		65	71
Reclassification to assets		–	–1,380
Tax effect		10	16
Changes recognized in equity		–15	–568
Exchange differences on translating foreign operations			
Changes taken directly to equity		591	972
Reclassification to profit or loss		–74	–
Changes recognized in equity		517	972
		521	409
Other comprehensive income		**177**	**524**
Comprehensive income		**1,810**	**1,648**
of which: attributable to shareholders of Merck KGaA, Darmstadt, Germany		1,804	1,636
of which: attributable to non-controlling interests	→ 24	6	12

Consolidated Balance Sheet

€ million	Note	Dec. 31, 2016	Dec. 31, 2015
Non-current assets[1]			
Intangible assets[1]	→ 16	24,989	25,422
Property, plant and equipment[1]	→ 17	4,230	4,008
Non-current financial assets[1]	→ 18	218	130
Other non-current assets	→ 19	131	128
Deferred tax assets	→ 14	1,013	1,050
		30,582	**30,737**
Current assets[1]			
Inventories[1]	→ 20	2,607	2,610
Trade accounts receivable	→ 21	2,889	2,738
Current financial assets	→ 18	145	227
Other current assets[1]	→ 19	674	500
Income tax receivables	→ 22	403	391
Cash and cash equivalents	→ 23	939	832
Assets held for sale	→ 4	12	46
		7,670	**7,344**
Total assets[1]		**38,251**	**38,081**
Total equity	→ 24		
Equity capital		565	565
Reserves		10,362	9,679
Gains/losses recognized in equity		3,062	2,543
Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany		**13,989**	**12,787**
Non-controlling interests		61	68
		14,050	**12,855**
Non-current liabilities[1]			
Provisions for pensions and other post-employment benefits	→ 25	2,313	1,836
Other non-current provisions	→ 26	834	855
Non-current financial liabilities	→ 27	8,809	9,616
Other non-current liabilities	→ 28	439	609
Deferred tax liabilities[1]	→ 14	2,720	2,926
		15,115	**15,842**
Current liabilities[1]			
Current provisions[1]	→ 26	412	536
Current financial liabilities	→ 27	3,788	4,097
Trade accounts payable	→ 29	2,048	1,921
Income tax liabilities	→ 30	883	1,011
Other current liabilities	→ 28	1,947	1,819
Liabilities directly related to assets held for sale	→ 4	8	–
		9,086	**9,384**
Total equity and liabilities[1]		**38,251**	**38,081**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Consolidated Cash Flow Statement

€ million	Note	2016	2015
Profit after tax		**1,633**	**1,124**
Depreciation/amortization/impairment losses/reversals of impairments		1,934	1,511
Changes in inventories		23	–90
Changes in trade accounts receivable		–73	–84
Changes in trade accounts payable		76	166
Changes in provisions		–51	215
Changes in other assets and liabilities		–587	–636
Neutralization of gains/losses on disposal of assets		–451	–42
Other non-cash income and expenses		14	32
Net cash flows from operating activities	→ 33	**2,518**	**2,195**
thereof: from discontinued operations		–	6
Payments for investments in intangible assets		–132	–179
Payments from the disposal of intangible assets		2	27
Payments for investments in property, plant and equipment		–716	–514
Payments from the disposal of property, plant and equipment		21	9
Payments for investments in financial assets		–344	–1,741
Payments for acquisitions less acquired cash and cash equivalents		–156	–13,482
Payments from the disposal of other financial assets		457	3,858
Payments from divestments less transferred cash and cash equivalents		5	–
Payments from other divestments		–3	–
Payments from divestment of assets held for sale		364	86
Net cash flows from investing activities	→ 34	**–503**	**–11,936**
thereof: from discontinued operations		24	84
Dividend payments to shareholders of Merck KGaA, Darmstadt, Germany		–136	–129
Dividend payments to non-controlling interests		–3	–4
Dividend payments to E. Merck KG, Darmstadt, Germany		–461	–435
Payments from new borrowings of financial liabilities from E. Merck KG, Darmstadt, Germany		881	560
Repayments of financial liabilities to E. Merck KG, Darmstadt, Germany		–729	–484
Repayment of bonds		–272	–1,738
Payments from issuance of bonds		–	5,756
Payments from new borrowings of other current and non-current financial liabilities		236	4,106
Repayments of other current and non-current financial liabilities		–1,424	–470
Net cash flows from financing activities	→ 34	**–1,908**	**7,164**
thereof: from discontinued operations		–	–
Changes in cash and cash equivalents		**107**	**–2,577**
Changes in cash and cash equivalents due to currency translation		8	531
Cash and cash equivalents as of January 1		832	2,879
Changes in cash and cash equivalents due to changes in scope of consolidation		–8	–
Cash and cash equivalents as of December 31		939	832
Plus cash and cash equivalents included in assets held for sale		–	–
Cash and cash equivalents as of December 31 (consolidated balance sheet)	→ 23	**939**	**832**

Consolidated Statement of Changes in Net Equity

For details see Note [24] “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
Balance as of January 1, 2015	**397**	**168**	**3,814**	**6,500**	**–1,275**
Profit after tax	–	–	–	1,115	–
Other comprehensive income	–	–	–	–	115
Comprehensive income	**–**	**–**	**–**	**1,115**	**115**
Dividend payments	–	–	–	–129	–
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	–	–	–	–461	–
Transactions with no change of control	–	–	–	–	–
Changes in scope of consolidation/Other	–	–	–	–	–
Balance as of December 31, 2015	**397**	**168**	**3,814**	**7,025**	**–1,160**
Balance as of January 1, 2016	**397**	**168**	**3,814**	**7,025**	**–1,160**
Profit after tax	–	–	–	1,629	–
Other comprehensive income	–	–	–	–	–344
Comprehensive income	**–**	**–**	**–**	**1,629**	**–344**
Dividend payments	–	–	–	–136	–
Profit transfer to/from E. Merck KG, Darmstadt, Germany, including changes in reserves	–	–	–	–466	–
Transactions with no change of control	–	–	–	–	–
Changes in scope of consolidation/Other	–	–	–	–3	3
Balance as of December 31, 2016	**397**	**168**	**3,814**	**8,049**	**–1,501**

Gains/losses recognized in equity					
Available-for-sale financial assets	Derivative financial instruments	Currency translation difference	Equity attributable to shareholders of Merck KGaA, Darmstadt, Germany	Non-controlling interests	Total equity
–	**393**	**1,745**	**11,742**	**59**	**11,801**
–	–	–	1,115	9	1,124
5	–568	969	521	3	524
5	**–568**	**969**	**1,636**	**12**	**1,648**
–	–	–	–129	–4	–133
–	–	–	–461	–	–461
–	–	–	–	–	–
–	–	–	–	–	–
5	**–176**	**2,714**	**12,787**	**68**	**12,855**
5	**–176**	**2,714**	**12,787**	**68**	**12,855**
–	–	–	1,629	4	1,633
19	–15	515	175	2	177
19	**–15**	**515**	**1,804**	**6**	**1,810**
–	–	–	–136	–3	–139
–	–	–	–466	–	–466
–	–	–	–	–	–
–	–	–	–	–10	–10
24	**–191**	**3,229**	**13,989**	**61**	**14,050**

Notes to the Consolidated Financial Statements

General

(1) Company information

The accompanying consolidated financial statements as of December 31, 2016 have been prepared with MERCK Kommanditgesellschaft auf Aktien (Merck KGaA), Frankfurter Strasse 250, 64293 Darmstadt, Germany, as parent company. Merck KGaA, Darmstadt, Germany, which manages the operations of the Group, 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, the ultimate parent company and general partner of Merck KGaA, Darmstadt, Germany, with an equity interest of 70.274% as of December 31, 2016. 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 and adopted by the European Union as issued by the International Accounting Standards Board and the IFRS Interpretations Committee (IFRS and IAS, as well as IFRIC and SIC) as well as the additionally applicable provisions of section 315a 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.

In comparison with the previous year, there were no material changes to accounting and measurement principles. The accounting and measurement policies used in the consolidated financial statements are presented in Notes [49] “Measurement policies” to [65] “Share-based compensation programs”.

The following rules take effect as of fiscal 2016:

- Amendment to IAS 1 “Presentation of Financial Statements”
- Amendments to IAS 16 “Property, Plant and Equipment”
- Amendment to IAS 19 “Employee Benefits”
- Amendment to IAS 27 “Separate Financial Statements”
- Amendment to IAS 28 “Investments in Associates”
- Amendment to IAS 38 “Intangible Assets”
- Amendment to IAS 41 “Agriculture”
- Amendment to IFRS 10 “Consolidated Financial Statements”
- Amendment to IFRS 11 “Joint Arrangements”
- Amendment to IFRS 12 “Disclosure of Interests in Other Entities”
- Annual Improvements to IFRSs 2010 – 2012 Cycle
- Annual Improvements to IFRSs 2012 – 2014 Cycle

The amendments had no material effects on the consolidated financial statements.

The following rules take effect as of fiscal 2018:

- IFRS 9 “Financial Instruments”
- IFRS 15 “Revenue from Contracts with Customers”
- Amendment to IFRS 15 “Revenue from Contracts with Customers”

In the course of introducing IFRS 9, the focus of the review is currently on analyzing the effects of the new impairment model on trade accounts receivable as well as the classification and measurement of equity instruments held by the Group. According to the present state of knowledge, the new rules will not have any material adjustment effects on the Group in terms of hedge accounting. The presentation of financial instruments in the consolidated balance sheet will change owing to the new classification and measurement rules. A final, reliable estimation of the other impacts of initial application of IFRS 9 is not yet available. The Group will make use of the possibility of modified initial application and record the cumulative adjustment from initial application as of January 1, 2018.

Since the beginning of 2015, a cross-functional project team has been analyzing the effects of the new rules on revenue recognition and is using quantitative and qualitative analyses, questionnaires and contract analyses to do so. Since the Group generates the vast majority of its sales revenues from simply structured sales of goods at a point in time and only provides longer-term services or conducts complex sales transactions with multiple performance obligations only to a small extent, from today’s perspective, the initial application of IFRS 15 is expected to have only immaterial impacts on the net assets, financial position and results of operations. According to the present state of knowledge, the new rules on variable consideration, on the costs of obtaining or fulfilling a contract, as well as on principal versus agent considerations will

be of only minor relevance to the Group. Moreover, separate performance obligations from transportation or other logistics services that must be recognized separately exist only to a very minor extent. Only minor adjustment effects will probably result from the changes in connection with the timing of when control of an asset is transferred within the context of product sales, the accounting treatment of outlicensing intellectual property as well as the accounting treatment for rights of return. According to the present state of knowledge, based on the contracts existing as of the balance sheet date, the adjustment effect resulting from the change in presentation of multiple-element arrangements that include service components will be less than € 10 million when IFRS 15 is applied for the first time. The implementation of the new rules in the systems and processes of the Group companies commenced in 2016 and will be completed in the course of 2017. The necessary system adaptations relate in particular to the expanded sales revenue disclosure requirements in the Notes to the Consolidated Financial Statements. The Group will make use of the possibility of modified initial application and record the cumulative adjustment from initial application as of January 1, 2018.

As of the balance sheet date, the following standards were published by the International Accounting Standards Board and the IFRS Interpretations Committee, but not yet endorsed by the European Union:

- IFRS 14 "Regulatory Deferral Accounts"
- IFRS 16 "Leases"
- IFRIC 22 "Foreign Currency Transactions and Advance Consideration"
- Amendment to IAS 7 "Statement of Cash Flows"
- Amendment to IAS 12 "Income Taxes"
- Amendment to IAS 28 "Investments in Associates and Joint Ventures"
- Amendment to IAS 40 "Investment Property"
- Amendment to IFRS 2 "Share-based Payment"
- Amendment to IFRS 4 "Insurance Contracts"
- Amendment to IFRS 10 "Consolidated Financial Statements"
- Amendment to IFRS 15 "Revenue from Contracts with Customers"
- Annual Improvements to IFRSs 2014 – 2016 Cycle

The impact of IFRS 16, which will become effective as of 2019 subject to a corresponding endorsement by the European Union, on the consolidated financial statements is currently being examined.

The implementation of IFRS 16 will mean that as a lessee, for all leases the Group will generally be required to recognize a liability and a corresponding right of use in its balance sheet. The possibility to classify a lease as an operating lease and to recognize the associated expenses in the period in which they are incurred will no longer exist. The Group will make use of the option under IFRS 16 to continue to refrain from recognizing utilization rights and the corresponding liabilities from leases of low-value assets in its balance sheet. At the time of initial application, the Group will make use of the transition relief provided by IFRS 16 to recognize the cumulative transition effect instead of adjusting the prior-year periods retroactively. In order to determine the impact of IFRS 16, around 7,000 leases have been identified and analyzed to date. According to the current status of the analysis, with the transition to IFRS 16, the increase in the balance sheet total will be less than 2%.

From today's perspective, the other new rules are also not expected to have any material effects on the consolidated financial statements.

(3) Changes in the scope of consolidation

The scope of consolidation changed as follows in the reporting period:

Fully consolidated companies as of December 31, 2015		**316**
Additions	Establishment	2
	Acquisition	5
	Materiality	8
Retirements	Liquidation / Merger	–13
	Divestment	–3
	Immateriality	–
	Loss of control	–2
Fully consolidated companies as of December 31, 2016		**313**
Non-consolidated subsidiaries as of December 31, 2015		63
Non-consolidated subsidiaries as of December 31, 2016		48

Overall, the impact of subsidiaries not consolidated due to immateriality on sales, profit after tax, assets and equity was less than 1% relative to the entire Group. The interests in subsidiaries not consolidated due to immateriality were classified as available-for-sale financial assets and presented under non-current financial assets (see Note [18] "Financial Assets").

The Venezuelan entities were deconsolidated effective February 29, 2016 since management came to the conclusion that due to the nearly complete absence of dividend payments and payments for Group-internal supplies of goods, the possibility of receiving and influencing variable returns from the involvement in the Venezuelan entities was no longer given (see Note [6] "Management judgments and sources of estimation uncertainty"). Accordingly, the deconsolidations were reported as disposals due to loss of control.

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 [66] "List of shareholdings").

(4) Acquisitions, assets held for sale and disposal groups

Acquisition of BioControl Systems, Inc., USA

On December 21, 2016, the Group acquired a 100% interest in BioControl Systems, Inc., Bellevue, USA (BioControl), a company that develops, manufactures and commercializes materials and systems to check food safety. BioControl was integrated into the Life Science business sector of the Group. The purchase price was US$ 167 million (€ 160 million after currency translation based on the closing rate on December 21, 2016). The purchase price allocation could not be completed by December 31, 2016. Consequently, the acquired assets and liabilities were reported on a preliminary basis at their carrying amounts.

Acquisition of Sigma-Aldrich Corporation, St. Louis, USA, in 2015

On November 18, 2015, the Group obtained control of the Sigma-Aldrich Corporation, St. Louis, USA (Sigma-Aldrich). The life science business of Sigma-Aldrich was integrated into the Life Science business sector and the SAFC Hitech business was integrated into the Performance Materials business sector of the Group.

Since the acquisition date was November 18, 2015, the acquired Sigma-Aldrich business only contributed to the results of the Group in fiscal 2015 for this period. Consolidation as a member of the Group for fiscal 2016 led to significant effects, primarily on the consolidated income statement and the consolidated cash flow statement. The acquired inventories measured at fair values were recognized in cost of sales over a period of six months. Property, plant and equipment is depreciated over a period of up to 36 years. In fiscal 2016, this resulted in depreciation of € 135 million.

The intangible assets are being amortized over a period of up to 22 years. In 2016, amortization totaled € 335 million.

Purchase price allocation

The determination of fair values required extensive analyses and calculations, which were completed in November 2016. In comparison with the preliminary purchase price allocation, adjustments resulted for inventories, property, plant and equipment, intangible assets, non-current financial assets, current provisions as well as deferred tax liabilities.

The fair values as of the acquisition date were as follows:

€ million	Fair values on the acquisition date
Non-current assets	
Intangible assets (excluding goodwill)	5,808
Property, plant and equipment	838
Other non-current assets	124
	6,770
Current assets	
Cash and cash equivalents	1,235
Inventories	841
Receivables	452
Other current assets	36
Assets held for sale	124
	2,688
Assets	**9,458**
Non-current liabilities	
Non-current financial liabilities	–
Other non-current liabilities and provisions	150
Deferred tax liabilities	2,511
	2,661
Current liabilities	
Current financial liabilities	425
Other current liabilities and provisions	539
Liabilities directly related to assets held for sale	–
	964
Liabilities	**3,625**
Acquired net assets	**5,833**
Purchase price for the acquisition of shares	**14,594**
Positive difference (goodwill)	**8,761**

The most significant impact of the purchase price allocation resulted from the remeasurement of intangible assets, property, plant and equipment as well as finished and unfinished goods within inventories at fair value, and from the recognition of deferred taxes. The intangible assets identified during the purchase price allocation and recognized on the date of first-time consolidation as well as the measurement methods applied are presented in the following overview:

	Fair values on the acquisition date € million	Useful lives in years	Valuation method for determining the fair values
Customer relationships	4,623	21 – 22	multi-period excess earnings method
Trademarks and brands	958	12	relief from royalty method
Technologies (patented and non-patented)	130	10 – 12	relief from royalty method, replacement cost method
Other	97		
Total	**5,808**		
Goodwill	8,761	indefinite	
Total	**14,569**		

A major factor for the measurement of customer relationships was the assumption regarding long-term customer retention. If the annual loss of customers was one percentage point higher, the fair value of customer relationships would have been € 468 million lower and the amortization period would have had to be reduced by two years. The most significant assumption for the measurement of trademarks and brands concerned the underlying royalty rates. These were derived from available market information. If the royalty rates were reduced by 0.25 percentage points, the fair value would have been € 57 million lower.

The positive difference of € 8,761 million was recognized as goodwill. This comprised anticipated synergies from the integration of Sigma-Aldrich into the Group as well as intangible assets that are not recognizable, such as the expertise of the transferred workforce. Synergies are primarily expected in the areas of administration, production and purchasing. Apart from these cost synergies, earnings synergies are expected particularly through the use of the e-commerce platform of Sigma-Aldrich for products from the legacy life science business. The goodwill was allocated to the two business sectors Life Science (€ 8,402 million) and Performance Materials (€ 359 million). It is not expected that goodwill will be deductible for tax purposes.

The development of goodwill between the two balance sheet dates was as follows:

€ million	Development of goodwill
Goodwill on December 31, 2015[1]	8,541
Exchange rate effects	336
Goodwill on December 31, 2016	**8,877**

[1] Previous year's figure has been adjusted.

No material contingent liabilities were identified in the course of the purchase price allocation. The gross amounts of the acquired receivables on the acquisition date were € 457 million. The best possible estimate of irrecoverable receivables amounted to € 5 million.

Further acquisitions in 2015

In December 2015, the Group acquired the outstanding shares (89.7%) in Ormet Circuits, Inc., San Diego, USA (Ormet) to enhance its position as a semiconductor materials supplier. Ormet was integrated into the Performance Materials business sector of the Group. US$ 30 million (€ 28 million) was spent to acquire the outstanding interest. The purchase price for 100% of the shares would have been US$ 31 million (€ 28 million). An expense of € 1 million was recorded from the remeasurement of the interests in Ormet prior to the obtainment of control. In 2015, the preliminary difference from the purchase price allocation was fully reported as goodwill due to the fact that the acquisition was completed shortly before year-end. The purchase price allocation conducted in 2016 identified technology-related intangible assets amounting to € 26 million. Overall, deferred tax liabilities amounted to € 4 million. Goodwill thus amounted to € 3 million.

At the end of July 2015, the Group acquired the remaining 52.3% interest in the start-up Qlight Nanotech Ltd., Jerusalem, Israel (Qlight). Since then, the Group has held 100% of the company. Qlight conducts research in the field of quantum materials and was integrated into the Performance Materials business sector. The purchase price comprised fixed consideration amounting to US$ 3 million (€ 3 million), milestone payments of up to US$ 4 million (€ 4 million) as well as license fees provided that certain preconditions are met. There were no adjustments to the preliminary purchase price allocation or to the measurement of the contingent consideration.

Adjustment of the consolidated balance sheet for 2015 due to the completion of the purchase price allocation in 2016

In 2016, the preliminary purchase price allocations as of December 31, 2015 for the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA, were completed.

The values in the consolidated balance sheet as of December 31, 2015 were retroactively adjusted as follows:

PREVIOUS YEAR ADJUSTMENT

	Dec. 31, 2015			
€ million	Pre adjustment	Sigma-Aldrich Corporation	Ormet Circuits, Inc.	Post adjustment
Non-current assets	**30,657**	**80**	**–**	**30,737**
of which:				
Goodwill	14,370	148	–26	14,492
Intangible assets (excluding goodwill)	10,969	–65	26	10,930
Property, plant and equipment	4,009	–2	1	4,008
Non-current financial assets	131	–1	–	130
Unadjusted other non-current assets	1,178	–	–	1,178
Current assets	**7,350**	**–10**	**4**	**7,344**
of which:				
Inventories	2,620	–10	–	2,610
Other current assets	496	–	4	500
Unadjusted other current assets	4,234	–	–	4,234
Total assets	**38,007**	**70**	**4**	**38,081**
Total equity	**12,855**	**–**	**–**	**12,855**
Non-current liabilities	**15,769**	**69**	**4**	**15,842**
of which:				
Deferred tax liabilities	2,853	69	4	2,926
Unadjusted other non-current liabilities	12,916	–	–	12,916
Current liabilities	**9,383**	**1**	**–**	**9,384**
of which:				
Current provisions	535	1	–	536
Unadjusted other current liabilities	8,848	–	–	8,848
Total equity and liabilities	**38,007**	**70**	**4**	**38,081**

Divestment of the rights to Kuvan® and Peg-Pal

On October 1, 2015, the Group entered into an agreement with BioMarin Pharmaceutical Inc., USA (BioMarin), to return the rights to Kuvan® (sapropterin dihydrochloride), a drug used to treat phenylketonuria (PKU), a rare metabolic disorder, and the related business activities. These business activities, which were allocated to the Healthcare business sector, were reported as a disposal group in fiscal 2015 and included an intangible asset of € 24 million, allocable goodwill of € 22 million, as well as inventories to a limited extent.

Moreover, an agreement was also reached on October 1, 2015 under which the Group is obligated to return its option to develop and commercialize Peg-Pal to BioMarin. Peg-Pal is an investigational drug that is also designed for the treatment of PKU.

Both agreements became effective at the beginning of January 2016. Based on the agreements, in January 2016, the Group received an upfront payment of € 340 million for the sale of the rights to Kuvan®. Moreover, the Group is entitled to milestone payments of up to € 185 million.

Divestment of Pakistani subsidiaries

On December 9, 2016, the Group divested its 75% shareholding in the Pakistani Merck (Private) Limited, a subsidiary of Merck KGaA, Darmstadt, Germany, its subsidiary Merck Pharmaceuticals (Private) Limited, a subsidiary of Merck KGaA, Darmstadt, Germany, as well as its 100% shareholding in Merck Specialities (Private) Limited, a subsidiary of Merck KGaA, Darmstadt, Germany, to Martin Dow Limited, Pakistan. The transaction involved the mutual transfer of trademarks and brands, making them accessible to the acquirer. The businesses of the Pakistani companies comprised allocated goodwill (€ 7 million), property, plant and equipment (€ 8 million), inventories (€ 16 million), cash (€ 15 million) and non-controlling interests (€ 10 million). The loss from the divestment of the three subsidiaries amounted to € 8 million and was recognized in other operating expenses.

Planned divestment of the Biosimilars business

The Group is in advanced stages of negotiations to divest its Biosimilars business. In this business, the Group develops similar subsequent versions of already registered biopharmaceuticals, primarily for the therapeutic areas of oncology and autoimmune diseases. The divestment is expected to be completed in 2017. The business activities allocable to the Healthcare business sector were reported as a disposal group as of December 31, 2016 and mainly consist of intangible assets amounting to € 2 million, the allocable goodwill of € 9 million as well as liabilities in connection with these activities.

Business activities of Sigma-Aldrich acquired with a view to resale

On December 15, 2015, the Group sold to Honeywell Specialty Chemicals Seelze GmbH of Seelze, Germany, parts of the European solvents and inorganics business that had been acquired within the scope of the acquisition of the Sigma-Aldrich Corporation, USA, in order to meet the antitrust conditions of the European Commission. In accordance with the agreement with the acquirer, during the reporting period the Group received a further payment of € 24 million, which had already been recognized as income in 2015.

(5) Collaborations of material significance

Strategic alliance with Pfizer Inc., USA, 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., USA, (Pfizer) to co-develop and co-commercialize the anti-PD-L1 antibody avelumab. This antibody is currently being studied in multiple clinical trials as a potential treatment for various 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. As part of the strategic alliance, the two companies will combine resources and expertise to also co-develop and co-market Pfizer's anti-PD-1 antibody. The overriding objective of the strategic alliance is to share the risks of development and to accelerate the two companies' presence in immuno-oncology.

According to the collaboration agreement, during the development period each partner will bear one-half of the development expenses. In a potentially later commercialization phase, the Group will realize the vast majority of sales from the commercialization of avelumab while Pfizer will realize the vast majority of sales from the commercialization of its anti-PD-1 antibody. At the same time, the Group and Pfizer will evenly split defined income and expense components. The execution of the collaboration agreement is not being structured through a separate vehicle. This means that the assets and liabilities attributable to the contractual arrangement are owned by the two contract partners.

Under the terms of the agreement, in 2014 Pfizer made an upfront cash payment of US$ 850 million (€ 678 million) to the Group after the closing. 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-market 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. In the United States and the European Union, Xalkori® is also indicated for the treatment of metastatic NSCLC in patients whose tumors are ROS1-positive. During co-commercialization of Xalkori®, the Group receives from Pfizer a share of the profits, which are reported in net sales. In 2016, these amounted to € 64 million (2015: € 8 million). When it arose, 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 will be amortized over the term of the agreement. The residual book value of these assets as of December 31, 2016 was € 153 million (2015: € 262 million). More information on the impairment of € 71 million recognized on the intangible asset in 2016 can be found in Note [6] "Management judgments and sources of estimation uncertainty."

On the date of the closing of the collaboration agreement, both the upfront payment received and the value of the right to co-market Xalkori® were recognized in the balance sheet as deferred revenues under other liabilities. Both amounts are being recognized over the expected period during which the Group is to meet certain obligations and will be disclosed under other operating income. More information on the exercise of management judgments and estimation uncertainties in this regard can be found in Note [6] "Management judgments and sources of estimation uncertainty."

Agreement with Bristol-Myers Squibb Company, USA, for the co-commercialization of Glucophage® in China

In March 2013, the Group established an agreement with Bristol-Myers Squibb Company, USA, (BMS) for the co-commercialization of the antidiabetic agent Glucophage® (active ingredient: metformin hydrochloride) for the treatment of type 2 diabetes in China. In 2016, the Group recorded commission income of € 104 million from co-commercialization (2015: € 84 million). As of 2017, the Group will book net sales instead of commission income from the distribution of Glucophage® in China and in return make license payments to BMS.

Agreement with Intrexon Corporation, USA, on the co-development and co-commercialization of CAR-T cancer therapies

In March 2015, the Group and Intrexon Corporation, USA, entered into an exclusive 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. Intrexon will be responsible for all platform and product developments until the investigational new drug application is submitted for regulatory approval. The Group will select targets of interest for which CAR-T products will be developed. The Group will also lead the regulatory submission process and pre-submission interactions with the regulatory authorities, as well as clinical development and commercialization. Intrexon received an upfront payment of US$ 115 million. This amount was recognized as part of intangible assets not yet available for use (carrying amount as of December 31, 2016: € 104 million / 2015: € 104 million). For the first two targets of interest selected by the Group, Intrexon will receive research funding and is eligible to receive up to US$ 826 million development, regulatory and commercial milestones, as well as tiered royalties on product sales. In addition, Intrexon is also eligible to receive further payments upon achievement of certain technology development milestones.

(6) Management judgments and sources of estimation uncertainty

The preparation of the consolidated financial statements requires 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.

Recognition and measurement of assets, liabilities and contingent liabilities acquired in the context of business combinations

The recognition and measurement of assets, liabilities and contingent liabilities at fair value during purchase price allocations involve the use of estimates. The expertise of external valuation experts is normally obtained here. The fair values of the assets and liabilities recognized as part of the purchase price allocation of the Sigma-Aldrich Corporation, a sensitivity analysis in relation to the acquired customer lists, and trademarks and brands, as well as further information on this acquisition, which closed in 2015, can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

Sales deductions

The Group grants its customers various kinds of rebates and discounts. In addition, expected returns, state compulsory charges and rebates from health plans and programs are also deducted from sales.

The most significant portion of these deductions from sales is attributable to the Healthcare business sector. The most substantial sales deductions in this business sector relate to government rebate programs in North America.

Insofar as sales deductions were not already made on payments received, the Group determines the level of sales deductions on the basis of current experience and recognizes them as a liability (carrying amount on December 31, 2016: € 443 million/2015: € 421 million). The sales deductions reduce gross sales revenues. Adjustments of liabilities can lead to increases or reductions in net sales in later periods.

Impairment tests of goodwill and intangible assets not yet available for use

The goodwill (carrying amount as of December 31, 2016: € 15,064 million/2015: € 14,492 million) and other intangible assets not yet available for use (carrying amount as of December 31, 2016: € 181 million/2015: € 184 million) reported in the consolidated financial statements are tested for impairment at least once a year or when a triggering event arises.

The carrying amounts of goodwill are allocated to the following cash-generating units or groups of cash-generating units on which level the impairment tests were performed:

	Goodwill	
€ million	**as of Dec. 31, 2016**	as of Dec. 31, 2015
Biopharma	1,560	1,580
Consumer Health	251	243
Life Science[1]	11,801	11,272
Performance Materials[1]	1,452	1,397
Total	**15,064**	**14,492**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The identified cash-generating units or groups of cash-generating units represent the lowest level at which goodwill is monitored by management.

As in 2015, no impairment losses for goodwill were recorded in the year under review. Owing to the termination of development projects in the Healthcare business sector, in 2016 impairment losses of other intangible assets not yet available for use were recorded in the amount of € 12 million (2015: € 109 million).

When conducting the impairment tests the following parameters were used:

Measurement basis	Value in use
Impairment test level	Biopharma (including Allergopharma and Biosimilars[1]) Consumer Health 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 after tax – 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 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 tax (Weighted average cost of capital after tax – 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 the respective peer group

[1] Biosimilars was not yet reported as a disposal group when the impairment test was performed.

The long-term growth rates and weighted average costs of capital (WACC) used to conduct the goodwill impairment tests were as follows:

	Long-term growth rate		Cost of capital after tax		Cost of capital before tax	
	2016	2015	**2016**	2015	**2016**	2015
Biopharma	0.00%	0.00%	6.1%	6.2%	8.1%	8.0%
Consumer Health	2.00%	2.00%	5.9%	6.2%	7.2%	7.6%
Life Science[1]	1.75%	1.75%	6.1%	6.1%	7.5%	7.5%
Performance Materials[1]	0.50%	0.50%	6.1%	6.6%	7.9%	8.6%

[1] The disclosures for 2015 relate to the impairment test performed as of October 31, 2015 before the closing of the acquisition of the Sigma-Aldrich Corporation, USA.

For the impairment test, 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. Overall, 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	
	2016	2015	**2016**	2015	**2016**	2015
	in percentage points		in percentage points		in %	
Biopharma	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%
Consumer Health	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%
Life Science[1]	> 2.0	> 2.0	> 1.5	> 2.0	> 5%	> 5%
Performance Materials[1]	> 2.0	> 2.0	> 2.0	> 2.0	> 5%	> 5%

[1] The disclosures for 2015 relate to the impairment test performed as of October 31, 2015 before the closing of the acquisition of the Sigma-Aldrich Corporation, USA.

Determination of the amortization of intangible assets with finite useful lives

In addition to goodwill and intangible assets not yet available for use, the Group has a significant amount of intangible assets with finite useful lives (carrying amount as of December 31, 2016: € 9,556 million / December 31, 2015: € 10,636 million). Substantial assumptions and estimates are required to determine the appropriate level of amortization of these intangible assets. This relates in particular to the determination of the underlying remaining useful life, which the Group reviews regularly and adjusts if necessary. The Group considers 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, marketing authorizations, patents, licenses and similar rights, brands and trademarks had been 10% higher, for example due to shortened remaining useful lives, profit before tax would have been € 122 million lower in fiscal 2016 (2015: € 95 million lower).

In fiscal 2016, 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 tax by € 123 million (2015: € 92 million). An extension of the useful life by one year would have increased profit before tax by € 74 million (2015: € 61 million).

Research and development collaborations as well as in- and out-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 expense) or whether such payments result in an in-licensing of an intangible asset that has to be capitalized. This assessment is normally subject to judgment.

The Group regularly receives upfront and milestone payments as part of research and development collaborations or out-licensing agreements. In this context, income may only be recognized if the Group has transferred all material risks and rewards of an intangible asset to the acquirer, has no interest in the remaining business activities and has no material continuing commitment. If these criteria are not deemed to be met, the received payments are deferred and recognized over the period in which the Group is expected to fulfill its performance obligations. Both the assessment of the revenue recognition criteria and the determination of the appropriate period during which income is recognized are subject to judgment.

If the consideration that was received as part of the strategic alliance with Pfizer Inc., USA, in November 2014 and deferred as a liability had been recognized in the income statement over a shorter period reduced by one year, in 2016 this would have increased other operating income and thus profit before tax would have increased by € 64 million (2015: € 48 million). Recognition over a period extended by one year would have lowered other operating income and profit before tax by € 38 million (2015: € 32 million).

Identification of impairment of non-financial assets

Discretionary decisions are required in the identification of objective evidence of impairment of intangible assets and property, plant and equipment. As of December 31, 2016, the carrying amounts of these assets totaled € 29,219 million (2015: € 29,430 million). External and internal information is used to identify indications of impairment. For example, the approval of a competing product in the Healthcare business sector or the closure of a site can be an indicator of impairment.

In the second quarter of 2016, the intangible asset in connection with the co-commercialization right for Xalkori® (crizotinib), a medicine to treat patients with ALK-positive metastatic non-small cell lung cancer, was subjected to an impairment test owing to negative developments in the market environment. This test led to an impairment loss of € 71 million on the intangible asset, which was reported under other operating expenses. Within the scope of the impairment test, the recoverable amount was determined using a discount rate before tax of 7.9%. This included an asset-specific risk premium.

Impairment of financial assets

On every balance sheet date, the Group reviews whether there is any objective evidence that a financial asset is impaired and, if this is the case, recognizes allowances to the extent estimated as necessary. Particularly important in this context are allowances on trade accounts receivable, whose carrying amount was € 2,889 million as of December 31, 2016 (2015: € 2,738 million).

Key indicators for the identification of impaired receivables and the subsequent recoverability tests are, in particular, payment default or delay in the payment of interest or principal, negative changes in economic framework conditions as well as considerable financial difficulties of a debtor. These estimates are discretionary.

Other provisions and contingent liabilities

As a global company for high-tech products, the Group is exposed to a multitude of litigation risks. In particular, these include risks from product liability, competition and antitrust law, pharmaceutical law, patent law, tax law and environmental protection. The Group is engaged in legal proceedings and official investigations, the outcomes of which are uncertain. A description of the most important legal matters as of the balance sheet date can be found in Notes [26] “Other provisions” and [38] “Contingent liabilities”. The provisions recognized for legal disputes mainly relate to the Healthcare and Performance Materials business sectors and amounted to € 483 million as of the balance sheet date (2015: € 492 million).

To assess the existence of a reporting obligation in relation to provisions and to quantify pending outflows of resources, the Group draws on the knowledge of the legal department as well as any other 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 are highly subject to uncertainty. Equally, the measurement of provisions is to be considered a major source of estimation uncertainty.

To a certain extent, the Group is obliged to take measures to protect the environment and reported provisions for environmental protection of € 142 million as of December 31, 2016 (2015: € 127 million). The underlying obligations were located mainly in Germany and Latin America. Provisions were recognized primarily for obligations from soil remediation and groundwater protection in connection with the discontinued crop protection business.

The calculation of the present value of the future settlement amount requires, among other things, estimates 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 is carried out regularly in consultation with independent experts. The determination of the future settlement amount of the provisions for environmental protection measures is subject to a considerable degree of uncertainty.

In the event of the discontinuation of clinical development projects, the Group is regularly required to bear unavoidable subsequent costs for a certain future period of time. The measurement of these provisions requires estimates regarding the length of time and the amount of the follow-on costs.

Apart from provisions, contingent liabilities are also subject to estimation uncertainties and discretionary judgment. Accordingly, contingent liabilities from legal and tax disputes are subject to the same estimation uncertainties and discretionary judgment as provisions for litigation. Therefore, the existence and the amount of the outflow of resources, which is not remote, are subject to estimation uncertainties similarly to the date on which a potential obligation arises.

Provisions for pensions and other post-employment benefits

The Group maintains several defined benefit pension plans, particularly in Germany, Switzerland and the United Kingdom. The determination of the present value of the obligation from these defined benefit pension plans primarily requires estimates of the discount rate, future salary increases, and future pension increases.

As of the balance sheet date, the amount recorded in the consolidated balance sheet for provisions for pensions and other post-employment benefits was € 2,313 million (2015: € 1,836 million). The present value of the defined benefit pension obligation was € 4,698 million as of December 31, 2016 (2015: € 4,153 million). The following overview shows how the present value of all defined benefit obligations would have been impacted by changes to relevant actuarial assumptions.

€ million	Dec. 31, 2016	Dec. 31, 2015
Change in present value of all defined benefit obligations if		
the discount rate were 50 basis points higher	–441	–373
the discount rate were 50 basis points lower	518	444
the expected rate of future salary increases were 50 basis points higher	160	126
the expected rate of future salary increases were 50 basis points lower	–138	–112
the expected rate of future pension increases were 50 basis points higher	280	234
the expected rate of future pension increases were 50 basis points lower	–209	–176

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. Further information on the existing pension obligations is provided in Note [25] “Provisions for pensions and other post-employment benefits” and under “Accounting and measurement principles” in Note [63] “Provisions for pensions and other post-employment benefits”.

Income taxes

The calculation of the reported assets and liabilities from current and deferred income taxes requires extensive discretionary judgments, assumptions and estimates. Income tax liabilities were € 883 million as of December 31, 2016 (2015: € 1,011 million). The carrying amounts of deferred tax assets and liabilities amounted to € 1,013 million and € 2,720 million respectively, as of the balance sheet date (2015: € 1,050 million and € 2,926 million, respectively).

The recognized income tax liabilities and provisions are partially based on estimates and interpretations of tax laws and ordinances in different jurisdictions.

With regard to deferred tax items, there are 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 relates to deferred tax liabilities 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 requires an estimate of the probability of the future realizability of loss carryforwards. Factors considered in this estimate are results history, results planning and any tax planning strategy of the respective Group company.

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 for a 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.

Deconsolidation of the Venezuelan entities

In the past, the Group imported products in Venezuela and marketed these via its local subsidiaries. Due to the nearly complete absence of dividend payments and payments for Group-internal supplies of goods, management came to the conclusion that the possibility of receiving and influencing variable returns from the involvement in the Venezuelan entities can no longer be deemed given. Owing to the lack of control, the Venezuelan subsidiaries were therefore deconsolidated effective February 29, 2016. This estimate is discretionary. The Group continues to closely monitor the development of the situation in Venezuela.

Up until deconsolidation on February 29, 2016, in Venezuela the Group generated net sales of € 1 million in fiscal 2016. In 2015, net sales amounted to € 175 million. Of this amount, sales of € 168 million were attributable to the first half of 2015 (using the CENCOEX exchange rate) and sales of € 7 million were attributable to the second half of 2015 (using the SIMADI exchange rate). Cash and cash equivalents in Venezuela amounted to € 8 million as of December 31, 2015. They were classified as restricted. The deconsolidation gain recognized in 2016 amounted to € 50 million and was reported under other operating income. This figure included the currency result of the Venezuelan entities that was previously reported in equity and subsequently reclassified to the consolidated income statement.

Other judgments, assumptions and sources of estimation uncertainty

The Group makes other judgments, assumptions and estimates in the following areas:

- Classification of financial assets and financial liabilities
- Cash flow hedging for highly probable forecast transactions
- Determination of the fair value of financial instruments classified as available-for-sale and of derivative financial instruments
- Determination of the fair value of contingent consideration
- Determination of the fair value of the liability for share-based compensation
- Determination of the fair value of plan assets.

Notes to the Consolidated Income Statement

(7) Net sales

Net sales were generated primarily from the sale of goods and to a limited degree also included revenues from services rendered, commission income as well as profit-sharing from collaborations. Group net sales totaled € 15,024 million in 2016 (2015: € 12,845 million), which represented an increase of 17.0% compared with 2015. The breakdown of net sales is presented in the Segment Reporting in Note [31] "Information by business sector/countries and regions".

(8) Cost of sales

Cost of sales primarily included the cost of manufactured products sold as well as merchandise sold. Cost comprises overheads and, if necessary, inventory write-downs, in addition to directly attributable costs, such as the cost of materials, personnel and energy, as well as depreciation/amortization.

(9) Marketing and selling expenses

Marketing and selling expenses comprised the following:

€ million	**2016**	2015
Sales force	–1,063	–913
Internal sales services	–903	–740
Sales promotion	–598	–522
Logistics	–614	–471
Amortization of intangible assets[1]	–1,032	–779
Royalty, license and commission expenses	–177	–513
Other marketing and selling expenses	–140	–112
Marketing and selling expenses	**–4,526**	**–4,050**

[1] 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.

Royalty, license and commission expenses arose mainly in connection with the commercialization of Erbitux® outside the United States and Canada amounting to € 97 million (2015: € 93 million). In 2016, no further commission expenses were incurred for the commercialization of Rebif® in the United States following the expiration of a marketing agreement with Pfizer, Inc., USA (2015: € 334 million).

(10) Research and development costs

Research and development costs totaled € 1,976 million in 2016 (2015: € 1,709 million).

Reimbursements for research and development amounting to € 84 million (2015: € 88 million) were offset against research and development costs. This figure also included government subsidies of € 3 million (2015: € 3 million). As in 2015, the reimbursements were mainly from the strategic alliance with Pfizer Inc., USA.

The breakdown of research and development costs by region is presented in the Segment Reporting (see Note [31] "Information by business sector/country and region").

(11) Other operating income

Other operating income was as follows:

€ million	2016	2015
Gains on disposal of businesses and non-current assets	483	52
Income from milestone payments, rights and royalties	317	262
Reversal of allowances for receivables	59	40
Gains from the release of provisions for litigation	23	35
Income from miscellaneous services	18	22
Remaining other operating income	96	59
Other operating income	**996**	**471**

In fiscal 2016, the gains on the disposal of businesses and non-current assets in the amount of € 483 million (2015: € 52 million) were attributable to sale of the rights to Kuvan® (€ 330 million), the deconsolidation of the Venezuelan entities (€ 50 million) as well as the disposal of equity investments.

An amount of € 191 million (2015: € 191 million) of the income from milestone payments, rights and royalties totaling € 317 million (2015: € 262 million) resulted from the collaboration agreement entered into with Pfizer Inc., USA, in 2014 in the field of immuno-oncology. This related to the pro rata recognition of deferred income from the upfront payment as well as the value of the right to co-promote Xalkori® (see Note [5] "Collaborations of material significance"). Royalty and license income was mainly due to a license granted in 2016 for interferon beta products (Biogen Inc., USA) as well as for the product Viibryd® (Allergan plc, Ireland).

(12) Other operating expenses

The breakdown of other operating expenses was as follows:

€ million	2016	2015
Integration costs/IT costs	–193	–78
Impairment losses	–134	–128
Litigation	–104	–85
Non-income-related taxes	–68	–44
Premiums, fees and contributions	–65	–57
Exchange rate differences from operating activities (net)	–57	–49
Allowances for receivables	–52	–84
Profit-sharing expenses	–39	–26
Restructuring costs	–22	–48
Expenses for miscellaneous services	–15	–20
Project costs	–11	–16
Acquisition costs	–7	–102
Remaining other operating expenses	–215	–180
Other operating expenses	**–981**	**–917**

Integration and IT costs amounting to € 193 million (2015: € 78 million) were incurred for the global harmonization of the IT landscape and in connection with the integration of acquired and existing businesses. In 2016, this related mainly to the Sigma-Aldrich integration.

Impairment losses totaled € 134 million (2015: € 128 million) and related in the amount of € 93 million to sales-related assets (2015: € 0 million), in the amount of € 19 million to production plants and technologies (2015: € 0 million), in the amount of € 14 million to assets which were assigned to research and development (2015: € 121 million), and in the amount of € 2 million to administration (2015: € 7 million). Moreover, impairment losses in the amount of € 5 million (2015: € 0 million) were recognized on other financial instruments which were classified to the category "available for sale". Further information on impairments of intangible assets can be found in Note [16] "Intangible assets".

The restructuring costs incurred in fiscal 2016 amounting to € 22 million (2015: € 48 million) arose mainly in connection with the "Fit for 2018" transformation and growth program. As in the previous year, these costs largely related to personnel measures, for instance the elimination of positions in order to create a leaner and more efficient organization.

Remaining other operating expenses also included environmental protection costs as well as personnel expenses not allocable to the functional areas.

(13) Financial result

€ million	2016	2015
Interest income and similar income	20	32
Interest expenses and similar expenses	–277	–292
Interest expenses from interest rate derivatives	–13	–11
Interest result	**–270**	**–271**
Interest component of the additions to pension provisions and other non-current provisions	–52	–46
Currency differences from financing activities	–4	–40
Financial result	**–326**	**–357**

Currency differences from financing activities in 2015 were mainly the result of expenses for hedging intragroup transactions in foreign currency. These expenses result from hedging at forward rates while intragroup transactions are measured at spot rates. The decline in 2016 was primarily due to a lower hedging volume and changes in forward rate markups.

(14) Income tax

€ million	2016	2015
Current income taxes in the period	–671	–705
Income taxes for previous periods	–19	–95
Deferred taxes in the period	168	432
Income tax	**–521**	**–368**

The following table presents the tax reconciliation from theoretical income tax expense to income tax expense according to the income statement. The theoretical income tax expense is determined by applying the statutory tax rate of 30.7% of a corporation headquartered in Darmstadt.

€ million	**2016**	2015
Profit before income tax	2,154	1,487
Tax rate	30.7%	30.7%
Theoretical income tax expense	–661	–456
Tax rate differences	235	151
Tax effect of companies with a negative contribution to consolidated profit	–38	–22
Income tax for previous periods	–19	–95
Tax credits	4	521
Tax effect on tax loss carryforwards	1	16
Tax effect of non-deductible expenses/Tax-free income/Other tax effects	–43	–482
Income tax expense according to consolidated income statement	**–521**	**–368**
Tax ratio according to consolidated income statement	24.2%	24.8%

Income taxes consisted of corporation and trade taxes for the companies domiciled in Germany as well as comparable income taxes for foreign companies.

The higher tax credits in 2015 arose primarily in the United States due to the consideration of dividend income. However, this dividend income was also taxable in the United States; the related tax expense was included in 2015 under "Tax effect of non-deductible expenses/Tax-free income/Other tax effects." The change in the item "Income tax for previous periods" resulted, among other things, from the addition to provisions for tax audits in 2015.

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	**2016**	2015[1]
Change in deferred tax assets (consolidated balance sheet)	–37	57
Change in deferred tax liabilities (consolidated balance sheet)	206	–2,107
Deferred taxes credited/debited to equity	–85	41
Changes in scope of consolidation/currency translation/other changes	84	2,441
Deferred taxes (consolidated income statement)	**168**	**432**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Tax loss carryforwards were structured as follows:

	Dec. 31, 2016			Dec. 31, 2015[1]		
€ million	**Germany**	**Abroad**	**Total**	Germany	Abroad	Total
Tax loss carryforwards	88	959	**1,047**	22	1,184	**1,206**
thereof: including deferred tax asset	13	322	**335**	5	469	**474**
Deferred tax asset	2	74	**76**	–	119	**119**
thereof: excluding deferred tax asset	75	637	**712**	17	715	**732**
Theoretical deferred tax asset	11	156	**167**	3	181	**184**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The decrease in non-German tax loss carryforwards was mainly due to the utilization of loss carryforwards in the United States.

Deferred tax assets are recognized for tax loss and interest carryforwards only if for tax loss carryforwards of less than € 5 million realization of the related tax benefits is probable within one year, and for tax loss carryforwards of more than € 5 million realization of the related tax benefits is probable within the next three years.

The vast majority of the tax loss carryforwards either has no expiry date or can be utilized for up to 20 years.

In 2016, the income tax expense was reduced by € 1 million (2015: € 16 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 tax assets and liabilities correspond to the following balance sheet items:

	Dec. 31, 2016		Dec. 31, 2015[1]	
€ million	**Assets**	**Liabilities**	Assets	Liabilities
Intangible assets	71	2,724	80	2,940
Property, plant and equipment	25	114	23	169
Current and non-current financial assets	4	11	10	12
Inventories	589	14	627	27
Current and non-current receivables/Other assets	27	2	26	11
Provisions for pensions and other post-employment benefits	460	85	351	70
Current and non-current other provisions	355	41	308	36
Current and non-current liabilities	106	13	125	20
Tax loss carryforwards	76	–	119	–
Tax refund claims/Other	50	467	164	427
Offset deferred tax assets and liabilities	– 751	– 751	– 784	-784
Deferred taxes (consolidated balance sheet)	**1,013**	**2,720**	**1,050**	**2,926**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

In addition to deferred tax assets on tax loss carryforwards amounting to € 76 million (2015: € 119 million), deferred tax assets of € 937 million were recognized for temporary differences (2015: € 930 million).

As of the balance sheet date, deferred taxes for temporary differences for interests in subsidiaries were recognized to the extent that these related to planned dividend payments and, in this context, the reversal of these differences was foreseeable. Deferred tax liabilities in a total amount of € 466 million (2015: € 391 million) were recognized for the higher or lower tax expense attributable to dividend payments. Temporary differences relating to the retained earnings of subsidiaries amounted to € 5,669 million (2015: € 5,248 million).

(15) Earnings per share

Basic earnings per share are calculated by dividing the profit after tax attributable to the shareholders of Merck KGaA, Darmstadt, Germany, 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. 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, the total capital thus amounted to € 565 million or 434,777,878 theoretical shares outstanding. The weighted average number of shares in 2016 was likewise 434,777,878.

As of December 31, 2016, there were no potentially dilutive shares. Diluted earnings per share were equivalent to basic earnings per share.

Notes to the Consolidated Balance Sheet

(16) Intangible assets

€ million	Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other[1]		Goodwill[1]	Software[1]	Advance payments and software in development	Total[1]
	Finite useful life	Not yet available for use				
Cost at January 1, 2015	**12,325**	**634**	**5,694**	**354**	**37**	**19,044**
Changes in scope of consolidation	5,743	–	8,765	29	68	14,605
Additions	303	126	–	2	43	474
Disposals	–3	–	–	–9	–	–13
Transfers	8	–2	–	37	–38	5
Classification as held for sale or transfer to a disposal group	–61	–	–22	–	–	–83
Currency translation	141	–	54	6	–	201
December 31, 2015	**18,455**	**757**	**14,492**	**418**	**111**	**34,232**
Accumulated amortization and impairment losses January 1, 2015	**–6,926**	**–465**	**–**	**–257**	**–**	**–7,648**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–948	–	–	–36	–	–984
Impairment losses	–6	–109	–	–	–	–115
Disposals	3	–	–	9	–	12
Transfers	–4	–	–	–	–	–4
Reversals of impairment losses	–	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	38	–	–	–	–	38
Currency translation	–104	–	–	–5	–	–109
December 31, 2015	**–7,948**	**–574**	**–**	**–289**	**–**	**–8,811**
Net carrying amount as of December 31, 2015	**10,507**	**184**	**14,492**	**129**	**111**	**25,422**

€ million	Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other[1]		Goodwill[1]	Software[1]	Advance payments and software in development	Total[1]
	Finite useful life	Not yet available for use				
Cost at January 1, 2016	**18,455**	**757**	**14,492**	**418**	**111**	**34,232**
Changes in scope of consolidation	1	–	138	–	–	140
Additions	16	12	–	2	106	136
Disposals	–1	–2	–	–10	–	–13
Transfers	–3	–	–	26	–19	4
Classification as held for sale or transfer to a disposal group	–	–2	–9	–	–	–10
Currency translation	312	–	443	3	2	760
December 31, 2016	**18,780**	**766**	**15,064**	**439**	**200**	**35,248**
Accumulated amortization and impairment losses January 1, 2016	**–7,948**	**–574**	**–**	**–289**	**–**	**–8,811**
Changes in scope of consolidation	–	–	–	–	–	–
Amortization	–1,218	–	–	–59	–	–1,277
Impairment losses	–94	–12	–	–	–11	–118
Disposals	–	2	–	10	–	12
Transfers	3	–	–	–	–	3
Reversals of impairment losses	–	–	–	–	–	–
Classification as held for sale or transfer to a disposal group	–	–	–	–	–	–
Currency translation	–62	–	–	–6	–1	–69
December 31, 2016	**–9,318**	**–585**	**–**	**–344**	**–13**	**–10,259**
Net carrying amount as of December 31, 2016	**9,462**	**181**	**15,064**	**95**	**187**	**24,989**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The carrying amounts of "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" as well as goodwill were attributable to the business sectors as follows:

€ million	Remaining useful life in years	Healthcare	Life Science	Performance Materials	**Total Dec. 31, 2016**	Total Dec. 31, 2015[1]
Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other						
Finite useful life	**–**	**1,639**	**6,656**	**1,166**	**9,462**	**10,507**
Rebif®	3.0	1,105	–	–	1,105	1,473
Gonal-f®	2.0	190	–	–	190	285
Xalkori®	5.0	153	–	–	153	262
Saizen®	3.0	92	–	–	92	123
Other marketing authorizations	3.0 – 5.3	68	–	–	68	86
Technologies	0.1 – 16.3	–	443	957	1,400	1,542
thereof: acquisition of AZ Electronic Materials S.A.	*4.3 – 16.3*	–	–	*918*	*918*	*999*
Brands	0.2 – 10.9	5	1,087	13	1,105	1,186
thereof: acquisition of Sigma-Aldrich Corporation	*10.9*	–	*862*	*2*	*864*	*921*
Customer relationships	0.2 – 20.9	1	5,121	189	5,311	5,507
thereof: acquisition of Sigma-Aldrich Corporation	*19.9 – 20.9*	–	*4,236*	*189*	*4,425*	*4,486*
thereof: acquisition of Millipore Corporation	*1.5 – 10.5*	–	*859*	–	*859*	*988*
Others	1.2 – 17.5	25	4	8	37	44
Not yet available for use	**–**	**181**	**–**	**–**	**181**	**184**
Goodwill	**–**	**1,811**	**11,801**	**1,452**	**15,064**	**14,492**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other

The changes in the scope of consolidation in 2015 mainly included the additions to intangible assets resulting from the acquisitions of the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA. In 2016, the changes in the scope of consolidation comprised in particular the additions to intangible assets from the acquisition of BioControl Systems, Inc., USA. Detailed presentations of these acquisitions and their respective effects can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

The net carrying amount of "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" with finite useful lives amounting to € 9,462 million (2015: € 10,507 million) mainly included the identified and capitalized assets from the purchase price allocations for the acquisition of the Sigma-Aldrich Corporation, AZ Electronic Materials S.A., the Millipore Corporation, and Serono SA.

The additions to intangible assets with finite useful lives amounted to € 16 million in 2016 (2015: € 303 million), and at € 9 million was largely attributable to the Performance Materials business sector.

In fiscal 2016, impairment losses on intangible assets with indefinite useful lives totaled € 94 million (2015: € 6 million). An impairment loss of the co-commercialization right for Xalkori® amounting to € 71 million was attributable to the Healthcare business sector. The impairment loss was recognized owing to an increasingly intensive competitive environment for ALK inhibitors and the corresponding revision of profit participation assumptions from the co-commercialization right. In addition, in the Performance Materials business sector the SAFC Hitech brand was partly impaired since the decision was made to discontinue the use of this brand as of January 1, 2018. This led to an impairment loss of € 14 million. In the Life Science business sector, impairment losses in the amount of € 9 million were recognized, mainly attributable to a technology that is no longer used. These items were recorded in the consolidated income statement in impairment losses under other operating expenses.

The "Customer relationships, marketing authorizations, patents, licenses and similar rights, brands, trademarks and other" not yet available for use mainly refer to rights that the Group had acquired in connection with active ingredients, products or technologies that were still in development stages. Owing to the uncertainty as to the extent to which these projects will lead to the commercialization of marketable products, the period for which any resulting capitalized asset would generate an economic benefit for the company could not yet be determined. Amortization will only begin once the products receive marketing authorization and is carried out on a straight-line basis over the shorter period of the patent or contract term or the expected useful life.

The impairment losses for "Customer relationships, marketing authorizations, patents, licenses and similar rights, brand names, trademarks and other" not yet available for use amounted to € 12 million (2015: € 109 million) and were related to the Healthcare business sector. These impairment losses were largely attributable to development projects that were no longer pursued. The impairment losses on "Advance payments and software in development" in the amount of € 11 million were due to discontinued software development projects. The impairment was reported in the consolidated income statement in impairment losses under other operating expenses.

In 2016, borrowing costs of € 3 million (2015: € 3 million) directly allocable to qualified assets were capitalized.

In 2016, no intangible assets were pledged as security for liabilities.

Goodwill

Goodwill was incurred mainly in connection with the acquisition 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, part of which is carried in U.S. dollars, into the reporting currency. More information on the acquisition of the Sigma-Aldrich Corporation can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

In 2016, goodwill was not impaired. The assumptions used in the goodwill impairment test are presented in Note [6] "Management judgments and sources of estimation uncertainty".

(17) Property, plant and equipment

€ million	Land, land rights and buildings, including buildings on third-party land[1]	Plant and machinery[1]	Other facilities, operating and office equipment[1]	Construction in progress and advance payments to vendors and contractors	**Total**[1]
Cost at January 1, 2015	**2,635**	**3,410**	**1,018**	**430**	**7,493**
Changes in the scope of consolidation	510	233	18	80	840
Additions	6	27	28	502	564
Disposals	–45	–52	–54	–4	–155
Transfers	129	223	69	–417	4
Classification as held for sale or transfer to a disposal group	–	–	–	–	–
Currency translation	48	37	13	1	100
December 31, 2015	**3,284**	**3,879**	**1,091**	**592**	**8,846**
Accumulated depreciation and impairment losses January 1, 2015	**–1,187**	**–2,548**	**–767**	**–1**	**–4,503**
Changes in the scope of consolidation	–	–	–	–	–
Depreciation	–110	–197	–93	–	–399
Impairment losses	–8	–2	–4	–	–14
Disposals	41	50	52	1	143
Transfers	–4	–5	4	–	–5
Reversals of impairment losses	–	1	–	–	1
Classification as held for sale or transfer to a disposal group	–	–	–	–	–
Currency translation	–22	–30	–10	–	–62
December 31, 2015	**–1,289**	**–2,732**	**–817**	**–**	**–4,838**
Net carrying amount as of December 31, 2015	**1,995**	**1,147**	**274**	**592**	**4,008**
Cost at January 1, 2016	**3,284**	**3,879**	**1,091**	**592**	**8,846**
Changes in the scope of consolidation	–2	–10	–7	–	–20
Additions	17	36	32	669	753
Disposals	–59	–82	–68	–4	–214
Transfers	154	221	78	–460	–8
Classification as held for sale or transfer to a disposal group	–41	–2	–	–	–42
Currency translation	37	26	11	12	85
December 31, 2016	**3,391**	**4,067**	**1,136**	**807**	**9,401**
Accumulated depreciation and impairment losses January 1, 2016	**–1,289**	**–2,732**	**–817**	**–**	**–4,838**
Changes in the scope of consolidation	–	8	5	–	13
Depreciation	–147	–281	–100	–	–529
Impairment losses	–4	–1	–2	–4	–11
Disposals	47	78	64	–	189
Transfers	3	–3	–	–	–
Reversals of impairment losses	1	1	–	–	1
Classification as held for sale or transfer to a disposal group	41	1	–	–	41
Currency translation	–13	–19	–7	–	–38
December 31, 2016	**–1,361**	**–2,950**	**–857**	**–4**	**–5,171**
Net carrying amount as of December 31, 2016	**2,030**	**1,117**	**279**	**804**	**4,230**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Changes in the scope of consolidation in 2015 mainly included the additions to property, plant and equipment from the acquisitions of the Sigma-Aldrich Corporation, USA, and Ormet Circuits, Inc., USA. In fiscal 2016, the changes in the scope of consolidation included the additions to property, plant and equipment from the acquisition of BioControl Systems, Inc., USA, as well as the disposals owing to the divestment of the Pakistani subsidiaries and the deconsolidation of the Venezuelan entities. A detailed presentation of these acquisitions can be found in Note [4] "Acquisitions, assets held for sale and disposal groups".

Material additions to construction in progress were attributable to the expansion of global headquarters as well as the construction of a new Innovation Center at the Darmstadt site. Further investments at the Darmstadt site were made in a new OLED production plant and a new laboratory building. In addition, investments were made in a new pharmaceutical production plant in Nantong, China, as well as at the production sites in Bari, Italy, and Reinbek, Germany. Furthermore, construction work on a new packaging site in Aubonne, Switzerland, continued and investments were made to expand the production site. Transfers relating to construction in progress mainly included completed subprojects at Group headquarters in Darmstadt as well as investments in the United States, China, France, and Spain.

In 2016, impairment losses amounted to € 11 million (2015: € 14 million). They mainly related to assets attributable to the Life Science business sector. Reversals of impairment losses were immaterial overall.

The total amount of property, plant and equipment used to secure financial liabilities as well as government grants and subsidies was immaterial.

Directly allocable borrowing costs on qualified assets in the amount of € 6 million (2015: € 6 million) were capitalized.

The carrying amounts of assets classified as finance leases were as follows:

€ million	**Dec. 31, 2016**	Dec. 31, 2015
Land and buildings	4	6
Vehicles	1	1
Other property, plant and equipment	1	1
	6	**9**

(18) Financial assets

€ million	**current**	**non-current**	**Dec. 31, 2016**	current	non-current[1]	Dec. 31, 2015[1]
Held-to-maturity investments	–	–	–	30	–	30
Available-for-sale financial assets	43	191	233	162	109	271
Loans and receivables	44	10	55	3	17	19
Derivative assets (financial transactions)	59	17	76	33	5	37
	145	**218**	**364**	**227**	**130**	**358**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Current available-for-sale financial assets included bonds amounting to € 29 million (2015: € 143 million).

Non-current available-for-sale financial assets mainly included investments in companies amounting to € 112 million (2015: € 88 million) and investments in subsidiaries that were not consolidated due to their minor significance in the amount of € 24 million (2015: € 22 million). In addition, entitlements to future milestone payments in connection with the disposal of Kuvan® were recognized for the first time in 2016 (see Note [4] "Acquisitions, assets held for sale and disposal groups").

In 2016, impairment losses were recognized for investments in companies and other non-current financial assets held for sale in a total amount of € 5 million (2015: € 0 million). Fair value adjustments of € 50 million (2015: € 0 million) were made on available-for-sale non-current financial assets and recognized in equity. On the divestment of a minority interest, € –31 million (2015: € 0 million) of these fair value adjustments previously recognized in equity were reclassified to the consolidated income statement.

The loans and receivables contained in financial assets are neither past due nor impaired.

(19) Other assets

Other assets comprised:

€ million	current	non-current	Dec. 31, 2016	current[1]	non-current	Dec. 31, 2015[1]
Other receivables	272	5	277	152	3	155
Derivative assets (operative)	7	5	12	8	6	14
Financial items	**279**	**10**	**289**	**160**	**9**	**169**
Receivables from non-income related taxes	205	29	234	176	29	205
Prepaid expenses	71	12	82	61	20	81
Assets from defined benefit plans	–	–	–	6	–	6
Other assets	120	81	200	97	70	166
Non-financial items	**395**	**121**	**516**	**341**	**118**	**459**
	674	**131**	**805**	**500**	**128**	**628**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Other receivables included current receivables from related parties amounting to € 124 million (2015: € 35 million). This increase resulted from reimbursement claims vis-à-vis shareholders arising from taxes paid on their behalf.

Moreover, other receivables included license receivables amounting to € 38 million (2015: € 12 million).

The carrying amounts of other receivables from third parties were as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Neither past due nor impaired	270	153
Past due, but not impaired		
up to 3 months	3	1
up to 6 months	–	1
up to 12 months	2	–
up to 24 months	1	1
over 2 years	–	–
Impaired	–	–
Other receivables	**277**	**155**

As in the prior year, there were no allowances or reversals of allowances for other receivables.

(20) Inventories

This item comprised:

€ million	Dec. 31, 2016	Dec. 31, 2015[1]
Raw materials and supplies	501	493
Work in progress	694	679
Finished goods/goods for resale	1,413	1,437
Inventories	**2,607**	**2,610**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Write-downs of inventories in 2016 amounted to € 236 million (2015: € 133 million). The increase resulted primarily from the first full-year consolidation of the Sigma-Aldrich Corporation, USA. In 2016, reversals of inventory write-downs of € 59 million were recorded (2015: € 47 million). As of the balance sheet date, no inventories were pledged as security for liabilities.

(21) Trade accounts receivable

The maturity structure of the carrying amounts of trade accounts receivable was as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Neither past due nor impaired	2,458	2,321
Past due, but not impaired		
up to 3 months	232	234
up to 6 months	20	14
up to 12 months	8	5
up to 24 months	3	2
over 2 years	1	–
Impaired	168	162
Trade accounts receivable	**2,889**	**2,738**

The corresponding allowances developed as follows:

€ million	2016	2015
January 1	**–165**	**–126**
Additions	– 52	– 84
Reversals	59	40
Utilizations	17	9
Change in scope of consolidation	– 302	– 5
Currency translation and other changes	– 20	1
December 31	**–464**	**–165**

The changes in the scope of consolidation resulted from the allowances attributable to the divested Venezuelan entities, for which impairment losses in this amount had been recognized.

In the period from January 1 to December 31, 2016, trade accounts receivable in Italy with a nominal value of € 54 million were sold for € 53 million. Previous impairments in this context amounting to € 2 million were reversed and disclosed under other operating income. The sold receivables do not involve any further rights of recovery against the Group.

(22) Tax receivables

Income tax receivables amounted to € 403 million (2015: € 391 million). Tax receivables resulted primarily from tax prepayments that exceeded the actual amount of tax payable for 2016 and prior fiscal years, and from refund claims for prior years.

(23) Cash and cash equivalents

This item comprised:

€ million	Dec. 31, 2016	Dec. 31, 2015
Cash, bank balances and cheques	662	578
Short-term cash investments (up to 3 months)	277	255
Cash and cash equivalents	**939**	**832**

Changes in cash and cash equivalents as defined by IAS 7 are presented in the consolidated cash flow statement.

Cash and cash equivalents include restricted cash amounting to € 238 million (2015: € 327 million). Restricted cash relates mainly to cash and cash equivalents with subsidiaries which the Group only has restricted access to owing to foreign exchange controls.

The maximum default risk is equivalent to the carrying value of the cash and cash equivalents.

(24) 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. 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.

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 rules governing the adjustment of earnings relate partly to legal regulations that were amended in 2015 as a result of the German Accounting Directive Implementation Act. Articles 27 and 30 of the Articles of Association were thus adapted, without any changes to the contents and economic consequences of the principle of the allocation of net profit/loss. The amendments took effect in 2016. For better comparability, the previous year's presentation has been adapted to the new rules. 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:

€ million		2016 E. Merck KG, Darmstadt, Germany	2016 Merck KGaA, Darmstadt, Germany	2015 E. Merck KG, Darmstadt, Germany	2015 Merck KGaA, Darmstadt, Germany
Result of E. Merck KG, Darmstadt, Germany		–6	–	–20	–
Net income of Merck KGaA, Darmstadt, Germany		–	556	–	494
Corporation tax		–	11	–	28
Basis for appropriation of profits	**(100%)**	**–6**	**567**	**–20**	**522**
Profit transfer to E. Merck KG, Darmstadt, Germany Ratio general partner's capital to total capital	(70.274%)	398	–398	367	–367
Profit transfer from E. Merck KG, Darmstadt, Germany Ratio of share capital to total capital	(29.726%)	2	–2	6	–6
Corporation tax		–	–11	–	–28
Net income		**394**	**156**	**353**	**121**

The result of E. Merck KG, Darmstadt, Germany, on which the appropriation of profits adjusted for trade tax is based amounted to € –6 million (2015: € –20 million). This resulted in a profit/loss transfer to Merck KGaA, Darmstadt, Germany, of € –2 million (2015: € –6 million). The net income of Merck KGaA, Darmstadt, Germany, adjusted for corporation tax, on which the appropriation of its profit is based, amounted to € 567 million (2015: € 522 million). Merck KGaA, Darmstadt, Germany, transferred a gain in the amount of € 398 million of its profit to E. Merck KG, Darmstadt, Germany (2015: € 367 million). In addition, an expense from corporation tax charges amounting to € 11 million resulted (2015: expense of € 28 million). Corporation tax is only calculated on the income received by shareholders. Its equivalent is the income tax applicable to E. Merck KG, Darmstadt, Germany. However, this must be paid by the partners of E. Merck KG, Darmstadt, Germany, directly and is not disclosed in the annual financial statements.

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 the 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	2016 E. Merck KG, Darmstadt, Germany	2016 Merck KGaA, Darmstadt, Germany	2015 E. Merck KG, Darmstadt, Germany	2015 Merck KGaA, Darmstadt, Germany
Net income	394	156	353	121
Profit carried forward previous year	37	15	72	30
Withdrawal from revenue reserves	–	–	–	–
Transfer to revenue reserves	–	–	–	–
Retained earnings Merck KGaA, Darmstadt, Germany		**171**		**151**
Withdrawal by E. Merck KG, Darmstadt, Germany	–392		–388	
Dividend proposal		–155		–136
Profit carried forward	**39**	**16**	**37**	**15**

For 2015, a dividend of € 1.05 per share was distributed. The dividend proposal for fiscal 2016 will be € 1.20 per share, corresponding to a total dividend payment of € 155 million (2015: € 136 million) to shareholders. The amount withdrawn by E. Merck KG, Darmstadt, Germany, would amount to € 392 million (2015: € 388 million).

Changes in reserves

For 2016 the profit transfer to E. Merck KG, Darmstadt, Germany, including changes in reserves amounted to € 466 million. This consisted of the profit transfer to E. Merck KG, Darmstadt, Germany (€ – 398 million), the result transfer from E. Merck KG, Darmstadt, Germany, to Merck KGaA, Darmstadt, Germany, (€ – 2 million), the change in profit carried forward of E. Merck KG, Darmstadt, Germany, (€ 2 million) as well as the profit transfer from Merck & Cie, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany (€ – 68 million). Merck & Cie, 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.

Non-controlling interests

The disclosure 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 companies Merck Ltd., India, a subsidiary of Merck KGaA, Darmstadt, Germany, and P.T. Merck Tbk, Indonesia, a subsidiary of Merck KGaA, Darmstadt, Germany, as well as in the company Merck Ltd., Thailand, a subsidiary of Merck KGaA, Darmstadt, Germany.

(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 of the Group. Generally, these systems are based on the years of service and salaries of the employees. Pension obligations of the Group include both defined benefit and defined contribution plans and comprise both obligations from current pensions and accrued benefits for pensions payable in the future. In the Group, defined benefit plans are funded and unfunded.

In order to limit the risks of changing capital market conditions and other developments, for many years now the Group has been offering newly hired employees 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, 2016	Dec. 31, 2015
Present value of all defined benefit obligations	**4,698**	**4,153**
Fair value of the plan assets	– 2,386	– 2,323
Funded status	**2,312**	**1,830**
Effects of asset ceilings	1	–
Net defined benefit liability recognized in the balance sheet	**2,313**	**1,830**
Assets from defined benefit plans	–	6
Provisions for pensions and other post-employment benefits	**2,313**	**1,836**

The calculation of the defined benefit obligations as well as the relevant plan assets was based on the following actuarial parameters:

	Germany		Switzerland		United Kingdom		Other countries	
	2016	2015	**2016**	2015	**2016**	2015	**2016**	2015
Discount rate	1.90%	2.40%	0.60%	0.70%	2.69%	3.86%	3.08%	3.72%
Future salary increases	2.51%	2.50%	1.80%	1.80%	2.53%	2.42%	3.59%	3.80%
Future pension increases	1.75%	1.75%	–	–	3.10%	3.07%	1.68%	1.91%

These are average values weighted by the present value of the respective benefit obligation.

The defined benefit obligations of the Group were based on the following types of benefits provided by the respective plan:

€ million	Germany **Dec. 31, 2016**	Other countries **Dec. 31, 2016**	Group **Dec. 31, 2016**
Benefit based on final salary			
Annuity	2,525	633	3,158
Lump sum	–	101	101
Installments	1	–	1
Benefit not based on final salary			
Annuity	457	882	1,339
Lump sum	–	47	47
Installments	7	–	7
Other	–	12	12
Medical plan	–	33	33
Present value of defined benefit obligations	**2,990**	**1,708**	**4,698**

The main benefit rules are as follows:

Group companies in Germany accounted for € 2,990 million of the defined benefit obligations (2015: € 2,560 million) as well as for € 1,116 million of the plan assets (2015: € 1,104 million). Of these amounts the vast majority in each case were attributable to plans that encompass old-age, disability and surviving dependent pensions. On the one hand, these obligations are 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 comprise a direct commitment that is not based on the final salary. The benefit entitlement results from the cumulative total of annually determined pension components that are calculated on the basis of a defined benefit expense and an age-dependent annuity table. Statutory minimum funding obligations do not exist.

Pension plans in Switzerland accounted for € 808 million of the defined benefit obligations (2015: € 768 million) as well as for € 648 million of the plan assets (2015: € 600 million). The agreed benefits comprise old-age, disability and surviving dependent benefits. The employer and the employees make contributions to the plans. Statutory minimum funding obligations exist.

Pension plans in the United Kingdom accounted for € 549 million of the defined benefit obligations (2015: € 500 million) as well as for € 460 million of the plan assets (2015: € 466 million). These obligations 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 comprise old-age, disability and surviving dependent benefits. The employer and the employees make contributions to the plans. Statutory minimum funding obligations exist.

In the reporting period, the following items were recognized in income:

€ million	**2016**	2015
Current service cost	–140	–134
Past service cost	18	–
Gains (+) or losses (–) on settlement	11	1
Other effects recognized in income	– 3	– 6
Interest expense	– 92	– 83
Interest income	51	45
Total amount recognized as expenses (–)/income (+)	**–155**	**–177**

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 relevant expenses for defined benefit and defined contribution pension systems are allocated to the individual functional areas.

During the reporting period, the present value of the defined benefit obligations changed as follows:

€ million	**Funded benefit obligations**	**Benefit obligations funded by provisions**	**2016**	Funded benefit obligations	Benefit obligations funded by provisions	2015
Present value of the defined benefit obligations on January 1	3,810	343	4,153	3,504	309	3,813
Currency translation differences recognized in equity	– 66	2	– 64	39	– 3	36
Currency translation differences recognized in income	4	–	4	38	–	38
Current service cost	124	16	140	119	15	134
Past service cost	–18	–	–18	–	–	–
Gains (–) or losses (+) on settlement	–11	–	–11	–1	–	–1
Interest expense	84	8	92	76	7	83
Actuarial gains (–)/losses (+)	457	35	492	–166	– 23	–189
Contributions by plan participants	10	–	10	10	–	10
Pension payments	–101	– 8	–109	–146	– 7	–153
Changes in the scope of consolidation	–	– 2	– 2	343	43	386
Other effects recognized in income	–	–	–	–	–	–
Other changes	18	– 7	11	– 6	2	– 4
Present value of the defined benefit obligations on December 31	**4,311**	**387**	**4,698**	**3,810**	**343**	**4,153**

A sensitivity analysis of the key parameters is given in Note [6] "Management judgments and sources of estimation uncertainty".

The fair value of the plan assets changed in the reporting period as follows:

€ million	**2016**	2015
Fair value of the plan assets on January 1	2,323	1,994
Currency translation differences recognized in equity	– 62	35
Currency translation differences recognized in income	3	34
Interest income from plan assets	51	45
Actuarial gains (+)/losses (–) arising from experience adjustments	69	– 29
Employer contributions	35	30
Employee contributions	10	10
Pension payments from plan assets	– 38	– 85
Changes in the scope of consolidation	–	293
Plan administration costs paid from the plan assets recognized in income	– 2	– 2
Other effects recognized in income	–	–
Other changes	– 3	– 2
Fair value of the plan assets on December 31	**2,386**	**2,323**

The actual return on plan assets amounted to € 120 million in 2016 (2015: € 16 million).

In 2016, the effects of the asset ceilings in accordance with IAS 19.64 changed as follows:

€ million	**2016**	2015
Effects of the asset ceilings on January 1	–	–
Currency translation differences recognized in equity	–	–
Interest expense	–	–
Actuarial gains (–)/losses (+) arising from changes in the effects of the asset ceilings	1	–
Effects of the asset ceilings on December 31	**1**	**–**

The development of cumulative actuarial gains (+) and losses (–) was as follows:

€ million	**2016**	2015
Cumulative actuarial gains (+)/losses (–) recognized in equity on January 1	–1,420	–1,568
Currency translation differences	21	–12
Remeasurements of defined benefit obligations		
Actuarial gains (+)/losses (–) arising from changes in demographic assumptions	4	– 38
Actuarial gains (+)/losses (–) arising from changes in financial assumptions	– 484	217
Actuarial gains (+)/losses (–) arising from experience adjustments	–12	10
Remeasurements of plan assets		
Actuarial gains (+)/losses (–) arising from experience adjustments	69	– 29
Effects of the asset ceilings		
Actuarial gains (+)/losses (–)	–1	–
Reclassification within retained earnings	3	–
Cumulative actuarial gains (+)/losses (–) recognized in equity on December 31	**–1,820**	**–1,420**

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.

The ratio of the fair value of the plan assets to the present value of the defined benefit obligations is referred to as the degree of pension plan funding. If the benefit obligations exceed the plan assets, this represents underfunding of the pension fund.

It should be noted, however, that both the benefit obligations as well as the plan assets fluctuate over time. This could lead to an increase in underfunding. Depending on the statutory regulations, it could become necessary in some countries for the Group 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 such fluctuations, in managing its plan assets, the Group also pays attention to potential fluctuations in liabilities. In the ideal case, assets and liabilities develop in opposite directions when exposed to exogenous factors, thus creating a natural defense against these factors.

The fair value of the plan assets can be allocated to the following categories:

	Dec. 31, 2016			Dec. 31, 2015		
€ 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	72	–	72	27	–	27
Equity instruments	729	–	729	740	–	740
Debt instruments	968	–	968	958	–	958
Direct investments in real estate	–	102	102	–	98	98
Investment funds	379	–	379	370	–	370
Insurance contracts	–	82	82	–	79	79
Other	54	–	54	51	–	51
Fair value of the plan assets	**2,202**	**184**	**2,386**	**2,146**	**177**	**2,323**

Employer contributions to plan assets and direct payments to beneficiaries will probably amount to around € 35 million and € 72 million in 2017. The weighted duration amounted to 21 years.

The cost of ongoing contributions for defined contribution plans that are financed exclusively by external funds and for which the companies of the Group are only obliged to pay the contributions amounted to € 54 million (2015: € 47 million). In addition, employer contributions amounting to € 67 million (2015: € 63 million) were transferred to the German statutory pension insurance system and € 42 million (2015: € 35 million) to statutory pension insurance systems abroad.

(26) Other provisions

Other provisions developed as follows:

€ million	Litigation	Restructuring	Personnel	Environmental protection	Acceptance and follow-on obligations	Other	**Total**
January 1, 2016[1]	**492**	**92**	**339**	**127**	**121**	**221**	**1,392**
Additions	85	17	151	27	15	54	349
Utilizations	–14	–30	–101	–10	–34	–61	–250
Release	–23	–6	–46	–5	–57	–55	–193
Interest portion	9	–	1	3	–	–	13
Currency translation	2	–	5	1	–	4	12
Changes in scope of consolidation / Other	–67	–	–13	–	–	3	–77
December 31, 2016	**483**	**73**	**336**	**142**	**45**	**167**	**1,246**
thereof: current	68	34	104	27	41	138	412
thereof: non-current	415	39	232	115	4	28	834

[1] Figures have been adjusted, see “Acquisitions, assets held for sale and disposal groups”.

Litigation

As of December 31, 2016, the provisions for legal disputes amounted to € 483 million (2015: € 492 million). The legal matters described below represent the most significant legal risks.

Product-related and patent disputes

Rebif®: The Group is involved in a patent dispute with Biogen Inc., USA, (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 2009 in the United States. 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 on by the Group's actions. A Markman hearing took place in January 2012, leading to a decision in the first quarter of 2016 that accelerated the litigation. A first-instance ruling is now expected for September 2017. In parallel, the parties are involved in court-ordered mediation proceedings that have not yet officially ended but have not led to an agreement to date. The Group has taken appropriate accounting measures. 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. 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 two cases were already successful in first-instance proceedings. The competitor has meanwhile filed two patent infringement lawsuits and appeals in the case of the nullity actions. The Group has taken appropriate precautionary accounting measures. It is anticipated that a final decision will be made only within the next two to five years, leading to a potential outflow of resources.

Antitrust proceedings

Raptiva®: In December 2011, the Brazilian federal state of São Paulo sued the Group for damages because of alleged collusion between various pharmaceutical companies and an association of patients suffering from psoriasis and vitiligo. The collusion is alleged to have aimed at an increase in the sales of the involved companies' drugs to the detriment of patients and state coffers. Moreover, in connection with the product Raptiva®, patients have filed suit to receive compensatory damages. The Group has taken appropriate accounting measures for these legal disputes. These are different legal disputes. An outflow of cash in fiscal 2017 is not expected.

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 CMA informed the Group of the assumption that a settlement agreement entered into in 2002 between Generics (UK) Ltd. and several GlaxoSmithKline companies in connection with the antidepressant drug paroxetine violates British and European competition law. As the owner of Generics (UK) Ltd. at the time, the Group was allegedly involved in the settlement negotiations 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 took legal action against this fine. The Group has taken appropriate accounting measures. A decision and a potential outflow of resources are expected for 2017.

Trademark rights/breach of agreement: The Group is involved in various legal disputes with Merck & Co. of the United States (outside the United States and Canada: Merck Sharp & Dohme (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. As in 2015, the Group did not consider recourse and a related outflow of resources to be likely as of the balance sheet date (see Note [38] "Contingent liabilities"). The Group has taken appropriate accounting measures for any costs of legal defense. An outflow of resources for the costs of external legal counsel is partially expected in 2017.

In addition to provisions for the mentioned litigation, provisions existed as of the balance sheet date for various smaller pending legal disputes.

Restructuring

Provisions for restructuring mainly include commitments to employees in connection with restructuring projects and provisions for onerous contracts. These were recognized once detailed restructuring plans had been prepared and communicated.

In 2012, the "Fit for 2018" transformation and growth program was established. The aim of this program is to secure the competitiveness and the growth of the Group over the long term. The provisions of € 73 million as of December 31, 2016 (2015: € 92 million) in this context mainly consist of commitments to employees from partial and early retirement arrangements. The payments made in 2016 in the amount of € 30 million are primarily due to severance or early retirement payments to employees. Cash flows owing to provisions for restructuring are for the most part expected within a period until 2019.

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 [65] "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:

	2014 tranche	2015 tranche	**2016 tranche**
Performance cycle	Jan. 1, 2014 – Dec. 31, 2016	Jan. 1, 2015 – Dec. 31, 2017	Jan. 1, 2016 – Dec. 31, 2018
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)	122.84[1]	74.53	87.92
DAX® value (60-day average of the DAX® prior to the start of the performance cycle)	9,065.08	9,403.99	10,669.76
Potential number of MSUs			
Potential number offered for the first time in 2014	355,164	–	–
Forfeited	21,247	–	–
MSUs granted to employees of the AZ Electronic Materials Group on May 2, 2014	22,865	–	–
Status as on Dec. 31, 2014	356,782	–	–
Potential number offered for the first time in 2015	–	609,799	–
Forfeited	23,541	21,447	–
Further additional granted MSUs	2,167	–	–
Status as on Dec. 31, 2015	335,408	588,352	–
Potential number offered for the first time in 2016	–	–	763,463
Forfeited	28,327	35,691	24,392
Status as on Dec. 31, 2016	**307,081**	**552,661**	**739,071**

[1] Price of shares before share split in 2014.

The value of the provision was € 133 million as of December 31, 2016 (2015: € 124 million). The net expense for fiscal 2016 was € 76 million (2015: € 64 million). The three-year tranche issued in 2013 ended at the end of 2015 and was paid out in 2016 in the amount of € 68 million.

Provisions for employee benefits also include obligations for the partial retirement program and other severance pay that were not set up in connection with the "Fit for 2018" transformation and growth program as well as obligations in connection with long-term working hour accounts and anniversary bonuses.

With respect to provisions for defined-benefit 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 that was discontinued in 1987 in Germany and Latin America.

Acceptance and follow-on obligations

Provisions for acceptance and follow-on obligations primarily took into account costs stemming from discontinued research projects as well as obligation surpluses from onerous contracts. Utilizations and releases were attributable to research projects discontinued in previous years.

Other

Other mainly included provisions for other guarantees, for uncertain commitments from contributions, duties and fees as well as for interest and penalties from tax audits.

(27) Financial liabilities / Capital management

The composition of financial liabilities as well as a reconciliation to net financial debt are presented in the following table:

	Book value Dec. 31, 2016 € million	Book value Dec. 31, 2015 € million	Maturity	Interest rate %	Nominal volume million	Currency
Eurobond 2006/2016	–	214	June 2016	5.875%	250	€
Eurobond 2009/2016	–	60	Nov. 2016	4.000%	60	€
USD bond 2015/2017	238	–	March 2017	variable[1]	250	USD
Eurobond 2015/2017	699	–	Sept. 2017	variable[2]	700	€
Bonds (current)	**937**	**274**				
Commercial paper	918	999				
Bank loans	1,128	2,137				
Liabilities to related parties	758	578				
Loans from third parties and other financial liabilities	20	27				
Liabilities from derivatives (financial transactions)	25	80				
Finance lease liabilities	1	2				
Current financial liabilities	**3,788**	**4,097**				
USD bond 2015/2017	–	229	March 2017	variable[1]	250	USD
Eurobond 2015/2017	–	699	Sept. 2017	variable[2]	700	€
USD bond 2015/2018	380	366	March 2018	1.700%	400	USD
Eurobond 2015/2019	798	797	Sept. 2019	0.750%	800	€
Eurobond 2009/2019	69	69	Dec. 2019	4.250%	70	€
USD bond 2015/2020	712	684	March 2020	2.400%	750	USD
Eurobond 2010/2020	1,346	1,345	March 2020	4.500%	1,350	€
USD bond 2015/2022	947	910	March 2022	2.950%	1,000	USD
Eurobond 2015/2022	547	547	Sept. 2022	1.375%	550	€
USD bond 2015/2025	1,508	1,448	March 2025	3.250%	1,600	USD
Hybrid bond 2014/2074	990	988	Dec. 2074[3]	2.625%	1,000	€
Hybrid bond 2014/2074	497	497	Dec. 2074[4]	3.375%	500	€
Bonds (non-current)	**7,794**	**8,578**				
Bank loans	850	869				
Liabilities to related parties	–	–				
Loans from third parties and other financial liabilities	59	63				
Liabilities from derivatives (financial transactions)	103	104				
Finance lease liabilities	2	3				
Non-current financial liabilities	**8,809**	**9,616**				
Financial liabilities	**12,597**	**13,713**				
less:						
Cash and cash equivalents	939	832				
Current financial assets	145	227				
Net financial debt	**11,513**	**12,654**				

[1] Interest rate: 0.35% spread over 3-month U.S. dollar LIBOR.
[2] Interest rate: 0.23% spread over 3-month EURIBOR.
[3] 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.
[4] 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.

The Group issued a USD bond with a five-tranche structure in March 2015, and a further eurobond with a three-tranche structure in August 2015. Both issuances were part of the financing of the acquisition of the Sigma-Aldrich Corporation, USA. The Group repaid a eurobond with a volume of € 212 million in June 2016 as well as a further bond with a volume of € 60 million in November 2016.

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 are 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 2.0% (2015: 2.0%).

Information on liabilities to related parties can be found in Note [45] "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 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. In addition, the Group has a € 2 billion multi-currency revolving credit facility, which was renewed in fiscal 2013 ("Syndicated Loan 2013"). The credit line was underwritten by an international group of banks and has a remaining term until March 2020. This credit line had not been utilized as of December 31, 2016. The Group still had access to a commercial paper program to meet short-term capital requirements with a volume of € 2 billion, of which € 919 million had been utilized as of December 31, 2016 (2015: € 1 billion). As of December 31, 2016, there were liabilities of € 3.47 billion (2015: € 3.53 billion) from a Debt Issuance Program most recently renewed in 2015. As of the balance sheet date, € 400 million (2015: € 1,600 million) of a loan agreement for acquisition financing set up with a consortium of banks in 2014 had been used. As of December 31, 2016, further bank lines of € 336 million were available (2015: € 206 million). There are no indications that the availability of credit lines already extended was restricted.

On the balance sheet date, the bank financing commitments vis-à-vis the Group were as follows:

	Dec. 31, 2016		Dec. 31, 2015			
€ million	**Financing commitments from banks**	**Utilization**	Financing commitments from banks	Utilization	Interest	Maturity of financing commitments
Syndicated loan 2013	2,000	–	2,000	–	variable	2020
Loan agreement with banking syndicate for acquisition financing	400	400	1,600	1,600	variable	2018
Bilateral credit agreement with banks	700	700	700	700	variable	2019
Bilateral credit agreement with banks	400	400	400	400	variable	2020
Bilateral credit agreement with banks	250	250	250	250	variable	2022
Various bank credit lines	336	228	206	56	variable	< 1 year
	4,086	**1,978**	**5,156**	**3,006**		

(28) Other liabilities

This item comprised:

€ million	current	non-current	Dec. 31, 2016	current	non-current	Dec. 31, 2015
Other financial liabilities	922	14	936	890	14	904
Liabilities from derivatives (operational)	71	34	105	46	14	61
Financial items	**993**	**48**	**1,041**	**936**	**29**	**965**
Accruals for personnel expenses	603	–	603	536	–	536
Deferred income	237	386	623	226	576	802
Advance payments received from customers	12	–	12	15	–	15
Liabilities from non-income related taxes	103	5	108	105	4	109
Non-financial items	**955**	**391**	**1,345**	**882**	**580**	**1,462**
Other liabilities	**1,947**	**439**	**2,386**	**1,819**	**609**	**2,427**

As of December 31, 2016, other financial liabilities included liabilities to related companies amounting to € 457 million (2015: € 454 million). These were profit entitlements of E. Merck KG, Darmstadt, Germany. Moreover, other liabilities included interest accruals of € 98 million (2015: € 97 million) as well as payroll liabilities of € 169 million (2015: € 179 million). The remaining amount of € 212 million (2015: € 174 million) recorded under other financial liabilities included, among other things, liabilities to insurers as well as contractually agreed payment obligations vis-à-vis other companies. The deferred income resulted mainly from the collaboration agreement with Pfizer Inc., USA, in immuno-oncology and was released further as planned on a pro rata basis in 2016.

(29) Trade accounts payable

Trade accounts payable amounted to € 2,048 million (2015: € 1,921 million).

This item also included accrued amounts of € 544 million (2015: € 486 million) for outstanding invoices and € 443 million (2015: € 421 million) in sales deductions.

(30) Tax liabilities

Tax liabilities and provisions for tax liabilities resulted in total income tax liabilities of € 883 million as of December 31, 2016 (2015: € 1,011 million).

Segment Reporting

(31) Information by business sector / country and region

INFORMATION BY BUSINESS SECTOR

	Healthcare		Life Science	
€ million	**2016**	2015	**2016**	2015
Net sales[1]	**6,855**	**6,934**	**5,658**	**3,355**
Operating result (EBIT)[2]	**1,593**	**1,097**	**556**	**301**
Depreciation and amortization	746	752	797	372
Impairment losses	88	122	26	2
Reversals of impairment losses	–3	–	–1	–
EBITDA[2]	**2,425**	**1,970**	**1,378**	**674**
Exceptionals[2]	–297	31	274	182
EBITDA pre exceptionals (Segment result)[2]	**2,128**	**2,002**	**1,652**	**856**
EBITDA margin pre exceptionals (in % of net sales)[2]	31.0%	28.9%	29.2%	25.5%
Net operating assets[2,3]	5,600	5,813	21,853	21,624
Segment liabilities	–2,427	–2,479	–953	–910
Investments in property, plant and equipment[4]	315	232	254	133
Investments in intangible assets[4]	47	146	47	8
Net cash flows from operating activities	1,723	1,683	1,417	706
Business free cash flow[2]	1,648	1,581	1,144	676

[1] Without intersegment sales.
[2] Not defined by International Financial Reporting Standards (IFRS).
[3] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[4] According to the consolidated cash flow statement.

INFORMATION BY COUNTRY AND REGION

	Europe		thereof: Germany		thereof: Switzerland		North America	
€ million	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
Net sales by customer location[1]	4,735	4,103	983	851	238	160	3,858	2,723
Net sales by company location[1]	5,466	4,735	1,712	1,563	327	177	3,854	2,719
Intangible assets[2]	7,047	7,753	372	352	3,345	3,979	17,131	16,787
Property, plant and equipment[2]	2,554	2,401	1,187	1,104	548	527	1,015	1,026
Research and development costs	–1,697	–1,510	–763	–835	–840	–530	–184	–124
Number of employees	24,438	23,429	12,450	11,938	2,078	1,946	10,037	9,794

[1] Without intersegment sales.
[2] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

Performance Materials		Corporate and Other		Group	
2016	2015	**2016**	2015	**2016**	2015
2,511	**2,556**	**–**	**–**	**15,024**	**12,845**
823	**878**	**–492**	**–432**	**2,481**	**1,843**
237	242	25	18	1,805	1,383
17	2	2	3	134	128
–	–1	–	–	–5	–1
1,077	**1,120**	**–465**	**–411**	**4,415**	**3,354**
29	12	69	51	75	276
1,106	**1,132**	**–396**	**–360**	**4,490**	**3,630**
44.1%	44.3%	–	–	29.9%	28.3%
4,146	4,170	200	113	31,798	31,720
–290	–290	–106	–61	–3,777	–3,739
96	103	51	45	716	514
13	10	25	15	132	179
1,054	1,139	–1,677	–1,333	2,518	2,195
1,011	931	–485	–421	3,318	2,766

thereof: USA		Asia-Pacific		thereof: China		Latin America		Middle East and Africa		Group	
2016	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015	**2016**	2015
3,668	2,567	4,736	4,241	1,356	1,105	1,136	1,265	559	513	15,024	12,845
3,691	2,587	4,450	4,014	1,041	669	1,099	1,238	154	138	15,024	12,845
17,131	16,787	803	871	46	52	2	5	6	6	24,989	25,422
1,013	1,024	504	443	172	124	110	93	49	44	4,230	4,008
–184	–121	–61	–45	–25	–12	–21	–24	–12	–7	–1,976	–1,709
9,874	9,629	10,754	11,096	2,999	2,619	4,140	4,352	1,045	942	50,414	49,613

(32) Information on Segment Reporting

Segmentation was performed in accordance with the organizational and reporting structure of the Group that applied during 2016.

The Healthcare business sector comprises the businesses with prescription and over-the-counter pharmaceuticals and biopharmaceuticals as well as allergy products. 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. The Performance Materials business sector consists of the entire specialty chemicals business. 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. The expenses and income as well as cash flows attributable to the financial result and income taxes were also presented under Corporate and Other.

Apart from sales, the success of a segment is mainly determined by EBITDA pre exceptionals (segment result) and business free cash flow. EBITDA pre exceptionals 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 exceptionals excludes depreciation and amortization, impairment losses, and reversals of impairment losses as well as exceptional income and expenses presented in the following. Among other things, business free cash flow is also used for internal target agreements.

In 2016, only the Life Science business sector generated intragroup sales between business sectors. These resulted mainly from transactions with the Healthcare business sector in an amount of € 46 million and with the Performance Materials business sector (€ 2 million). Transfer prices for intragroup sales are determined on an arm's length basis.

Neither in 2016 nor in 2015 did any single customer account for more than 10% of Group sales.

The following table presents the reconciliation of EBITDA pre exceptionals of all operating businesses to the profit before income tax of the Group:

€ million	2016	2015
EBITDA pre exceptionals of the operating businesses[1]	**4,887**	**3,990**
Corporate and Other	–396	–360
EBITDA pre exceptionals of the Group[1]	**4,490**	**3,630**
Depreciation/amortization/impairment losses/reversals of impairment losses	–1,934	–1,511
Exceptionals[1]	–75	–276
Operating result (EBIT)[1]	**2,481**	**1,843**
Financial result	–326	–357
Profit before income tax	**2,154**	**1,487**

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

Exceptionals comprised the following:

€ million	2016	2015
Restructuring costs	–22	–48
Integration costs/IT costs	–193	–78
Gains (+)/losses (–) on the divestment of businesses	304	–2
Acquisition-related exceptionals	–153	–133
Other exceptionals	–11	–16
Exceptionals before impairment losses/reversals of impairment losses[1]	**–75**	**–276**
Impairment losses	–115	–92
Reversals of impairment losses	–	–
Exceptionals (total)[1]	**–191**	**–367**

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

Exceptionals were included in the consolidated income statement under cost of sales as well as under other operating expenses and income. The exceptionals of € 193 million recorded under integration costs/IT costs (2015: € 78 million) were largely incurred in connection with the integration of the Sigma-Aldrich Corporation, USA (€ 125 million), as well as expenses for ERP systems (€ 40 million). These amounts were recorded under other operating expenses.

The gains from the divestment of businesses amounting to € 304 million (2015: losses from the divestment of businesses amounting to € 2 million) resulted mainly from the sales of the rights to Kuvan® and the associated business transactions. These gains were included in other operating income.

The acquisition-related exceptionals amounting to € 153 million (2015: € 133 million) were due to the acquisition of the Sigma-Aldrich Corporation, USA, and primarily consisted of the step-up of the inventories from the purchase price allocation for the Sigma-Aldrich Corporation, USA, which was recognized six months after the acquisition in the income statement as part of cost of sales.

Business free cash flow was determined as follows:

€ million	**2016**	2015
EBITDA pre exceptionals[1]	**4,490**	**3,630**
Investments in property, plant and equipment, software as well as advance payments for intangible assets	–859	–609
Changes in inventories according to the consolidated balance sheet[2]	3	–950
Changes in trade accounts receivable and receivables from royalties and licenses according to the consolidated balance sheet	–177	–514
Adjustment first-time consolidation of Sigma-Aldrich[2]	–149	1,210
Adjustment first-time consolidation of BioControl Systems	10	–
Business free cash flow[1]	**3,318**	**2,766**

[1] Not defined by International Financial Reporting Standards (IFRS).
[2] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".

The reconciliation of operating assets presented in the Segment Reporting to the total assets of the Group was as follows:

€ million	**Dec. 31, 2016**	Dec. 31, 2015[1]
Assets	38,251	38,081
Monetary assets (cash and cash equivalents, current financial assets, loans and securities)	–1,123	–1,093
Non-operating receivables, income tax receivables, deferred taxes and net defined benefit assets	–1,542	–1,484
Assets held for sale	–12	–46
Operating assets (gross)[2]	**35,575**	**35,458**
Trade accounts payable	–2,048	–1,921
Other operating liabilities	–1,729	–1,818
Segment liabilities	**–3,777**	**–3,739**
Operating assets (net)[2]	**31,798**	**31,720**

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[2] Not defined by International Financial Reporting Standards (IFRS).

Notes to the Consolidated Cash Flow Statement

The consolidated cash flow statement presents the changes in cash and cash equivalents as a result of cash inflows and outflows from operating, investing and financing activities. Further information on cash flows can be found in the explanation of cash and cash equivalents (see Note [23] "Cash and cash equivalents"). The amount of undrawn borrowing facilities that could be tapped for future operating activities and to meet obligations is disclosed in Note [27] "Financial liabilities/Capital management".

The cash flows reported by Group companies in non-functional currencies are in principle translated at average exchange rates. Cash and cash equivalents are translated at the closing rates. The impact of foreign exchange rate changes is disclosed separately under changes in cash and cash equivalents.

(33) Net cash flows from operating activities

In 2016, tax payments totaled € 841 million (2015: € 865 million). Tax refunds totaled € 63 million (2015: € 161 million). Interest paid totaled € 327 million (2015: € 297 million). Interest received amounted to € 22 million (2015: € 54 million).

The neutralization of the profits/losses from the disposal of assets mainly comprises the gain on the sale of the rights to Kuvan®.

(34) Net cash flows from investing activities and financing activities

In 2016, an amount of € 156 million, including acquired cash of € 4 million, was paid for the acquisition of BioControl Systems, Inc., USA. In 2015, this item mainly included the acquisition of the Sigma-Aldrich Corporation, USA, amounting to € 13,454 million.

Net cash outflows from investments in current and non-current financial assets amounting to € 344 million (2015: € 1,741 million) mainly resulted from the purchase of short-term investments in securities not classified as cash and cash equivalents.

Cash inflows from the divestment of assets held for sale included the upfront payment amounting to € 340 million received in January 2016 for the sale of the rights to Kuvan®.

Cash inflows from investing activities include € 24 million from discontinued operations in relation to those business activities of Sigma-Aldrich that were acquired with a view to resale in 2015 (see Note [4] "Acquisitions, assets held for sale and disposal groups").

Net cash flows from financing activities contained the repayment of two bonds amounting to € 272 million. The repayment of other current and non-current financial debt mainly related to the repayment of bank loans to finance the acquisition of the Sigma-Aldrich Corporation, USA.

Other Disclosures

(35) Other disclosures

The following derivatives were held by the Group as of the balance sheet date:

	Nominal volume		Fair value	
€ million	**Dec. 31, 2016**	Dec. 31, 2015	**Dec. 31, 2016**	Dec. 31, 2015
Cash flow hedge	2,741	2,161	–91	–90
Interest	–	–	–	–
Currency	2,741	2,161	–91	–90
Fair value hedge	–	–	–	–
Interest	–	–	–	–
Currency	–	–	–	–
No hedge accounting	8,012	5,468	–55	–103
Interest	1,100	1,100	–87	–99
Currency	6,912	4,368	32	–4
	10,753	**7,629**	**–146**	**–193**

Cash flow hedges included currency hedges in a nominal volume of € 1,795 million (2015: € 1,387 million) with a remaining term of up to one year and hedges in a nominal volume of € 946 million (2015: € 774 million) with a remaining term of more than one year.

The maturities of the derivatives (nominal volume) were as follows as of the balance sheet date:

€ million	**Remaining maturity less than 1 year**	**Remaining maturity more than 1 year**	**Total Dec. 31, 2016**	Remaining maturity less than 1 year	Remaining maturity more than 1 year	Total Dec. 31, 2015
Forward exchange contracts	8,555	784	9,339	5,715	765	6,480
Currency options	153	162	314	40	9	49
Interest rate swaps	–	1,100	1,100	–	1,100	1,100
	8,707	**2,046**	**10,753**	**5,755**	**1,874**	**7,629**

Currency hedging serves to economically protect the company from the foreign exchange risks of the following types of transaction:

- Forecast transactions in non-functional currency, the expected probability of which is very high for the next 36 months,
- Off-balance sheet firm purchase commitments of the next 36 months in non-functional currency,
- Intragroup financing in non-functional currency as well as
- Receivables and liabilities in non-functional currency.

Exchange rate fluctuations of mainly the following currencies against the euro were hedged:

Nominal volume € million	**Dec. 31, 2016**	Dec. 31, 2015
USD	5,031	3,674
CHF	1,211	402
JPY	800	458
CNY	717	480
GBP	576	312
TWD	406	343

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. Overall, forecast transactions and firm purchase commitments in non-functional currency were hedged in the amount of € 2,741 million (2015: € 1,921 million).

All hedging transactions for forecast transactions and firm purchase commitments in non-functional currency represent cash flow hedges in 2016.

Intragroup financing as well as receivables and payables in non-functional currency were hedged exclusively using forward exchange contracts. Overall, balance sheet items amounting to € 6,912 million (2015: € 4,608 million) were hedged. In this context, the hedging transactions in 2016 were exclusively purely economic hedges for which hedge accounting is not applied.

To fix the interest rate level of a bond issued in August 2015 for refinancing purposes with a volume of € 550 million, in 2012 and 2013 forward starting payer interest rate swaps were entered into with a nominal volume of € 550 million and interest payments from 2015 to 2022. Up until May 2015, these interest hedging relationships represented cash flow hedges. With entry into offsetting transactions in May 2015, the hedging relationship was terminated voluntarily. Therefore, in 2016 an amount of € 13 million (2015: € 4 million) was reclassified from Other Comprehensive Income under the line item “Reclassification to profit or loss” within “Derivative financial instruments” to the financial result. The original transactions as well as the offsetting transactions are now classified as “held for trading”. The changes in fair value are reflected in the consolidated income statement.

In 2015, the ineffective portion from hedge accounting amounted to € –3 million. In 2016, there was no ineffectiveness.

(36) 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, also 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 derivative financial instruments (hereinafter “derivatives”) to hedge risks from currency and interest rate positions. The Group uses marketable forward exchange contracts, options and interest rate swaps as hedging instruments. Depending on the nature of the hedged item, changes in the fair values of derivatives are recorded in the consolidated income statement either in the operating result or in the financial result. 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. Extensive guidelines regulate the use of derivatives. There is a ban on speculation. Derivative transactions are subject to continuous risk management procedures. Trading, settlement and control functions are strictly separated. 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 foreign-exchange-related transaction risks within the scope of both ordinary business and financing activities. Different strategies are used to limit or eliminate these risks. Foreign exchange risks from transactions already recognized on the balance sheet are eliminated as far as possible through the use of forward exchange contracts. Foreign exchange risks arising from forecast transactions are analyzed regularly and reduced if necessary through forward exchange contracts or currency options by applying the hedge accounting rules. The Group is exposed to currency translation risks since many companies of the Group are located outside the eurozone. The financial statements of these companies are translated into euros. Exchange differences resulting from currency translation of the assets and liabilities of these companies are recognized in equity. These effects are not taken into consideration in the following tables.

The following table presents the net exposure of the Group in relation to exchange rate fluctuations of the major currencies against the euro:

€ million	CHF	CNY	GBP	JPY	TWD	USD
Net exposure Dec. 31, 2016	–267	412	82	154	165	1,009
Net exposure Dec. 31, 2015	–265	203	95	135	215	1,407

The net exposure of each of the aforementioned currencies consists 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, the hedging ratio is 30% – 70%.

Balance sheet items in the aforementioned currencies were economically hedged in full in both 2016 and 2015 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 following table shows the effects of 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. The effects of planned cash flows of the next 12 months are not taken into consideration here. By contrast, the effects of cash flow hedges are taken into consideration in the equity of the Group and are included in the following table.

€ million Dec. 31, 2016		CHF	CNY	GBP	JPY	TWD	USD
Exchange rate +10% (Appreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	17	–31	–1	–26	–26	–148
Exchange rate –10% (Depreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	–20	38	3	25	32	159

€ million Dec. 31, 2015		CHF	CNY	GBP	JPY	TWD	USD
Exchange rate +10% (Appreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	12	–15	–	–15	–21	–109
Exchange rate –10% (Depreciation vs. €)	Consolidated income statement	–	–	–	–	–	–
	Equity	–15	19	–	17	25	133

Interest rate risks

The Group's exposure to interest rate changes comprises the following:

€ million	Dec. 31, 2016	Dec. 31, 2015
Short-term or variable interest rate monetary deposits	1,085	1,059
Short-term or variable interest rate monetary borrowings	–4,587	–5,800
Net interest rate exposure	**–3,502**	**–4,741**

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, all securities classified as "available for sale" as well as all derivatives are presented in the following table.

€ million	2016		2015	
Change in market interest rate	**+100 basis points**	**–100 basis points**	**+100 basis points**	**–100 basis points**
Effects on consolidated income statement	–36	22	–47	23
Effects on equity	–	–	–	–

The scenario calculations here assumed that for material variable interest-bearing loan agreements, the risk-free interest rate component (EURIBOR) cannot fall below 0%.

Changes in market interest rates did not have effects on equity since an interest rate hedge for a bond issued in August 2015 for refinancing purposes was voluntarily terminated in 2015 with the entry into an offsetting transaction. Additionally, as in 2015, the level of interest-bearing securities was immaterial as of the balance sheet date.

Share price risks

The shares in publicly listed companies amounting to € 8 million (2015: € 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 € 1 million (2015: € 2 million). This change in value would initially be recognized in equity and then in profit or loss at the time of disposal.

Liquidity risks

The liquidity risk, meaning the risk that the Group cannot meet its payment obligations resulting from financial liabilities, is limited by establishing the required financial flexibility and by effective cash management. Information on bonds issued by the Group and other sources of financing can be found in Note [27] "Financial liabilities/Capital management".

Liquidity risks are monitored and reported to management on a regular basis.

The following tables present the contractual cash flows such as repayments and interest on financial liabilities and derivative financial instruments with a negative fair value as well as the settlement amount of trade accounts payable:

€ million Dec. 31, 2016	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	9,650	224	1,855	759	4,314	245	3,523
Bank loans	1,978	11	1,128	5	600	1	250
Trade accounts payable	2,048	–	2,048	–	–	–	–
Liabilities to related parties	1,215	–	1,215	–	–	–	–
Other financial liabilities	478	–	464	–	14	–	–
Loans from third parties and other financial liabilities	80	6	22	10	55	–	2
Liabilities from derivatives	233	18	95	70	34	17	–
Finance lease liabilities	4	–	1	–	3	–	–
	15,686	**259**	**6,829**	**845**	**5,020**	**263**	**3,775**

€ million Dec. 31, 2015	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	9,851	237	1,272	852	4,201	401	4,429
Bank loans	3,006	19	2,135	13	619	2	250
Trade accounts payable	1,921	–	1,921	–	–	–	–
Liabilities to related parties	1,031	–	1,031	–	–	–	–
Other financial liabilities	451	–	437	–	14	–	–
Loans from third parties and other financial liabilities	89	6	27	11	60	–	3
Liabilities from derivatives	244	17	126	65	14	26	–
Finance lease liabilities	5	–	2	–	3	–	–
	16,599	**279**	**6,951**	**941**	**4,911**	**428**	**4,682**

Credit risks

The Group limits credit risk by only entering into financial contracts with banks and industrial companies with good credit ratings. Moreover, the broad-based business structure with a large number of different customers results in a diversification of credit risks within the Group. 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.

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 continuously analyzing the age structure of trade accounts receivable. The Group continuously reviews and monitors open positions of all trading partners in the affected countries and takes risk-mitigating measures if necessary. If there is objective evidence that particular accounts receivable are fully or partially impaired, respective impairment losses are recognized to provide for credit defaults. On the balance sheet date, the theoretically maximum default risk corresponded to the net carrying amounts less any compensation from credit insurance.

There were no indications of impairment for financial assets neither past due nor impaired on the balance sheet date.

(37) Other disclosures on financial instruments

The following table presents the reconciliation of the balance sheet items to categories of financial instruments pursuant to the disclosures required by IFRS 7 and provides information on the measurement of fair value:

		Subsequent measurement according to IAS 39				
€ million	**Carrying amount Dec. 31, 2016**	Amortized cost	At cost	Fair value	Carrying amount according to IAS 17	Non-financial items
Assets						
Cash and cash equivalents	939	939	–	–	–	–
Current financial assets	145	44	–	101	–	–
Held for trading (non-derivatives)	–	–	–	–	–	–
Derivatives without a hedging relationship	59	–	–	59	–	–
Held to maturity	–	–	–	–	–	–
Loans and receivables	44	44	–	–	–	–
Available for sale	43	–	–	43	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Trade accounts receivable	2,889	2,889	–	–	–	–
Loans and receivables	2,889	2,889	–	–	–	–
Other current and non-current other assets[1]	805	277	–	12	–	516
Derivatives without a hedging relationship	1	–	–	1	–	–
Loans and receivables	277	277	–	–	–	–
Derivatives with a hedging relationship	11	–	–	11	–	–
Non-financial items[1]	516	–	–	–	–	516
Non-current financial assets[1]	218	10	59	149	–	–
Derivatives without a hedging relationship	17	–	–	17	–	–
Held to maturity	–	–	–	–	–	–
Loans and receivables	10	10	–	–	–	–
Available for sale[1]	191	–	59	132	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Liabilities						
Current and non-current financial liabilities	12,597	12,465	–	128	4	–
Derivatives without a hedging relationship	128	–	–	128	–	–
Other liabilities	12,465	12,465	–	–	–	–
Derivatives with a hedging relationship	–	–	–	–	–	–
Finance lease liabilities	4	–	–	–	4	–
Trade accounts payable	2,048	2,048	–	–	–	–
Other liabilities	2,048	2,048	–	–	–	–
Current and non-current other liabilities	2,386	936	–	105	–	1,345
Derivatives without a hedging relationship	3	–	–	3	–	–
Other liabilities	936	936	–	–	–	–
Derivatives with a hedging relationship	102	–	–	102	–	–
Non-financial items	1,345	–	–	–	–	1,345

[1] Previous year's figures have been adjusted, see "Acquisitions, assets held for sale and disposal groups".
[2] The exemption provisions under IFRS 7.29a were applied for information on specific fair values.

		Subsequent measurement according to IAS 39					
Fair value, Dec. 31, 2016[2]	Carrying amount Dec. 31, 2015	Amortized cost	At cost	Fair value	Carrying amount according to IAS 17	Non-financial items	Fair value Dec. 31, 2015[2]
	832	832	–	–	–	–	
	227	33	–	194	–	–	
–	–	–	–	–	–	–	–
59	33	–	–	33	–	–	33
	30	30	–	–	–	–	
	3	3	–	–	–	–	
43	162	–	–	162	–	–	162
–	–	–	–	–	–	–	–
	2,738	2,738	–	–	–	–	
	2,738	2,738	–	–	–	–	
	628	155	–	14	–	459	
1	2	–	–	2	–	–	2
	155	155	–	–	–	–	
11	12	–	–	12	–	–	12
	459	–	–	–	–	459	
	130	17	81	33	–	–	
17	5	–	–	5	–	–	5
	–	–	–	–	–	–	
	17	17	–	–	–	–	
132	109	–	81	28	–	–	28
–	–	–	–	–	–	–	–
	13,713	13,524	–	184	5	–	
128	139	–	–	139	–	–	139
12,802	13,524	13,524	–	–	–	–	13,706
–	45	–	–	45	–	–	45
	5	–	–	–	5	–	
	1,921	1,921	–	–	–	–	
	1,921	1,921	–	–	–	–	
	2,427	904	–	61	–	1,462	
3	3	–	–	3	–	–	3
	904	904	–	–	–	–	
102	57	–	–	57	–	–	57
	1,462	–	–	–	–	1,462	

Net gains and losses on financial instruments mainly included measurement results from fair value adjustments, impairments and reversals of impairments, disposal gains/losses as well as the recognition of premiums and discounts. Dividends and interest were not recognized in the net gains and losses on financial instruments, except for dividends and interest in the category "held for trading". Within the Group, the category "held for trading" only included derivatives that were not in a hedging relationship.

The net gains and losses on financial instruments by category (excluding amounts recognized in other comprehensive income) were as follows:

		Net gains and losses			
€ million 2016	**Interest**	**Impairments**	**Reversals of impairment**	**Fair value adjustments**	**Disposal gains/losses**
Financial instruments of the category					
Held for trading				69	
Held to maturity	–	–	–		–
Loans and receivables	18	– 52	59		–
Available for sale	2	– 5	–		34
Other liabilities	– 287				–

		Net gains and losses			
€ million 2015	Interest	Impairments	Reversals of impairment	Fair value adjustments	Disposal gains/losses
Financial instruments of the category					
Held for trading				–15	
Held to maturity	3	–	–		–
Loans and receivables	18	– 84	40		–
Available for sale	11	–	7		18
Other liabilities	– 314				–

In 2016, foreign exchange losses of € – 57 million resulting from receivables and payables in operating business, their economic hedging, as well as hedging of forecast transactions in operating business were recorded (2015: foreign exchange losses of € – 49 million). Foreign exchange losses of € – 4 million resulting from financial balance sheet items, their economic hedging as well as fair value fluctuations of option contracts to hedge forecast transactions were recorded (2015: losses of € – 40 million).

The fair value of financial assets and liabilities is based on the official market prices and market values quoted on the balance sheet date (Level 1 assets and liabilities) as well as mathematical calculation models with inputs observable in the market on the balance sheet date (Level 2 assets and liabilities). Level 1 assets comprised stocks and bonds and were classified as "available for sale", Level 1 liabilities comprised issued bonds and were classified as "other liabilities". Level 2 assets and liabilities were primarily liabilities to banks classified as "other liabilities", unlisted equity instruments classified as "available for sale" as well as derivatives with and without hedging relationships.

The fair value of the liabilities classified as "other liabilities" was determined by discounting future cash flows using market interest rates. The calculation of the fair value of forward exchange contracts and currency options used spot and forward rates observable in the market as well as foreign exchange volatilities applying recognized mathematical principles. The fair value of interest rate swaps is determined with standard market valuation models using interest rate curves available in the market. The fair values of unlisted equity instruments were derived from observable prices taken from equity refinancing transactions.

Level 3 assets were classified as "available for sale". These comprised an interest in a partnership, contingent consideration from the sale of an interest in a corporation as well as contingent consideration from the divestment of business activities in connection with the product Kuvan®. They also included equity investments in unlisted funds. The fair value of the interest in the partnership was determined through an internally performed valuation using the discounted cash flow method. Expected future cash flows based on the company's latest medium-term planning were taken

into account. The planning relates to a period of five years. Cash flows for periods beyond this were included in the terminal value calculation by applying a long-term growth rate of 0.5% (2015: 0.5%). The after-tax discount rate used was 7.0% (2015: 7.0%). To calculate the fair values of the contingent consideration components, the expected future milestone payments were weighted using the probability of occurrence and discounted using after-tax discount rates of 7.1%. The determination of the fair values of the fund investments took into account the fair values of companies in which the funds were invested.

Level 3 liabilities consisted of contingent consideration from the acquisition of a corporation. These were reported as "other liabilities" and amounted to € 1 million as of the balance sheet date.

Counterparty credit risk was taken into consideration for all valuations. In the case of non-derivative financial instruments, such as other liabilities or interest-bearing securities, this was reflected using risk-adequate premiums on the discount rate, while discounts on market value (so-called credit valuation adjustments and debit valuation adjustments) were used for derivatives.

The fair values of investments in equity instruments classified as "available for sale" with a carrying amount of € 59 million (2015: € 81 million) could not be reliably determined since there was no quoted price for an identical instrument in an active market and it was not possible to make a reliable estimate of fair value. They were measured at cost. Financial investments primarily included investments in equity instruments in various companies. There is currently no intention to sell these financial instruments. The Group had no information on a market for these financial instruments.

The amounts of the financial instruments recognized at fair value in the balance sheet and the disclosed fair values for financial instruments were determined as follows:

€ million

Dec. 31, 2016	Assets	Liabilities
Fair value determined by official prices and quoted market values (Level 1)	**54**	**9,058**
thereof: available for sale	54	–
thereof: other liabilities	–	9,058
Fair value determined using inputs observable in the market (Level 2)	**134**	**3,978**
thereof: available for sale	46	–
thereof: derivatives with a hedging relationship	11	102
thereof: derivatives without a hedging relationship	77	131
thereof: other liabilities	–	3,744
Fair value determined using inputs unobservable in the market (Level 3)	**75**	**1**
thereof: available for sale	75	–
thereof: other liabilities	–	1

€ million

Dec. 31, 2015	Assets	Liabilities
Fair value determined by official prices and quoted market values (Level 1)	**178**	**9,022**
thereof: available for sale	178	–
thereof: other liabilities	–	9,022
Fair value determined using inputs observable in the market (Level 2)	**51**	**4,928**
thereof: available for sale	–	–
thereof: derivatives with a hedging relationship	12	102
thereof: derivatives without a hedging relationship	39	142
thereof: other liabilities	–	4,684
Fair value determined using inputs unobservable in the market (Level 3)	**12**	**1**
thereof: available for sale	12	–
thereof: other liabilities	–	1

The changes in financial assets and liabilities assigned to Level 3 and measured at fair value were as follows:

€ million	**2016**	2015
Net book values as of January 1	**11**	**11**
Additions due to acquisitions/disposals	46	–1
Transfers to Level 3 from previous measurement at cost/Level 1/Level 2	16	–
Fair value changes		
Gains (+)/losses (–) recognized in consolidated income statement	4	–
Gains (+)/losses (–) recognized in consolidated statement of comprehensive income	–3	1
Disposals	–	–
Transfers out of Level 3 into Level 1/Level 2	–	–
Net book values as of December 31	**74**	**11**

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" related to "available-for-sale financial assets". If the discount rate used for the determination of the fair value of the interest in the partnership had been one percentage point higher, other comprehensive income would have decreased by € 2 million. By contrast, a decline in the discount rate by one percentage point would have increased other comprehensive income by € 3 million. An increase or decrease in the discount rates used to calculate the fair values of the contingent consideration components would not have had a material impact on other comprehensive income since the corresponding calculations assume a limited planning horizon and the determination of the fair values does not include a calculation of a terminal value.

Balance sheet netting of financial instruments is not possible. From an economic perspective, netting is only possible for derivatives. This possibility results from the framework agreements on derivatives trading which the Group enters into with commercial banks. The Group does not offset financial assets and financial liabilities in its balance sheet.

The following table presents the potential netting volume of the reported derivative financial assets and liabilities:

				Potential netting volume		
€ million Dec. 31, 2016	**Gross presentation**	**Netting**	**Net presentation**	**due to master netting agreements**	**due to financial collateral**	**Potential net amount**
Derivative financial assets	88	–	88	64	–	24
Derivative financial liabilities	–233	–	–233	–64	–	–170

				Potential netting volume		
€ million Dec. 31, 2015	Gross presentation	Netting	Net presentation	due to master netting agreements	due to financial collateral	Potential net amount
Derivative financial assets	51	–	51	46	–	5
Derivative financial liabilities	–245	–	–245	–46	–	–199

(38) Contingent liabilities

€ million	Dec. 31, 2016	Dec. 31, 2015
Contingent liabilities from legal disputes and tax matters	73	64
Guarantees/Warranties	2	1

Contingent liabilities from legal disputes included potential obligations, for which the probability of 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 as well as under environmental 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. of the United States (outside the United States and Canada: Merck Sharp & Dohme (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." 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 pertaining to tax matters included various non-German income and non-income-related tax matters that mainly related to intragroup business transfers as well as legal disputes attributable to the determination of earnings under tax law, customs regulations, excise tax matters, and transfer pricing adjustments.

(39) Other financial obligations

Other financial obligations comprised the following:

€ million	Dec. 31, 2016	Dec. 31, 2015
Obligations to acquire intangible assets and to pay due to collaboration agreements	2,826	3,021
Obligations to acquire property, plant and equipment	187	109
Future operating lease payments	362	344
Long-term purchase commitments	309	384
Other financial obligations	208	35
	3,891	**3,892**

Obligations to acquire intangible assets existed in particular owing to contingent consideration and within the scope of research and development collaborations. Here the Group has obligations to make milestone payments when certain objectives are reached. In the unlikely event that all contract partners achieve all milestones, the Group would be obligated to pay up to € 1,456 million (2015: € 1,544 million) for the acquisition of intangible assets.

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 € 1,370 million (2015: € 1,447 million).

The expected maturities of these obligations were as follows:

€ million	Dec. 31, 2016	Dec. 31, 2015
Obligations to acquire intangible assets and to pay due to collaboration agreements		
within one year	263	258
in 1–5 years	1,176	1,219
more than 5 years	1,387	1,544
	2,826	**3,021**

The increase in the other financial obligations is largely attributable to a building leasing agreement, the term of which starts in 2017.

Other financial obligations were recognized at nominal value.

The maturities of liabilities from lease agreements were as follows:

€ million Dec. 31, 2016	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	**2**	**2**	**–**	**4**
Future operating lease payments	**112**	**221**	**29**	**362**

€ million Dec. 31, 2015	within 1 year	1–5 years	more than 5 years	Total
Present value of future payments from finance leases	2	3	–	5
Interest component of finance leases	–	–	–	–
Future finance lease payments	**2**	**3**	**–**	**5**
Future operating lease payments	**99**	**207**	**38**	**344**

Operating leasing agreements related mainly to leasing arrangements to lease real estate, company fleet vehicles as well as operating and office equipment. The payments resulting from operating leasing agreements amounted to € 132 million (2015: € 113 million) and were recorded as an expense in the reporting period.

(40) Personnel expenses / Headcount

Personnel expenses comprised the following:

€ million	2016	2015
Wages and salaries	3,575	2,993
Compulsory social security contributions and special financial assistance	555	432
Pension expenses	226	210
	4,356	**3,634**

As of December 31, 2016, the Group had 50,414 employees (2015: 49,613). The average number of employees during the year was 50,439 (2015: 41,511). The increase was mainly due to the acquisition of the Sigma-Aldrich Corporation, USA, which was completed on November 18, 2015.

The breakdown of personnel by function was as follows:

Average number of employees	2016	2015
Production	14,829	11,563
Logistics	3,955	2,581
Marketing and Sales	14,887	12,871
Administration	8,190	6,763
Research and Development	6,249	5,097
Infrastructure and Other	2,329	2,636
	50,439	**41,511**

(41) Material costs

Material costs in 2016 amounted to € 2,358 million (2015: € 1,737 million) and were largely reported under cost of sales.

(42) Auditors' fees

The costs of the auditors (KPMG) of the financial statements of the Group consisted of the following:

	2016		2015	
€ million	**Group**	**thereof: KPMG Germany**	Group	thereof: KPMG Germany
Audits of financial statements	8.2	2.2	7.9	2.2
Other audit-related services	0.3	0.2	1.0	0.8
Tax consultancy services	0.7	0.5	0.9	0.5
Other services	1.4	1.3	1.2	0.9
	10.6	**4.2**	**11.0**	**4.4**

(43) 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 2016 and thus made permanently available.

(44) 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 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 Consumer Health Holding GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Export GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Life Science GmbH, Eppelheim, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Selbstmedikation GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Serono GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany
- Merck Versicherungsvermittlung GmbH, Darmstadt, Germany, a subsidiary of Merck KGaA, Darmstadt, Germany

(45) 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. In principle, 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. This also includes the companies Merck Capital Asset Management Ltd., Malta, and Merck Pensionstreuhandverein e.V., Darmstadt, Germany, 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 of December 31, 2016, there were liabilities by Merck Financial Services GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, Merck KGaA, Darmstadt, Germany, and Merck & Cie, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany, in the amount of € 1,186.3 million (2015: € 1,031.2 million). In addition, as of December 31, 2016, Merck KGaA, Darmstadt, Germany, had receivables from E. Merck Beteiligungen KG, Darmstadt, Germany, in the amount of € 123.7 million (2015: € 35.4 million). Merck Financial Services GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany, had receivables from Merck Capital Asset Management Ltd., Malta, in the amount of € 2.5 million (2015: € 0.0 million) and from Merck Pensionstreuhandverein e.V., Darmstadt, Germany, in the amount of € 0.1 million (2015: € 0.0 million). The balances result mainly from the profit transfers by Merck & Cie, Switzerland, a subsidiary of Merck KGaA, Darmstadt, Germany, to E. Merck KG, Darmstadt, Germany, as well as the reciprocal profit transfers between Merck KGaA, Darmstadt, Germany, and E. Merck KG, Darmstadt, Germany. They included financial liabilities of € 729.2 million (2015: € 577.8 million) and financial receivables of € 2.5 million (2015: € 0.0 million), which 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 2016, Merck KGaA, Darmstadt, Germany, performed services for E. Merck KG, Darmstadt, Germany, with a value of € 1.0 million (2015: € 0.9 million), for E. Merck Beteiligungen KG, Darmstadt, Germany, with a value of € 0.1 million (2015: € 0.3 million), and for Emanuel-Merck-Vermögens-KG, Darmstadt, Germany, with a value of € 0.2 million (2015: € 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 (2015: € 0.5 million).

As of December 31, 2016, there were receivables from the Venezuelan entities deconsolidated as of February 29, 2016 (see Note [3] "Changes in the Scope of Consolidation") with a carrying amount of € 25.7 million after impairment losses and liabilities with a carrying amount of € 24.2 million. The Group no longer makes any commercial deliveries to Venezuelan entities. For ethical reasons, essential drugs to treat cancer and multiple sclerosis are provided to patients to a certain extent. Revenues are recognized when payment is received and were consequently not included in the stated receivables. From March to December 2016, the Group generated revenues of € 0.4 million from these deliveries and services. During the same period, the production costs of these deliveries and services totaled € 13.7 million.

As of December 31, 2016, there were receivables of € 18.8 million (2015: € 15.5 million) and liabilities of € 12.1 million (2015: € 10.5 million) vis-à-vis non-consolidated subsidiaries. From January to December 2016, the Group generated revenues of € 0.9 million (2015: € 0.8 million) with these companies. During the same period, expenses amounting to € 6.1 million (2015: € 1.7 million) were incurred as a result of transactions with these companies.

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". There were no further material transactions with these pension funds.

In 2016, there were no material transactions 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.

(46) Executive Board and Supervisory Board compensation

The compensation of the Executive Board of Merck KGaA, Darmstadt, Germany, is paid by the general partner, E. Merck KG, Darmstadt, Germany, and recorded as an expense in its income statement. For the period from January to December 2016, fixed salaries of € 6.6 million (2015: € 6.5 million), variable compensation of € 16.8 million (2015: € 22.3 million), and additional benefits of € 0.2 million (2015: € 0.3 million) were recorded for members of the Executive Board. Furthermore, additions to the provisions of E. Merck KG, Darmstadt, Germany, for the Long-Term Incentive Plan totaled € 12.5 million (2015: € 9.9 million), and additions to the pension provisions of E. Merck KG, Darmstadt, Germany, included current service costs of € 2.8 million (2015: € 4.2 million) and past service costs of € 3.5 million (2015: € 0.0 million) for members of the Executive Board of Merck KGaA, Darmstadt, Germany.

The compensation of the Supervisory Board amounting to € 869.0 thousand (2015: € 881.0 thousand) consisted of a fixed portion of € 822.5 thousand (2015: € 822.5 thousand) and meeting attendance compensation of € 46.5 thousand (2015: € 58.5 thousand).

Further individualized information and details can be found in the Compensation Report on pages 160 et seq.

(47) Information on preparation and approval

The Executive Board of Merck KGaA, Darmstadt, Germany, prepared the consolidated financial statements on February 14, 2017 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 January 11, 2017, the Group announced a licensing agreement with Vertex Pharmaceuticals Inc., Boston, USA, (Vertex). Within the scope of this agreement, Vertex will transfer to the Group the worldwide development and commercialization of four research and development programs that represent novel approaches to the treatment of cancer. In return, the Group will make an upfront payment of US$ 230 million (€ 218 million based on the exchange rate on January 11, 2017). In addition, the Group is obligated to pay royalties on future product sales.

On February 6, 2017, the Group entered into a contractual agreement according to which the Group will receive a one-time payment as compensation for future royalty and license payments. As a consequence of this agreement, in 2017 the Group will receive cash inflows of US$ 123 million (€ 114 million based on the exchange rate on February 6, 2017), which will be recognized as income in the Healthcare business sector.

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 of the Group.

Accounting and Measurement Policies

(49) Measurement policies

The main assets and liabilities disclosed in the consolidated balance sheet are measured as follows:

Balance sheet item	Measurement principle
ASSETS	
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)	
Held-to-maturity investments	Amortized cost
Available-for-sale financial assets	Fair value
Loans and receivables	Amortized cost
Derivative assets (financial transactions)	Fair value
Other assets	
Derivative assets (operational)	Fair value
Receivables from non-income related taxes	Amortized cost
Other receivables	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	Amortized cost
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	Nominal value
Assets held for sale	Lower of carrying amount and fair value less costs to sell

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	Amortized cost
Liabilities to related parties	Amortized cost
Bank loans	Amortized cost
Liabilities from derivatives (financial transactions)	Fair value
Finance lease liabilities	Amortized cost
Other liabilities (current/non-current)	
Liabilities from derivatives (operational)	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
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 directly related to assets held for sale	Fair value

(50) 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 IFRS.

Acquisitions are accounted for using the purchase method in accordance with IFRS 3. Subsidiaries acquired and consolidated for the first time were measured at the carrying values at the time of acquisition. Differences resulting in this context are recognized as assets and liabilities to the extent that their fair values differ from the values carried in the financial statements. Any remaining – and usually – positive difference is recognized as goodwill within intangible assets.

In cases where a company was not acquired in full, non-controlling interests are 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 is recognized immediately in equity.

IFRS 11 is 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 are included in the consolidated financial statements on a pro rata basis 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 are included 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.

(51) 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 recorded 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. Hedged items are likewise carried at the closing rate. The resulting gains or losses are eliminated in the consolidated income statement against offsetting amounts from the fair value measurement of derivatives.

Currency translation was based on the following key exchange rates:

	Average annual rate		Closing rate	
€ 1 =	**2016**	2015	**Dec. 31, 2016**	Dec. 31, 2015
British pound (GBP)	0.816	0.728	0.857	0.737
Chinese renminbi (CNY)	7.343	7.003	7.343	7.183
Japanese yen (JPY)	121.127	134.431	123.070	131.576
Swiss franc (CHF)	1.090	1.075	1.075	1.081
Taiwan dollar (TWD)	35.571	35.337	34.004	35.831
U.S. dollar (USD)	1.102	1.112	1.051	1.093

(52) Recognition of net sales and other income

Net sales and other income are recognized when the amount of revenue can be measured reliably, it is probable that the economic benefits will flow to the entity and when the following preconditions have been met.

Net sales are deemed realized once the goods are delivered or the services have been rendered and the significant risks and rewards of ownership have been transferred to the purchaser. In the case of sales of equipment in the Life Science business sector, these preconditions 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.

Net sales are recognized net of sales-related taxes and sales deductions. When sales are recognized, estimated amounts are taken into account for expected sales deductions, for example rebates, discounts and returns.

The vast majority of Group sales are generated by the sale of goods.

In the Healthcare business sector, products are often sold to pharmaceutical wholesalers and to a lesser extent directly to pharmacies 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.

In addition to revenue from the sale of goods, sales also include commission income, profit-sharing and in the Life Science business sector revenue from services, but the volume involved is insignificant. In the case of long-term service agreements, the Group records the sales revenues on a pro rata basis over the term of the agreement or in accordance with the services rendered.

Revenues from multiple-element arrangements (e.g. sales of goods in combination with services) are recognized when the respective contract element is delivered or rendered.

Royalty and license income is recognized when the contractual obligation has been met.

Dividend income is recognized when the shareholders' right to receive the dividend is established. This is normally the date of the dividend resolution.

Interest income is recognized in the period in which it is earned.

(53) Research and development costs

Research and development costs comprise the costs of research departments and process development, the expenses incurred as a result of research and development collaborations as well as the costs of clinical trials (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. Costs incurred after regulatory approval are usually insignificant and are therefore not recognized as intangible assets. Owing to the risks existing up until market launch, development expenses in the Life Science and Performance Materials business sectors can likewise not be capitalized.

Reimbursements for R&D are offset against research and development costs.

(54) Intangible assets

Acquired intangible assets are recognized at cost and are classified as assets with finite and indefinite useful lives. 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 other than goodwill 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.

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. The recoverable amount of a cash-generating unit is determined as the higher of fair value less costs of disposal and value in use estimated using the discounted cash flow method.

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, marketing authorizations, acquired patents, licenses and similar rights, brand names, trademarks 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.

(55) 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 directly 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 by 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 recorded.

(56) 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 recorded as liabilities. If an operating lease is concerned, the associated expenses are recognized in the period in which they are incurred.

(57) Financial instruments: Principles

A financial instrument is a contractual arrangement that gives rise to a financial asset of one entity and a financial liability or an equity instrument of another entity. A distinction is made between non-derivative and derivative financial instruments.

The Group accounts for regular way purchases or sales of non-derivative financial instruments at the settlement date and of derivatives at the trade date.

Upon initial recognition, financial assets and financial liabilities are measured at fair value, taking into account any transaction costs, if necessary.

Financial assets are derecognized in part or in full if the contractual rights to the cash flows from the financial asset have expired or have been fulfilled or if control and substantially all the risks and rewards of ownership of the financial asset have been transferred to a third party. Financial liabilities are derecognized if the contractual obligations have been discharged, cancelled, or expired. Cash and cash equivalents are carried at nominal value.

(58) Financial instruments: Categories and classes of financial instruments

Financial assets and liabilities are classified into the following IAS 39 measurement categories and IFRS 7 classes. The classes required to be disclosed in accordance with IFRS 7 consist of the measurement categories set out here. Additionally, cash and cash equivalents with an original maturity of up to 90 days, finance lease liabilities, and derivatives designated as hedging instruments are also classes in accordance with IFRS 7.

Financial assets and financial liabilities at fair value through profit or loss

"Financial assets and financial liabilities at fair value through profit or loss" can be both non-derivative and derivative financial instruments. Financial instruments in this category are subsequently measured at fair value. Gains and losses on financial instruments in this measurement category are recognized directly in the consolidated income statement. This measurement category includes an option to designate non-derivative financial instruments as "at fair value through profit or loss" on initial recognition (fair value option) or as "financial instruments held for trading". The fair value option was applied neither during the fiscal year nor the previous year. The Group only assigns derivatives to the "held for trading" measurement category. Special accounting rules apply to derivatives that are designated as hedging instruments in a hedging relationship.

Held-to-maturity investments

"Held-to-maturity investments" are non-derivative financial assets with fixed or determinable payments and a fixed maturity that are quoted in an active market. To be able to assign a financial asset to this measurement category, the entity must have the positive intention and ability to hold it to maturity. These investments are subsequently measured at amortized cost using the effective rate method. If there is objective evidence that such an asset is impaired, an impairment loss is recognized in profit or loss. Subsequent reversals of impairment losses are also recognized in profit or loss up to the amount of the amortized cost. Within the Group, this measurement category is used for current financial assets.

Loans and receivables

"Loans and receivables" are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. They are subsequently measured at amortized cost using the effective rate method. If there is objective evidence that such assets are impaired, an impairment loss is recognized in profit or loss. Subsequent reversals of impairment losses are also recognized in profit or loss up to the amount of amortized cost. Long-term non-interest-bearing and low-interest receivables are measured at their present value. The Group primarily assigns trade receivables, loans, and miscellaneous other current and non-current receivables to this measurement category. The Group always uses a separate allowance account for impairment losses on trade and other receivables. Amounts from the allowance account are recognized in the carrying amount of the corresponding receivable as soon as this is derecognized due to irrecoverability.

Available-for-sale financial assets

"Available-for-sale financial assets" are those non-derivative financial assets that are not assigned to the measurement categories "financial assets and financial liabilities at fair value through profit or loss", "held-to-maturity investments" or "loans and receivables". Financial assets in this category are subsequently measured at fair value. Generally, changes in fair value are recognized immediately in equity and are only transferred to the consolidated income statement when the financial asset is derecognized. Changes in the fair values of contingent consideration resulting from adjustments to cash flow estimated are recognized in profit or loss. If there is substantial evidence of an asset impairment, the accumulated loss recognized immediately in equity is to be reclassified to the consolidated income statement, even if the financial asset has not been derecognized. Reversals of impairment losses on previously impaired equity instruments are recognized immediately in equity. Reversals of impairment losses on previously impaired debt instruments are recognized in profit or loss up to the amount of the impairment loss. Any amount in excess of this is recognized directly in equity. Financial assets in this category for which no fair value is available or fair value cannot be reliably determined are measured at cost less any accumulated impairment losses. Impairment losses on financial assets carried at cost may not be reversed. Within the Group, this measurement category is used in particular for interest-bearing securities, financial assets, contingent consideration, and financial investments in equity instruments as well as interests in subsidiaries that are not consolidated due to secondary importance (affiliates). Both interests in non-consolidated subsidiaries as well as to some extent financial investments in equity instruments are measured at cost.

Other liabilities

Other liabilities are non-derivative financial liabilities that are subsequently measured at amortized cost. Differences between the amount received and the amount to be repaid are amortized to profit or loss over the maturity of the instrument. The Group primarily assigns financial liabilities such as issued bonds and bank loans, trade payables, and miscellaneous other non-derivative current and non-current liabilities to this category.

(59) Financial instruments: Derivatives and hedge accounting

The Group uses derivatives solely to economically hedge recognized assets or liabilities and forecast transactions. The hedge accounting rules in accordance with IFRS are applied to some of these hedges. A distinction is made between fair value hedge accounting and cash flow hedge accounting. Designation of a hedging relationship requires a hedged item and a hedging instrument. 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. 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". Changes in fair value are then recognized in profit or loss.

Within the Group, cash flow hedges normally relate to highly probable forecast transactions in foreign currency and to future interest payments. In cash flow hedges, the effective portion of the gains and losses on the hedging instrument taking deferred taxes into consideration is recognized in equity until the hedged expected cash flows affect profit or loss. This is also the case if the hedging instrument expires, is sold, or is terminated before the hedged transaction occurs and the occurrence of the hedged item remains likely. The ineffective portion of a cash flow hedge is recognized directly in profit or loss.

(60) Other non-financial assets and liabilities

Other non-financial assets are carried at amortized cost. Allowances 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 the amount to be repaid.

(61) Deferred taxes

Deferred tax assets and liabilities result from temporary differences between the carrying amount of an asset or liability in the IFRS 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. In addition, deferred tax assets are recorded in particular for tax loss carryforwards if and insofar as their utilization is probable in the foreseeable future. In accordance with the liability method, the tax rates enacted and published as of the balance sheet date are used.

Deferred tax assets and liabilities are only offset on the balance sheet date if they meet the requirements of IAS 12.

(62) 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 the inventories are not manufactured within the scope of long-term production processes, the manufacturing costs do not include any borrowing costs.

Inventory prepayments are recorded under other current assets.

(63) Provisions for pensions and other post-employment benefits

Provisions for pensions and other post-employment benefits are recorded in the balance sheet 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. The actuarial assumptions, e.g. for discount rates, salary and pension trends, which were used to calculate the benefit obligation, 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 major rating agencies (Standard & Poor's, Moody's or Fitch), and a euro swap rate of adequate duration served as the basis for the data. 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 discloses – 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 recorded in the respective reporting period are presented separately in the Statement of Comprehensive Income.

(64) Other provisions and contingent liabilities

Provisions are recognized in the balance sheet if it is more likely than not that a cash outflow 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 separately as an asset if their realization is virtually certain and the asset recognition criteria have been met.

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 with reliability. 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.

(65) Share-based compensation programs

Provisions have been set up for obligations from share-based compensation programs. These share-based compensation programs with cash settlement are aligned not only with target achievement based on key performance indicators, but above all also 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 total value 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 fiscal year (reference price). In order for members of top management to receive payment, they must personally own an investment in shares of Merck KGaA, Darmstadt, Germany, dependent on their respective fixed annual compensation. When the three-year performance cycle ends, the number of MSUs to then be granted is determined based on the development of two key performance indicators (KPIs). These are on the one hand the performance of the price of shares 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%. 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. The payment amount is limited to three times the reference price. The fair value of the obligations is recalculated on each balance sheet date 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 respective tranche. The dividend payments incorporated into the valuation model orient towards medium-term dividend expectations.

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.

List of Shareholdings

(66) List of shareholdings

The shareholdings of Merck KGaA, Darmstadt, Germany, as of December 31, 2016 are presented in the following table:

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	IHS – Intelligent Healthcare Solutions GmbH	Darmstadt	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 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
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

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
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 GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Eppelheim	100.00	100.00
Germany	Merck Performance Materials GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Wiesbaden	100.00	
Germany	Merck Schuchardt OHG, a subsidiary of Merck KGaA, Darmstadt, Germany	Hohenbrunn	100.00	100.00
Germany	Merck Selbstmedikation GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	
Germany	Merck Serono GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck Versicherungsvermittlung 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	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
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	Merck KGaA & Co. Werk Spittal, a subsidiary of Merck KGaA, Darmstadt, Germany	Spittal	100.00	99.00
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 Consumer Healthcare 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	Diegem	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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Czech Republic	Sigma-Aldrich spol.s.r.o.	Prague	100.00	
Denmark	Merck A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Hellerup	100.00	
Denmark	Merck Life Science A/S, a subsidiary of Merck KGaA, Darmstadt, Germany	Hellerup	100.00	
Denmark	Sigma-Aldrich Denmark ApS	Brøndby	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	Helsinki	100.00	
France	BioControl Systems S.a.r.l.	Lyon	100.00	
France	Gonnon S.A.S.	Lyon	100.00	
France	Laboratoire Médiflor 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 Médication Familiale S.A.S., a subsidiary of Merck KGaA, Darmstadt, Germany	Lyon	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.	St. Quentin Fallavier	100.00	
France	Sigma-Aldrich Chimie SNC Partnership	St. Quentin Fallavier	100.00	
France	Sigma-Aldrich Holding S.a.r.l.	St. Quentin Fallavier	100.00	
Greece	Merck A.E., a subsidiary of Merck KGaA, Darmstadt, Germany	Maroussi, Athens	100.00	
Hungary	Merck Kft., a subsidiary of Merck KGaA, Darmstadt, Germany	Budapest	100.00	
Hungary	Sigma-Aldrich Kft.	Budapest	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 Financial Services Limited	Carrigtwohill	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	BioControl Italia S.r.l.	Rome	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
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	Vimodrone	100.00	
Italy	Merck Serono S.p.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Rome	99.74	
Italy	Sigma-Aldrich Italia S.r.l.	Milan	100.00	
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 (Luxembourg) S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials Group S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials S.a.r.l.	Luxembourg	100.00	
Luxembourg	AZ Electronic Materials TopCo 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	
Luxembourg	Millilux S.a.r.l.	Luxembourg	100.00	
Luxembourg	Millipart 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	Ridgefield Holdco 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	
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	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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
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.	Poznań	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 AOZT/ZAO	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	
Slovenia	Merck d.o.o., a subsidiary of Merck KGaA, Darmstadt, Germany	Ljubljana	100.00	
Spain	Merck Chemicals and Life Science S.A., 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.	Tres Cantos	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 Biosciences AG, a subsidiary of Merck KGaA, Darmstadt, Germany	Läufelfingen	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	
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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
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	Bromborough	100.00	
United Kingdom	Lamberts Healthcare Ltd.	Tunbridge Wells	100.00	
United Kingdom	Merck Chemicals Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Nottingham	100.00	
United Kingdom	Merck Consumer Health Care Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	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	Bromborough	100.00	
United Kingdom	Seven Seas Limited	Feltham	100.00	
United Kingdom	Sigma-Aldrich Company 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	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	Amnis Corp.	Seattle	100.00	
United States	BioControl Systems, Inc.	Bellevue	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.	Quincy	100.00	
United States	EMD Finance LLC	Wilmington	100.00	
United States	EMD Holding Corp.	Rockland	100.00	
United States	EMD Millipore Corporation	Billerica	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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
United States	KL Acquisition Corp.	St. Louis	100.00	
United States	Millipore Asia Ltd.	Wilmington	100.00	
United States	Millipore Pacific 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 Hitech, Inc.	Haverhill	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 Finance Co.	St. Louis	100.00	
United States	Sigma-Aldrich Foreign Holding Co.	St. Louis	100.00	
United States	Sigma-Aldrich Lancaster, Inc.	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	
China	Merck Holding (China) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	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 Millipore Lab Equipment (Shanghai) Co., Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Shanghai	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
China	Merck Performance Materials Hong Kong Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hong Kong	100.00	
China	Merck Performance Materials Hong Kong Services 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 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	
China	Sigma-Aldrich Hong Kong Holding Ltd.	Hong Kong	100.00	
China	Suzhou Taizhu Technology Development Co., Ltd.	Taicang	100.00	
India	Merck Life Science Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	100.00	
India	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Mumbai	51.80	
India	Merck Performance Materials Pvt. Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Sanpada New 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	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials IP G.K., a subsidiary of Merck KGaA, Darmstadt, Germany	Tokyo	100.00	
Japan	Merck Performance Materials Manufacturing G.K., 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	Subang Jaya	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	
Philippines	Merck Business Solutions Asia Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Bonifacio Global City	99.99	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Philippines	Merck Inc., a subsidiary of Merck KGaA, Darmstadt, Germany	Makati 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	100.00	
South Korea	Sigma-Aldrich Holding Ltd.	Yongin City	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 Co., 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.	Kaohsuing	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, 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	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
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 Industries Ltd.	Yavne	100.00	
Israel	InterPharm Laboratories Ltd.	Yavne	100.00	
Israel	Merck Serono Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Herzliya Pituach	100.00	
Israel	Qlight Nanotech Ltd.	Jerusalem	100.00	
Israel	Sigma-Aldrich Israel Ltd.	Rehovot	100.00	
Mauritius	Millipore Mauritius Ltd.	Cyber City	100.00	
South Africa	Merck (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Halfway House	100.00	
South Africa	Merck Pharmaceutical Manufacturing (Pty) Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Wadeville	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-LLC, a subsidiary of Merck KGaA, Darmstadt, Germany	Dubai	100.00	
II. Companies not consolidated due to secondary importance				
Germany				
Germany	AB Pensionsverwaltung GmbH	Zossen	100.00	100.00
Germany	Merck 17. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck 18. Allgemeine Beteiligungs-GmbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Germany	Merck 19. Allgemeine Beteiligungs-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 Wohnungs- und Grundstücksverwaltungsgesellschaft mbH, a subsidiary of Merck KGaA, Darmstadt, Germany	Darmstadt	100.00	100.00
Other European countries				
Greece	Sigma-Aldrich (OM) Ltd.	Athens	100.00	
Ireland	SAFC Arklow Ltd.	Arklow	100.00	
Italy	BioControl Systems S.r.l.	Rome	100.00	
Netherlands	Merck Window Technologies B.V., a subsidiary of Merck KGaA, Darmstadt, Germany	Eindhoven	100.00	100.00
Portugal	Laquifa Laboratorios S.A.	Algés	100.00	
Russia	Chemical Trade Limited	Moscow	100.00	
Russia	MedChem Limited	Moscow	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
Russia	SAF-LAB AOZT/ZAO	Moscow	100.00	
Switzerland	Calypso Biotech SA	Plan-les-Ouates	66.51	
United Kingdom	B-Line Systems Limited	Gillingham	100.00	
United Kingdom	Bristol Organics Ltd.	Gillingham	100.00	
United Kingdom	Fluka Chemicals Ltd.	Gillingham	100.00	
United Kingdom	Merck Cross Border Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Feltham	100.00	
United Kingdom	Merck Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hull	100.00	
United Kingdom	Merck Pension Trustees Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Hull	100.00	
United Kingdom	Nature's Best Health Products Ltd.	Tunbridge Wells	100.00	
United Kingdom	Sigma Chemical Co. Ltd.	Poole	100.00	
United Kingdom	Sigma Entity One Limited	Gillingham	100.00	
United Kingdom	UFC Ltd.	Gillingham	100.00	
United Kingdom	Ultrafine Limited	Gillingham	100.00	
United Kingdom	Webnest Ltd.	Gillingham	100.00	
United Kingdom	Wessex Biochemicals Ltd.	Poole	100.00	
North America				
United States	BioControl Systems International, Inc.	Seattle	100.00	
United States	Fluka Chemical Corp.	St. Louis	100.00	
United States	Research Organics Foreign Trade Corporation	Cleveland	100.00	
United States	S and F Properties, Inc.	Cleveland	100.00	
United States	Sigma-Aldrich Subsidiary I Corp.	St. Louis	100.00	
United States	Techcare Systems, Inc.	St. Louis	100.00	
United States	TocopheRx, Inc.	Groton	62.83	
Asia-Pacific (APAC)				
Australia	Biochrom Australia Pty. Ltd.	Bayswater	100.00	
Japan	BioReliance KK	Tokyo	100.00	
South Korea	SAFC Hitech Korea Ltd.	Yongin City	100.00	
Thailand	Sigma-Aldrich (Thailand) Co., Ltd.	Bangkok	100.00	
Latin America				
Dominican Republic	Merck Dominicana, S.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Santo Domingo	100.00	
Middle East and Africa (MEA)				
Kenya	Merck Healthcare and Life Science Limited, a subsidiary of Merck KGaA, Darmstadt, Germany	Nairobi	100.00	
Morocco	Merck Maroc S.A.R.L., a subsidiary of Merck KGaA, Darmstadt, Germany	Casablanca	100.00	
Nigeria	Merck Pharmaceutical and Life Sciences Ltd., a subsidiary of Merck KGaA, Darmstadt, Germany	Lagos	100.00	
South Africa	Serono South Africa Ltd.	Johannesburg	100.00	

Country	Company	Registered Office	Equity interest (%)	Thereof: Merck KGaA, Darmstadt, Germany (%)
III. Non-controlled companies majority-owned				
Latin America				
Venezuela	Merck S.A., a subsidiary of Merck KGaA, Darmstadt, Germany	Caracas	100.00	
Venezuela	Representaciones MEPRO S.A.	Caracas	100.00	
IV. Associates not included at equity due to secondary importance				
Other European countries				
Switzerland	Asceneuron SA	Lausanne	40.26	
Switzerland	CAMAG Chemie-Erzeugnisse und Adsorptionstechnik AG	Muttenz	39.11	
Switzerland	Prexton Therapeutics SA	Plan-les-Ouates	28.36	
Switzerland	Vaximm AG	Basel	24.07	
North America				
United States	Prolog Healthy Living Fund, LP	St. Louis	38.32	
United States	Prolog Healthy Living Fund II, LP	St. Louis	50.58	
Middle East and Africa (MEA)				
Israel	Neviah Genomics Ltd.	Yavne	69.00	7.75

Darmstadt, February 14, 2017

Stefan Oschmann

Udit Batra

Kai Beckmann

Walter Galinat

Belén Garijo Lopez

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, 2017

Stefan Oschmann

Udit Batra

Kai Beckmann

Walter Galinat

Belén Garijo Lopez

Marcus Kuhnert

Auditor’s Report

We have audited the consolidated financial statements prepared by the MERCK Kommanditgesellschaft auf Aktien, Darmstadt, Germany, comprising the Consolidated Income Statement, the Consolidated Statement of Comprehensive Income, the Consolidated Balance Sheet, the Consolidated Cash Flow Statement, the Consolidated Statement of Changes in Net Equity and the Notes to the Consolidated Financial Statements, together with the Combined Management Report for the business year from January 1 to December 31, 2016. The preparation of the consolidated financial statements and the Combined Management Report in accordance with IFRSs, as adopted by the EU, and the additional requirements of German commercial law pursuant to § 315a Abs. 1 HGB [Handelsgesetzbuch “German Commercial Code”] and supplementary provisions of the articles of association are the responsibility of the parent company's management. Our responsibility is to express an opinion on the consolidated financial statements and on the Combined Management Report based on our audit.

We conducted our audit of the consolidated financial statements in accordance with § 317 HGB [Handelsgesetzbuch “German Commercial Code”] and German generally accepted standards for the audit of financial statements promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Those standards require that we plan and perform the audit such that misstatements materially affecting the presentation of the net assets, financial position and results of operations in the consolidated financial statements in accordance with the applicable financial reporting framework and in the Combined Management Report are detected with reasonable assurance. Knowledge of the business activities and the economic and legal environment of the Group and expectations as to possible misstatements are taken into account in the determination of audit procedures. The effectiveness of the accounting-related internal control system and the evidence supporting the disclosures in the consolidated financial statements and the Combined Management Report are examined primarily on a test basis within the framework of the audit. The audit includes assessing the annual financial statements of those entities included in consolidation, the determination of entities to be included in consolidation, the accounting and consolidation principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements and Combined Management Report. We believe that our audit provides a reasonable basis for our opinion.

Our audit has not led to any reservations.

In our opinion, based on the findings of our audit, the consolidated financial statements comply with IFRSs, as adopted by the EU, the additional requirements of German commercial law pursuant to § 315a Abs. 1 HGB and supplementary provisions of the articles of association and give a true and fair view of the net assets, financial position and results of operations of the Group in accordance with these requirements. The Combined Management Report is consistent with the consolidated financial statements, complies with the German statutory requirements, and as a whole provides a suitable view of the Company's position and suitably presents the opportunities and risks of future development.

Frankfurt/Main, February 15, 2017

KPMG AG
Wirtschaftsprüfungsgesellschaft

Original German version signed by

Braun
Wirtschaftsprüfer

Rackwitz
Wirtschaftsprüfer

Business Development 2012 – 2016

This overview may include historically adjusted values in order to ensure comparability with 2016.

€ million
Earnings performance
Net sales
Operating result (EBIT)
Margin (% of net sales)
EBITDA
Margin (% of net sales)
Exceptionals
EBITDA pre exceptionals
Margin (% of net sales)
Profit before income tax
Profit after tax
Earnings per share (in €)[1]
Assets and liabilities
Total assets[2]
Non-current assets[2]
of which:
Intangible assets (incl. goodwill)[2]
Property, plant and equipment[2]
Current assets[2]
of which:
Cash and cash equivalents
Trade accounts receivable
Inventories[2]
Financial liabilities
Current
Non-current
Net equity
Liquidity
Investments in intangible assets[3]
Investments in property, plant and equipment[3]
Business free cash flow
Net financial debt
Other key data
Equity ratio (in %)
Research and development costs
Dividend per share before share split (in €)[4]
Dividend per share after share split (in €)[4]
Employees (number as of December 31)

[1] Taking into account the share split in 2014; fiscal 2012 and 2013 have been adjusted accordingly.
[2] Fiscal 2015 has been adjusted, see "Acquisitions, assets held for sale and disposal groups" in the Notes to the Consolidated Financial Statements.
[3] According to the Consolidated Cash Flow Statement.
[4] In fiscal 2014, a 2:1 share split took place.
[5] Proposal on the appropriation of profits for 2016.

2012	2013	2014	2015	**2016**	Change in %
10,756	10,735	11,363	12,845	15,024	17.0%
964	1,611	1,762	1,843	2,481	34.6%
9.0%	15.0%	15.5%	14.3%	16.5%	
2,360	3,069	3,123	3,354	4,415	31.6%
21.9%	28.6%	27.5%	26.1%	29.4%	
–605	–184	–265	–276	–75	–72.6%
2,965	3,253	3,388	3,630	4,490	23.7%
27.6%	30.3%	29.8%	28.3%	29.9%	
709	1,389	1,557	1,487	2,154	44.9%
579	1,209	1,165	1,124	1,633	45.3%
1.30	2.77	2.66	2.56	3.75	46.5%
21,643	20,819	26,010	38,081	38,251	0.4%
15,017	13,434	15,530	30,737	30,582	–0.5%
10,945	9,867	11,396	25,422	24,989	–1.7%
2,954	2,647	2,990	4,008	4,230	5.5%
6,626	7,385	10,480	7,344	7,670	4.4%
730	981	2,879	832	939	12.8%
2,115	2,021	2,220	2,738	2,889	5.5%
1,534	1,474	1,660	2,610	2,607	–0.1%
4,454	3,698	5,637	13,713	12,597	–8.0%
1,091	440	2,076	4,097	3,788	–7.5%
3,362	3,257	3,561	9,616	8,809	–8.4%
10,415	11,069	11,801	12,855	14,050	9.3%
144	110	143	179	132	–26.3%
329	407	481	514	716	39.3%
2,969	2,960	2,605	2,766	3,318	20.0%
1,926	307	559	12,654	11,513	–9.0%
48.1%	53.2%	45.4%	33.8%	36.7%	
1,511	1,507	1,704	1,709	1,976	15.6%
1.70	1.90	–	–	–	
–	–	1.00	1.05	1.20[5]	14.3%
38,847	38,154	39,639	49,613	50,414	1.6%

Information and Service

The Annual Report for 2016 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 ar2016.emdgroup.com. 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 order at www.emdgroup.com/publications.

You can order all publications from Group Communications, Merck KGaA, 64271 Darmstadt, Germany, comms@emdgroup.com.

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Financial Calendar
for 2017

March
3/9/2017
Annual Press Conference

August
8/3/2017
Report on the second quarter

April
4/28/2017
Annual General Meeting

November
11/9/2017
Report on the third quarter

May
5/18/2017
Report on the first quarter