Fundamental Information about the Group

Merck

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, Merck comprises three business sectors: Healthcare, Life Science, and Performance Materials.

In Healthcare, we discover, develop and manufacture prescription medicines used to treat cancer, multiple sclerosis, and infertility. 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 up to high-tech materials for the manufacture of integrated circuits.

We hold the global rights to the Merck name and brand. The only exceptions are Canada and the United States. In these countries, we operate as EMD Serono in the biopharmaceutical business, as MilliporeSigma in the life science business and as EMD Performance Materials in the high-tech materials business.

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, 2017, we had 52,941 employees worldwide, which compares with 50,414 on December 31, 2016.¹

Healthcare

Our Healthcare business sector comprises the three businesses Biopharma, Consumer Health, and Allergopharma. Since 2015, Belén Garijo has been the CEO of the Healthcare business sector and member of the Executive Board. In 2017, Healthcare generated 46% of Group sales and 41% of EBITDA pre (excluding Corporate and Other), making it the largest of our three business sectors. The regions Europe and North America generated 57% of Healthcare’s net sales in 2017. In recent years, we have steadily expanded our presence in growth markets. In 2017, Asia Pacific and Latin America accounted for 36% of sales. Our divestment of the Biosimilars business to Fresenius closed on August 31.

Biopharma

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

In 2017, we reinforced our commitment to growing our immunology pipeline to provide new options to better the lives of people with immunological diseases with the receipt of regulatory approvals for Mavenclad® ( cladribine tablets) in the 28 member states of the EU as well as Liechtenstein, Iceland and Norway; Canada and Australia. We reached important development milestones for atacicept and sprifermin, reporting our results at key medical meetings around the world.

In June, the Committee for Medicinal Products for Human Use (CHMP) of the European Medicines Agency (EMA) issued a positive opinion for approval of Mavenclad® ( cladribine tablets). Data from clinical trials indicate that Mavenclad® can lead to high and sustained efficacy through selective modulation of B and T cells, resulting in lasting resolution of inflammation. We have robust data relating to the safety and tolerability profile and consider our unique oral short-course treatment to be an important therapeutic option for patients with relapsing multiple sclerosis (RMS) with high disease activity.

We view Mavenclad® as a complementary new oral treatment option in our MS product portfolio. Our MS treatment Rebif® is and remains a well-established therapy.

In August, the European Commission (EC) granted marketing authorization for Mavenclad® in the treatment of highly active relapsing multiple sclerosis. In December, the Therapeutic Goods Administration (TGA) in Australia updated the registration including the indication, dosing and safety information of Mavenclad® for the treatment of relapsing-remitting (RRMS), and Health Canada approved Mavenclad® as monotherapy for the treatment of adult patients with RRMS. In January 2018, the Israeli Ministry of Health approved Mavenclad® for the treatment of adult patients with highly active relapsing MS as defined by clinical or imaging features.

¹Merck also has employees at sites which are not fully consolidated subsidiaries. These figures refer to all people directly employed by Merck and therefore may deviate from figures in the financial section of this report.
We presented data on sprifermin, our investigational treatment for knee osteoarthritis, at the ACR/ARHP Annual Meeting held in November. The study of 549 patients met its primary endpoint, demonstrating statistically significant, dose-dependent increases in MRI total femorotibial joint cartilage thickness from baseline in the two sprifermin groups receiving the highest doses as compared with the placebo group after the two-year treatment period.

We presented a total of 11 abstracts at ACR/ARHP, highlighting the momentum of our various clinical programs in immunology. We presented other data of note on a Phase II post-hoc study analysis of atacicept for SLE patients with high disease activity. In the analysis of ADDRESS II, a 24-week, placebo-controlled Phase Ib study of 306 people, those who had high disease activity at baseline had three to five times the odds of attaining low disease activity at 24 weeks when treated with atacicept 150 mg dose (n=51) as compared to those treated with placebo (n=52).

Erbitux® (cetuximab) remains the second best-selling drug in the portfolio of our Biopharma business and is our 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.

Together with Pfizer Inc., USA, we are developing much-needed new treatment options for patients with hard-to-treat cancers. In 2017, we made key progress in this area. We have obtained a total of six regulatory approvals for our anti-PD-L1 antibody avelumab under the brand name Bavencio®. The U.S. Food and Drug Administration (FDA) granted two accelerated approvals for Bavencio® for the treatment of adults and pediatric patients 12 years and older with metastatic Merkel cell carcinoma (MCC) and previously treated patients with locally advanced or metastatic urothelial carcinoma (UC). These indications were approved under accelerated approval based on tumor response rate and duration of response. Continued approval for these indications may be contingent upon verification and description of clinical benefit in confirmatory trials. The prognosis for both patient groups is very poor, so for patients around the world this may represent a welcome new treatment option. Furthermore, approvals were granted for Merkel cell carcinoma in Switzerland, Japan, Canada and in the 28 member states of the European Union, as well as Iceland, Liechtenstein and Norway. Approvals followed in Australia and Israel in early 2018. In addition, Bavencio® was approved for the treatment of patients with urothelial carcinoma in Israel in late January 2018.

The Bavencio® approvals were based on data from our comprehensive clinical development program, JAVELIN, which currently comprises at least 30 clinical programs, including various Phase III trials, and over 7,000 patients evaluated across more than 15 different tumor types. In addition to MCC and urothelial carcinoma, these cancers include breast, gastric/gastro-esophageal junction, head and neck, Hodgkin’s lymphoma, melanoma, mesothelioma, non-small cell lung, ovarian, and renal cell carcinoma. Key data from the JAVELIN program were presented at major medical congresses in 2017 to help advance understanding of the field of immunoncology, and this will continue in 2018.

In November, we announced that our Phase III JAVELIN Gastric 300 study did not meet its pre-specified primary endpoint of superior overall survival. The study set a high bar for success and although the primary endpoint was not met, we believe that the data will provide valuable insights. We will therefore further examine the data in an effort to better understand the results and intend to present the results at an upcoming medical congress.

In addition, as part of our commitment to developing new treatment options for patients with hard-to-treat cancers who would otherwise have a low chance of survival, we are exploring all potential options and have entered into four new strategic collaborations to evaluate avelumab in combination with a range of complementary oncology medicines (further details can be found under “Research & Development”).

An important growth driver for our Biopharma business is our portfolio of fertility products that help couples conceive a child, ranging from drugs to technologies. Infertility has become a key topic globally due to the trend towards delaying childbirth. We see steadily increasing demand in growth markets fueling sales. In addition, we are facing a rapidly changing environment in the fertility market, changes in competitive environment trending towards increased price pressure in the drugs business, more educated patients and an increasing importance of technologies in Fertility. The innovative strategic objective of our Fertility business is to develop from the world market leader in fertility drugs into an integrated fertility treatment partner. We are therefore focusing on turning these trends into opportunities for Merck to achieve further growth. The first step to achieve this goal was to complement our existing drug portfolio with a 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 tested portfolio for every stage of the reproductive cycle. We are continuously supporting patients on their IVF journey. In November, the FDA approved a new version of the Gonal-F® (folitropin alfa injection) prefilled pen that is easy-to-learn and easy-to-use (please refer to the R&D section for details). Earlier in the year we received regulatory approval for the new Pergoveris® pen in Europe (please refer to the R&D section for details).

Our Fertility Technologies business continues to broaden its footprint. In December, we announced U.S. FDA 510(K) clearance of the benchtop embryo incubator Geri™. This innovative technology, designed to improve processes in fertility laboratories, will be commercially available to IVF clinics in the United States as of the first half of 2018. In early 2017, we announced the release of two advanced Fertility Technologies products for improved efficiency in the assisted reproductive treatment (ART) lab, Eeva® Test 3.0 and Geri™ humidified incubation products.

In January, we opened our first Center of Excellence (CoE) for fertility, an international state-of-the-art facility for high-quality training of healthcare professionals, such as physicians and embryologists, to improve clinical practices, protocols and clinical outcomes.

1 Geri™ is not yet available in the United States.
Every day, more than 60 million patients around the world use our trusted general medicine and endocrinology (GM&E) medicines. 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 the Healthcare business sector, with strong double-digit growth in all major therapeutic areas in 2017, contributing significantly to the overall profitability of Biopharma and Merck. 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. With a market share above 40% and double-digit sales growth, Euthyrox® (active ingredient levothyroxine) is the worldwide market leader for treating hypothyroidism, a disease with high prevalence but 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 May, the Medicines and Healthcare products Regulatory Agency (MHRA) in the United Kingdom authorized Glucophage® SR (sustained release formulation; metformin) for the reduction in the risk or delay of the onset of type 2 diabetes in adult, overweight patients with impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG), and/or increased glycated hemoglobin (HbA1c), when intensive lifestyle changes for three to six months have failed. In addition to the United Kingdom, we have approvals in the indication of prediabetes in 16 markets and see great potential due to an increasing prevalence of diabetes.

We also help to raise awareness and education in the areas we operate in, such as thyroid diseases and diabetes. For example, we took part in International Thyroid Awareness Week and announced a partnership with the International Diabetes Federation (IDF), which will serve as a basis for joint education and communication activities to raise awareness of the importance of type 2 diabetes prevention.

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™ electro-mechanical 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.

At the 2017 Pharmaceutical Market Excellence Awards, Merck won in the category “Excellence in Innovation”. We were awarded for our eHealth ecosystem designed to improve treatment outcomes by working with patients, carers and healthcare professionals.

**CONSUMER HEALTH**

Our Consumer Health business focuses on consumer-centric innovation under the umbrellas of several strategic brands such as Neurobion®, Bion3®, Seven Seas®, Nasivin®, Femibion® and Dolo-Neurobion®, as well as Vivera®/Floratil®, Sangobion®, Vigantoletten®, Apaisyl®, and Kytta®. The aim is to emotionalize 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 our Consumer Health business. People are becoming more health-conscious and looking after their own physical well-being. Preventive healthcare and minimally invasive treatment are growing in importance in both established and developing markets, the latter characterized by a growing middle class with specific needs. As people and societies are growing older than ever before, Consumer Health has established a movement around its new purpose of actively driving change in the societies it operates in, all under the independent label and motto “WE100®.”

Consumer Health currently ranks among the top 15 players in the global OTC market and already generates more than 50% of its annual sales in developing growth markets. In particular, markets such as Mexico, Brazil, Poland, Greece, South Africa, India, Indonesia, Thailand, and Malaysia are delivering significant growth rates. To further align the regional strategies with the strategic brand strategies and to even better focus on efficient region-brand combinations, the business has reorganized its brand structure into a brand-franchise model leveraging its full expertise and capabilities across functions.

On September 5, we announced that we are preparing strategic options for our Consumer Health business, including a potential full or partial sale of the business as well as strategic partnerships. This is consistent with our focus on our innovation-driven Biopharma pipeline.
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 18 countries worldwide.

Life Science
In the Life Science business sector, our purpose is to solve the toughest problems in life science by collaborating with the global scientific community – and through that, we aim to accelerate access to health for people everywhere. Udit Batra has been the CEO of our Life Science business sector since 2014 and a member of the Merck Executive Board since 2016. In 2017, Life Science generated 38% of Group sales as well as 38% of EBITDA (excluding Corporate and Other).

We serve customers in academia, biotech and pharma – helping them to deliver the promise of their work better, faster and safer. As a leading player in the life science industry, we offer innovative solutions for scientists and engineers at every stage.

Our 300,000 products range from lab water systems to genome-editing tools, antibodies and cell lines, as well as end-to-end bioprocessing systems to support the manufacturing needs of both emerging biotech and large pharma companies. For example, the Life Science business sector created the first-ever commercially available cell line platform for faster, simpler selection and scale-up of high-producing clones for making recombinant protein drugs. Used to produce biopharmaceuticals, the CHOZN® cell line has been proven to shorten bioproduction times in early development, enabling customers to enhance their speed to market and decrease costs.

Another example is the Life Science business sector’s Mobius® single-use bioreactors, which help customers move closer to fully disposable manufacturing. Single-use technology is becoming increasingly popular in the industry. With single-use disposable equipment, customers get improved batch turnaround times, reduced risk of product cross-contamination, decreased capital costs and have less equipment to clean.

After successfully orchestrating the largest integration in the history of Merck, the Life Science business sector redesigned its organizational structure in the second quarter of 2017 to capture growth opportunities even more nimbly and to align the entire organization to optimally contribute to, and capitalize on the strength of the Merck Group. Strategic Marketing & Innovation units and commercial teams have been streamlined into three distinct business units – Research Solutions, Process Solutions and Applied Solutions – with each designed to increase agility and drive sustained entrepreneurship to better serve our customers.

The Life Science business sector generates recurring sales and stable, attractive cash flows in an industry 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 that includes an e-commerce platform and global reach.

Our e-commerce platform, www.sigmaaldrich.com, allows customers in nearly every country to easily find the exact products needed to advance their research. Currently, more than 80% of legacy Merck Millipore products are available on the platform. 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 to drive increased web traffic to the content customers are seeking. In 2017, we continued to optimize our web channel and streamline the customer experience, resulting in increased user sessions and revenue.

We continued our journey to spark curiosity in the next generation of scientists with a year-long Curiosity Cube™ tour across the United States. The tour was built on the business sector’s successful Curiosity Labs™ program, where employee volunteers brought leading-edge science, technology and experiments to tens of thousands of students around the globe – aiming to inspire a future career in Science, Technology, Engineering and Math (STEM). Through 2017, the Curiosity Cube™ – a retrofitted shipping container transformed into a mobile science lab – visited 79 schools, held 54 public events and reached 38,040 students.
The Life Science Research Solutions business unit serves customers focused on identifying and developing new medicines. We offer a broad and relevant portfolio of solutions that enables scientific discovery through collaborative partnerships 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 May, we acquired Grzybowski Scientific Inventions (GSI) to complement our industry-leading e-commerce platform and chemistry portfolio of more than 400,000 building blocks, catalysts and reagents for chemical synthesis. GSI developed a revolutionary computer-aided retro-synthesis tool, used to advance reaction rules and proprietary algorithms to identify synthesis pathways that meet user-defined constraints. Virtual synthesis significantly reduces the time between chemical target conception and route evaluation by using a lab’s preferences to filter millions of data points.

The Process Solutions business unit delivers end-to-end products and expertise to customers who take what is developed in labs and manufacture it. We offer a diverse range of products to pharmaceutical and biotechnology companies that enables customers to develop large- and small-molecule drugs safely, effectively and cost-efficiently. The 15,000-plus products and services in this business unit include single-use manufacturing, filtration, chromatography and purification, virus reduction, pharma and biopharma raw materials, drug delivery compounds and engineering and validation services.

As a leader in single-use technology, we launched an industry-first program that allows more flexibility, better supply predictability and shorter lead times for safer and more efficient drug manufacture through the Mobius® MyWAY portfolio. This is critical to customers ranging from contract manufacturing organizations to large pharma companies, whose biggest challenge is getting custom assembly with fast, reliable lead times for quicker turnarounds and more rapid biomanufacturing.

Our single-use chromatography portfolio was boosted in August with an agreement to acquire Natrix Separations, a provider of hydrogel membrane products based in Ontario, Canada. Natrix is known for its unique technology platform, which delivers high productivity and impurity removal in a single-use format. The acquisition complements our efforts to drive next-generation bioprocessing, ultimately enabling faster and more efficient technology for customers.

In September, China’s first BioReliance® End-to-End Biodevelopment Center was opened in Shanghai. The center provides a full range of process development capabilities and services, including cell line development, upstream and downstream process development and non-GMP clinical production. The center is designed to meet the specific needs of customers in the APAC region.

The Applied Solutions business unit supports customers in their efforts to ensure that drugs, food and beverages are safe for consumption. We provide 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.

The Life Science business sector reinforced its commitment to food safety with the acquisition of BioControl Systems Inc., offering customers a complete workflow solution for food pathogen testing. BioControl’s established rapid-detection technology and third-party-validated testing platforms complement our current portfolio of instruments and consumables. The acquisition strengthens our ability to help customers protect the global food supply by providing an extensive portfolio of state-of-the-art testing technology.

Following the acquisition, we opened our first customer food-safety studio, located in Bellevue, Washington, USA, for manufacturers of all types of food. The new center gives customers access to a complete food-safety workflow, from raw materials testing to finished-product safety testing, to help find, correct and prevent hazards within the food supply chain. The investment brings teams together in a workspace designed to foster open innovation and collaboration aimed at our becoming the leader in food-safety testing.

In March, we marked the 50th anniversary of our first lab water system launch and introduced worldwide the Milli-Q® IQ 7000, the seventh-generation Milli-Q® water purification innovation. There have been tremendous advancements in the lab, and today’s scientists continue to seek ways to improve reproducibility and reliability of data. The new lab water system addresses these pain points. Milli-Q® water has become synonymous with ultrapure lab water and is the most cited brand in peer-reviewed publications.
Performance Materials

Our 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. In September 2017, Kai Beckmann, a member of the Executive Board of Merck since April 2011, succeeded Walter Galinat as CEO Performance Materials. In 2017, the Performance Materials business sector’s share of Group sales amounted to 16% and its share of EBITDA pre (excluding Corporate and Other) was 21%. The EBITDA pre margin amounted to 40.1% of sales.

Global demand for innovative display solutions has continued to grow in recent years. The demand for high-quality consumer electronics, such as high-resolution televisions and smartphones, will rise further in the coming years. This will be accompanied by the building of new capacities and growth in volume demand, driven primarily by large-screen televisions. In Display Materials, our largest business unit, we observed a normalization of our market shares in the liquid crystals sector in 2017. We want to stabilize this situation by further strengthening our position as market and technology leader. Key to this are new, sophisticated liquid crystal technologies, such as SA-VA (self-aligned vertical alignment) and UB-Plus (ultra brightness). Both new technologies are being intensively tested by customers – initial quantities to manufacture the corresponding display panels have already been sold. The innovative, energy-saving liquid crystal technology UB-FFS (ultra-brightness fringe-field switching) for small and medium-sized displays recorded double-digit growth compared with 2016. In addition, we further enhanced our ability to support customers in solving process technology issues. In 2017, we made further progress in developing new applications for liquid crystals. For example, we opened the first production facility for switchable liquid crystal window modules in Veldhoven, the Netherlands. This is an important milestone for capturing a new market segment for liquid crystals. Frost & Sullivan recognized our liquid crystal window technology with the Technology Innovation Award 2017. We also made good progress in applying liquid crystal technologies to smart antennas and automotive headlight systems, where we expect to generate initial sales in 2018.

In 2017, our annual “Displaying Futures” symposium, which took place in Tokyo, focused on the topic of Digital Transformations. We host this symposium in order to stimulate an interdisciplinary dialogue on the development and potential of technologies and their future impact on society. Experts in robotics, artificial intelligence (AI) and design participated, elucidating digital transformation from the various perspectives. Back in 2016, we launched the Displaying Futures Award to promote young entrepreneurs and researchers. The aim of this year’s call for proposals was to identify flexible applications in the field of hybrid electronics. The prize, worth US$ 50,000, was awarded to three teams from Canada and the United Kingdom.

Integrated Circuit Materials is our second-largest business unit and supplies products to manufacture integrated circuits and micro-electronic systems, for antireflection coatings, and for the miniaturization of transistor structures. Deposition materials and conductive pastes for semiconductor packaging round off the portfolio. As an important partner to leading global electronics manufacturers, the business unit achieved very strong organic sales growth and gained relevant market shares in an overall positively developing semiconductor market. Particularly strong growth was generated by materials for dielectric insulating layers and metal layers deposited from the gas phase used for advanced processors and latest-generation storage chips. At industry events such as the international trade show for semiconductor technology Semicon Korea, SPIE Photonics West in San Francisco, California, USA, and Semicon Taiwan, we presented our portfolio expanded by the acquisitions of SAFc Hitech and Ormet Circuits. At the International Conference on Atomic Layer Deposition (ALD) in Denver, Colorado, USA, we presented our latest advances in coating technology. In order to support our business expansion in Asia, we opened a new research and application center at our site in Kaohsiung, Taiwan. The center houses two laboratories developing applications for coating materials and semiconductor packaging in order to provide future-oriented support to our customers.

The Pigments & Functional Materials business unit develops and markets a comprehensive product portfolio of decorative effect pigments and functional materials. Our effect pigments are primarily used in automotive and industrial coatings, plastics, printing applications, cosmetics and some foods, in order to give products a unique luster. 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 repellants. In 2017, we introduced Xirallic® NXT Cougar Red as a new product for coating applications. It belongs to the improved product generation of the well-known high-tech effect pigments and stands out due to an attractive bluish red and very intense glitter. We developed a special clear coat for new effect dimensions in automotive coatings in cooperation with Daimler, the coatings specialist PPG Industries and the Fraunhofer Institute for Manufacturing Engineering and Automation. This new development, which was presented at Sucar, the international conference on automotive body finishing in Cannes, France, can significantly intensify the effect on existing OEM base coats, making it possible to create completely new color tones. For its innovative 3D effect printing technology, Merck entered into a strategic partnership with Schmid Rhyner of Switzerland. The aim is to further develop this innovative printing process with effect pigments for various surfaces and markets. We added Tivida® FL 3000 to our portfolio of fluorosurfactants. Its competitive differentiation is based on its favorable ecotoxicological profile, and even in very low concentrations it significantly improves the flow and wetting behavior of coating systems.

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At the Laser World of Photonics 2017 exhibition, we presented a new pigment for laser marking in a new application field. Iriotec® 8826 is particularly suitable for dark and high-contrast marking of colored polymers and for the first time enables the laser marking of films. Besides materials for technical applications, we are working on innovative materials for cosmetics. In 2017, two new raw materials complemented our portfolio: RonaCare® Pristine Bright liquid, a liquid variant of an active ingredient that makes the skin appear naturally lighter, and an alcohol-free variant of the anti-aging active ingredient RonaCare® CP5.

In 2017, we opened a new application laboratory in Shanghai, China. It is the first application laboratory for pigments and functional materials in China, through which we offer our customers comprehensive tailored services for our products and at the same time work with them to develop new products. China is one of the fastest-growing markets for our pigments and cosmetics businesses. With the new application laboratory, we are continuing our 20-year commitment in this business in China and Southeast Asia, and are under-scoring our leading position in pigments and functional materials.

At the International Symposium on Automotive Lighting (ISAL) in Darmstadt, we presented our functional pigments for lighting applications. With these pigments from the Iriotec® 8000 series, circuit layouts can be integrated into injection-molded components or powder-coated components in laser direct structuring processes. Laser structuring of the components offers tremendous design freedom, especially since these pigments also enable light-colored design in addition to dark modules.

In 2017, the Advanced Technologies business unit invested further, 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 worked intensively to improve materials for televisions, for instance. Brighter displays and a larger color spectrum were two areas of focus. At our debut at the International Motor Show (IAA) in Frankfurt, Germany, we exhibited rear lights with OLED materials, for instance. As OLEDs are extremely thin and lightweight, the parts require only little space. This allows rear lights in new forms, giving vehicle designers even greater possibilities in the future. OLED materials also permit free-form displays in vehicle interiors, which expands the design possibilities even further. The technology permits particularly vivid contrasts, brilliant colors, sharp images, and pleasant readability. We are continuing to drive OLED technology forward. The capacities at the application laboratory in Korea were doubled in 2017. High-quality phosphors are used for the backlighting of liquid crystal displays. We launched our new full-spectrum phosphors for application in violet chip-based LEDs. They are very luminous and achieve a high color rendering index and a spectrum that comes very close to natural sunlight. Apart from the use of OLED materials in displays, we are continuing to target the lighting market.

In the field of organic photovoltaics, more and more pilot projects demonstrate the manifold applications of the technology in architecture. In initial construction projects in Europe and Brazil, printed solar foils turn glass façades and canopies into active power generators. In 2017, we received the Innovation Award Architecture + Building at the BAU 2017 for our organic photovoltaic modules developed in cooperation with Belectric OPV.

Strategic realignment
In 2018, we want to focus even more strongly on the needs of our customers and markets. Therefore, in December 2017, we announced that we will combine our expertise in three newly created business units aligned with our target markets: Display Solutions, Semiconductor Solutions and Surface Solutions.
General principles and Group strategy

GENERAL PRINCIPLES
Merck is a vibrant science and technology company. Across Healthcare, Life Science and Performance Materials, we bring expert and high-quality products to the world. 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 value-based and economically sustainable corporate governance, and steers the strategic development of the Group.

Our annual strategic development process follows firmly defined principles. Our business portfolio is expected to be adequately balanced at all times so as to reflect an optimum mix between entrepreneurial opportunities and risks and ensure the long-term success of the company. 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 further expanding our presence in global growth markets. This exemplifies the long-term direction of our Group strategy. The company structure of Merck KGaA also contributes to this. The Merck family holds approximately 70% of the capital of Merck KGaA via E. Merck KG, the personally liable partner. In addition, the structure requires the Executive Board, whose members are also personally liable partners, to pay special attention to the long-term value creation.

For us, the principle of long-term thinking and actions applies not only to economic aspects, but also encompasses corporate responsibility. We pursue three strategic spheres of activity: health, environment as well as culture and education. 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 meet global challenges, from urbanization to aging populations.

GROUP STRATEGY
Over the past decade, Merck 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. In line with this strategy, we completed the divestment of our Biosimilars business in 2017. In addition, we are preparing strategic options for our Consumer Health business, including a potential full or partial sale of the business as well as strategic partnerships.

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, we continue 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 is greater than 2, unless divestments could be used to finance them. By the end of 2018, we aim to reduce our debt level to below 2 again. At Group level, we reduced our net debt by around €1.4 billion in 2017. At the same time, strict financial discipline supports the rating of the Merck Group. Our dividend policy reflects a sustainable earnings trend.

Our Group strategy aims to resolutely continue the transformation of Merck into a science and technology company and to position the company as a leading player in a changing market environment. We focus on three areas of key priority, namely “Performance”, “People” and “Technology”.
Priority area “Performance”
The priority area “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.

In Healthcare, the strategic direction is to become a global specialty innovator and we aim to maximize growth of existing franchises and to deliver pipeline with an average of one product launch or indication per year from 2017. We intend to keep our base business organically stable until 2022. In 2017, the potential of the pipeline materialized with six approvals for Bavencio®, two in the United States, and one in the EU, in Switzerland, in Japan, and in Canada, as well as for Mavenclad® in the EU, Canada and Australia.

In Life Science we deliver above-market organic growth by having a broad portfolio that addresses the needs of the scientific community, particularly in high-growth areas, for instance bioprocessing. We achieve solid organic sales growth consistently, even during the integration. Our profitability is industry-leading, driven by our e-commerce platform and synergies from the rapid integration of Sigma-Aldrich into our Life Science business sector. By the end of 2018, we expect to realize € 280 million in planned synergies.

In Performance Materials, we expect that our Semiconductor and Surface Solutions business units, which are developing well, will continue to mitigate the consequences of the fiercer competitive environment in our Liquid Crystals business in 2018. Going forward, we want to further enhance our degree of diversification. In addition, new technologies are in the testing phase. Our goal is to achieve innovation and technology leadership in all businesses and to push forward with innovative solutions in applications beyond displays.

From a regional perspective, in view of the importance of the Chinese market and China’s ambitious plan to become a global leader in innovation and technology, we are placing further importance on bolstering our positioning in this country. China will remain one of the most strategically important markets for us globally. By focusing on growth contributions from China and driving innovation and digitalization across our business sectors, we are fostering the development and evolution of the Chinese innovation landscape. Our Healthcare business sector continues to aim for very strong growth and is improving the lives of millions of patients in China, in particular with medicines from our General Medicines franchise, for example to treat cardiovascular diseases, as well as our Fertility franchise. Our Life Science and Performance Materials business sectors help Chinese companies and research institutes to become more competitive and efficient. We work with Chinese pharmaceutical companies on manufacturing and research processes and we make materials for Chinese electronic and display manufacturers.

Priority area “People”
The priority area “People” addresses how we as a science and technology company can create a working environment that meets our employees’ individual needs and allows curiosity to unfold. Our growth strategy calls for people with diverse experience and backgrounds who work together on the basis of shared values to create innovation and respond flexibly to changing demands.

The basis for this is the ability to identify talented employees within the company early on and to systematically promote them – also across business sectors and countries. Moreover, it is crucial to be perceived as an attractive employer in the market in order to continue to capture the interest of potential employees. The fact that we rank among the world’s best employers was also confirmed by the distinction as “Global Top Employer 2017” by the Dutch Top Employers Institute. In addition, we were ranked fourth among biotechnology and pharmaceutical companies worldwide by Science magazine, a leading peer-reviewed international scientific publication.

In the course of our transformation, our leaders play a key role. They are responsible for driving our strategy forward by building the right competencies, thereby enabling innovation. We therefore place great importance on the continuous advanced training and further development of our leaders. This is essential for them to address the diverse needs of their team members and the changing requirements of the businesses and of digitalization.

Based on employee feedback and external benchmarking, we are also continuously further developing our existing programs and processes. Our award-winning people analytics approach, which for example empowers our leaders to make data-driven decisions on matters relating to their functions and people, has been rolled out to all people managers globally. Other pilot initiatives focus on, among other things, strengthening the engagement and innovation potential of our research and development units, and on flexible ways of collaborating across national and departmental boundaries.

Priority area “Technology”
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 patients, customers and business associates. To us, digitalization means the digital integration of our entire value chain, the digitalization of our products, services and communication interfaces to customers as well as the development of new digital business models. This is supported by state-of-the-art methods to collect and analyze vast amounts of data. For example, we generate additional sales from our e-commerce platform www.sigmaaldrich.com using algorithmic optimization of ads and product recommendations. Other examples include a supply chain project with our partner Palantir Technologies, where we are using
advanced analytics to better forecast drug demand and to optimize our inventories. Within the scope of this partnership, we want to leverage Palantir’s advanced data analytics capabilities to more rapidly develop and deliver medicines and commercialize new products. This could also play a part in the development of entirely new therapeutic options for patients in the future. Initially, we will use Palantir’s technology in cancer treatment and patient services. Later on it can be used in other areas of the company. Our computer-aided retrosynthesis tool Chematica is also using advanced algorithms to help customers in medicinal chemistry and drug discovery to identify synthesis pathways.

Furthermore, we are working Group-wide to expand the physical and virtual infrastructure for technology-driven growth. The centerpiece is formed by our Innovation Center in Darmstadt. A modular Innovation Center was opened in April 2015 in Darmstadt as a prototype of the new Innovation Center that will be opened in spring 2018. The Innovation Center aims to develop entirely new businesses beyond the current scope, bringing together people, technologies, and skills from different areas under one roof.

We seek to establish projects in various strategic innovation fields of interest that we consider promising. The first such innovation field, “Biosensing and Interfaces”, focuses on the vast opportunities created by combining new sensor technology with smart algorithms and Big Data technology. This is expected to lead to new predictive and prescriptive approaches to treat and support patients in the therapeutic areas that we address. We want to offer innovation projects ideal conditions in the Innovation Center to grow into viable new businesses in an environment that provides both entrepreneurial freedom and dedicated support.

Additionally, the Innovation Center establishes strong connections to the start-up community, scientific centers of excellence, and external partners across industries, for example via our Accelerator program, that supports early-stage start-ups for a period of three months. The start-ups receive financial support, training and coaching as well as access to our experts from the businesses. Since the program began in September 2015, we have received more than 2,000 applications from over 70 countries and have mentored 30 start-ups.

Within the scope of our innovation strategy, we have established Merck Ventures as the strategic, corporate venture capital fund of Merck with a total volume of € 300 million to manage funds focused on Healthcare, Life Science, Performance Materials and New Businesses. Merck Ventures invests globally in transformational ideas driven by strong entrepreneurs. We take an active role in our portfolio companies and team up with entrepreneurs and co-investors to translate innovation into commercial success. We have a significant focus on early-stage investing and company creation, including the formation of spin-offs to leverage our science and technology base. Merck Ventures currently has an active portfolio of 30 companies.

Building on our 350-year history, the Darmstadt site is making a vital contribution to the company’s future in research-based specialty businesses. It serves as a key site for R&D and high-quality production for all our business sectors in their global markets, as the heart of Merck, as our global headquarters as well as the base for the family boards, executive management and our Group functions.

Business strategies

HEALTHCARE
Our Healthcare business sector comprises the three businesses Bio- pharma, Consumer Health 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.

Global megatrends such as a growing world population and an increase in average life expectancy are driving the demand for our healthcare products. To meet these demands and respond appropriately to the dynamics of our healthcare markets, we have significantly transformed our Healthcare business sector in recent years. Following on our successes of the past year, we continue to drive pipeline projects with the aim of bringing groundbreaking medicines to patients, maximizing our existing portfolio and continuing our expansion in growth markets.
The ambition of the Healthcare business sector is to become a global specialty innovator, to operate in therapeutic areas with significant unmet medical need and to bring high value to patients and consumers. Therefore, we invest heavily in research and development to discover new treatment options and improve existing ones. Together with our stakeholders and partners, we want to ensure that people can access the medicines they need to stay healthy and live longer.

The first pillar of our strategy is to reinforce our global footprint 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 products, sales in growth markets such as China will be driven by both our biologics and broad general medicine and cardiometabolic care 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 becoming a truly global leader.

The second pillar of our strategy is the focus on specialty medicine therapeutic areas. Here, we are concentrating our efforts on oncology, immuno-oncology, as well as neurology and immunology. 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 and immunological disorders. 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 neurology and immunology include evobrutinib as a potential treatment for multiple sclerosis, systemic lupus erythematosus as well as rheumatoid arthritis; atacicept as a potential treatment option for lupus patients with high disease activity; and sprifermin as a potential therapy for patients with osteoarthritis of the knee.

Our aspiration is to develop high-quality, first-to-market and best-in-disease assets, and to build a portfolio in each of our therapeutic areas. We have streamlined our pipeline and expanded 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 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 in strengthening our current portfolio. Here, we focus on balancing the right blend of internal capabilities and external partnerships, building strong collaborations with other leaders in industry, including Pfizer, Genea Biomedx and Vertex Pharmaceuticals.

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 patients will be vital to achieving our objective of becoming a global specialty innovator.

Our divestment of the Biosimilars business to Fresenius closed on August 31. On September 5, we announced that we are preparing strategic options for our Consumer Health business, including a potential full or partial sale of the business as well as strategic partnerships. The Biosimilars divestment as well as the decision to examine strategic options for Consumer Health were both aligned with our strategy to focus on our pipeline of innovative medicines.

**LIFE SCIENCE STRATEGY**

As a leader in the large and growing life science industry, our purpose is to solve the toughest problems in life science by collaborating with the global scientific community.

We have a portfolio of more than 300,000 products, in order to support a broad customer base – including academia, pharma and biotech labs, pharma manufacturing, biotech manufacturing, clinical diagnostics, environmental testing, food and beverage and industrial.

We have an industry leading e-commerce platform, www.sigmaaldrich.com, which offers life science solutions, services and expertise across the entire biopharma value chain.

To create sustainable value for the future, Life Science has set a strategy to:

- Deliver the integration to combine the strengths of Merck Millipore and Sigma-Aldrich
- Strengthen the core business by investing in high growth areas, addressing our customer needs and enhancing capabilities
- Place bold bets in areas with transformative potential in order to establish new pillars of growth

The Sigma-Aldrich integration has been ahead of plan and we continue to be on track as we begin year three of the integration. The synergy estimate was raised from € 260 million to € 280 million. We will leverage best practices from both organizations, combine our sales force for one face to the customer, and continue to harmonize processes for employees and customers.

We have tailored our strategy and will continue to manage our business based on scale and growth to optimize the overall performance and portfolio of the Life Science business sector. We have further streamlined our organizational structure to capture growth opportunities even more strongly. Strategic Marketing & Innovation units and commercial teams are now reorganized into three distinct, vertically integrated business units: Research Solutions, Process Solutions and Applied Solutions, with each designed to increase agility and drive sustained entrepreneurship to better serve our customers. We also announced a number of acquisitions in 2017. These include BioControl Systems to strengthen our leadership in biomonitoring, specifically in the food and beverage sector, as well as Grzybowski Scientific Inventions to boost capability in chemical synthesis, and Natrix Separations to advance in next-generation bioprocessing.

Based on a broad assessment of the market, competitive landscape and key industry trends, in 2016 we identified several strategic initiatives in important growth areas. For example, in genome editing and novel modalities, we have built intellectual property in key areas,
with patents granted in the European Union, Australia, Canada, and Singapore. The patents provide protection of our CRISPR technology, while giving scientists the ability to advance treatment options for the toughest medical challenges. In our BioReliance® End-to-End initiative we work with emerging biotech companies in process development, drug production and facility design services that help biopharmaceutical companies accelerate the progression of molecules into the clinic and towards commercialization.

**PERFORMANCE MATERIALS**

In the 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, continue to lead the market in pearlescent pigments, and share in the growth of the cosmetics industry.

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 in the coming years, too. 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 for further asserting our market and technology leadership, especially in the highly competitive Chinese market. In 2017, we sold the first quantity of our eco-friendly, resource-conserving and efficient liquid crystal technology SA-VA (self-aligned vertical alignment) for manufacture of large-area LC displays. In 2017, we opened the first production facility for switchable liquid crystal window modules in Veldhoven, the Netherlands. This is an important milestone for capturing an entirely new and attractive market segment for liquid crystals.

The OLED (organic light-emitting diodes) business contributes significantly to the growth of Performance Materials. It is our declared goal to strengthen our position as a leading global supplier of OLED materials. Continuous investments in research and development at the Darmstadt site as well as application laboratories at the Asian sites make an essential contribution to this. The opening of a new application laboratory in Shanghai is planned for 2018.

The great potential of OLED technology is confirmed by the development of the display market. OLED-based smartphone displays are the standard among all premium suppliers. OLED technology is also showing dynamic growth in the TV segment, bolstered by high investments by the leading OLED TV display manufacturer. The advantages offered by self-luminous OLED displays, such as intense colors, an especially deep black, thin structure, flexible use and low energy consumption are of importance here.

The Integrated Circuit Materials business unit supports the entire semiconductor industry with a portfolio of customized solutions. Increasingly higher storage capacity, faster process performance and lower power consumption are being demanded by the semiconductor industry. In addition, market trends such as mobility, Big Data and the Internet of Things are leading to higher demand for semiconductor materials and higher specialization at the same time. By means of novel materials and innovative technologies, we enable our customers to meet these requirements, produce more powerful chips, and counteract rising costs.

In the Pigments & Functional Materials business unit, we are further expanding our leading position in pearlescent pigments for automotive coatings. We are continuing to defend our good market position in plastics, printing and cosmetics applications. Here we are focusing on high-quality products and innovations. 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. In the latter, we see great growth potential for laser-marking additives and for novel coating materials. With these and further innovative product groups we will drive our growth in segments beyond our established markets.

Our Advanced Technologies business unit aims to develop profitable future businesses – both for Performance Materials and for our other business sectors. Besides a broad portfolio for the innovative LED industry, these also include organic photovoltaics and materials for flexible display technologies. In accordance with the Performance Materials strategy, our projects for future business fields are aligned to megatrends such as miniaturization and the Internet of Things.

**Strategic initiatives**

The LC 2021 strategic initiative is to significantly contribute to our future growth and continue to generate attractive margins. 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. First and foremost, this comprises liquid crystal windows. In Veldhoven, the Netherlands, we opened the first production facility for modules used in LC windows with sun protection and privacy control.

**Strategic realignment**

In 2018, we want to focus even more strongly on the needs of our customers and markets. Therefore, in December 2017, we announced that we will combine our expertise in three newly created business units, which are aligned to our target markets: Display Solutions, Semiconductor Solutions and Surface Solutions.
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 have a commercial paper program with a volume of € 2 billion at our disposal. Within the scope of this program, we can issue short-term commercial paper with a maturity of up to one year.

Furthermore, we are using bilateral bank loan agreements with first-class banks in order to optimize the funding structure and cost. Additionally, the bond market generally represents a key element. However, owing to our focus on deleveraging, no bonds were issued in 2017. The most recent bond issues took place in 2014 and 2015 in connection with the acquisition of Sigma-Aldrich. A hybrid bond, a U.S. dollar bond and a euro bond were issued. The use of various instruments provides a broad financing basis and addresses different investor groups.

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

We mainly work with a well-diversified, financially stable and reliable group of banks. Due to Merck’s 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 Merck’s financial policy, as it safeguards access to capital markets at attractive financial conditions. Merck currently has a Baa1 rating from Moody’s, an A rating from Standard & Poor’s (S&P) and an A– rating from Scope, each with a stable outlook. Continuing to reduce our debt, as in 2017, is of utmost importance to us.

**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.
Internal Management System

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

The Value Creation and Financial KPI Pyramid, which summarizes the important financial performance measures of the Merck 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 Merck Group, Business and Projects, each of which require the use of different indicators.

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**Abbreviations**

EBITDA pre = Earnings before interest, income tax, depreciation and amortization as well as adjustments
EPS = Earnings per share
MEVA = Merck value added
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 & Acquisitions

\(^1\)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, and business free cash flow are the most important factors for assessing operational performance. Therefore, we refer to these KPIs in the Report on Economic Position, the Report on Risks and Opportunities, and in the Report on Expected Developments. As the most important indicators of financial business performance, the KPIs are key elements of our performance management system.

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

MERCK GROUP

Net sales

<table>
<thead>
<tr>
<th>€ million</th>
<th>2017</th>
<th>2016</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales</td>
<td>15,327</td>
<td>15,024</td>
<td>303</td>
</tr>
</tbody>
</table>

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

MERCK GROUP

Reconciliation EBIT to EBITDA pre

<table>
<thead>
<tr>
<th>€ million</th>
<th>2017</th>
<th>2016</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating result (EBIT)</td>
<td>2,525</td>
<td>2,481</td>
<td>44</td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td>1,758</td>
<td>1,805</td>
<td>-47</td>
</tr>
<tr>
<td>Impairment losses/reversals of impairment losses</td>
<td>-1</td>
<td>129</td>
<td>-130</td>
</tr>
<tr>
<td>EBITDA</td>
<td>4,282</td>
<td>4,415</td>
<td>-76</td>
</tr>
<tr>
<td>Restructuring costs</td>
<td>84</td>
<td>22</td>
<td>62</td>
</tr>
<tr>
<td>Integration costs/IT costs</td>
<td>189</td>
<td>193</td>
<td>-4</td>
</tr>
<tr>
<td>Gains (-)/losses (+) on the divestment of businesses</td>
<td>-310</td>
<td>-304</td>
<td>-6</td>
</tr>
<tr>
<td>Acquisition-related adjustments</td>
<td>63</td>
<td>153</td>
<td>-90</td>
</tr>
<tr>
<td>Other adjustments</td>
<td>106</td>
<td>11</td>
<td>96</td>
</tr>
<tr>
<td>EBITDA pre</td>
<td>4,414</td>
<td>4,490</td>
<td>-76</td>
</tr>
</tbody>
</table>

1 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 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.

**MERCK GROUP**

Business free cash flow

<table>
<thead>
<tr>
<th></th>
<th>€ million</th>
<th>2017</th>
<th>2016</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA pre</td>
<td></td>
<td>4,414</td>
<td>4,490</td>
<td>–76</td>
</tr>
<tr>
<td></td>
<td>in %</td>
<td>–1.7%</td>
<td>–1.7%</td>
<td></td>
</tr>
<tr>
<td>Investments in property, plant and equipment, software as well as advance payments for intangible assets</td>
<td>–1,047</td>
<td>–859</td>
<td>–188</td>
<td>21.9%</td>
</tr>
<tr>
<td>Changes in inventories according to the consolidated balance sheet</td>
<td>–23</td>
<td>1</td>
<td>–24</td>
<td>&gt;100.0%</td>
</tr>
<tr>
<td>Changes in trade accounts receivable as well as receivables from royalties and licenses according to the consolidated balance sheet</td>
<td>–24</td>
<td>–177</td>
<td>153</td>
<td>–86.3%</td>
</tr>
<tr>
<td>Elimination first-time consolidation of Sigma-Aldrich</td>
<td>–</td>
<td>–149</td>
<td>149</td>
<td>–100.0%</td>
</tr>
<tr>
<td>Elimination first-time consolidation of BioControl Systems</td>
<td>–2</td>
<td>12</td>
<td>–14</td>
<td>&gt;100.0%</td>
</tr>
<tr>
<td>Business free cash flow</td>
<td></td>
<td>3,318</td>
<td>3,318</td>
<td>–</td>
</tr>
</tbody>
</table>

1 Not defined by International Financial Reporting Standards (IFRS).
2 Previous year’s figures have been adjusted, see Note (4) “Acquisitions and divestments”

**Investments and value management**

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

**NET PRESENT VALUE**

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

**INTERNAL RATE OF RETURN (IRR)**

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

**RETURN ON CAPITAL EMPLOYED (ROCE)**

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

**PAYBACK PERIOD**

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

**MERCK VALUE ADDED (MEVA)**

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

**NET INCOME, EARNINGS PER SHARE (EPS) AND EARNINGS PER SHARE PRE (EPS PRE)**

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

### RECONCILIATION OF NET INCOME TO NET INCOME PRE

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
<th>€ million</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>2,600</td>
<td>1,629</td>
<td>972</td>
<td>59.7%</td>
</tr>
<tr>
<td>Income taxes</td>
<td></td>
<td></td>
<td>-386 -521</td>
<td>-907</td>
</tr>
<tr>
<td>Income taxes on the basis of the underlying tax rate</td>
<td>-849 -855</td>
<td>6</td>
<td>-0.7%</td>
<td></td>
</tr>
<tr>
<td>Amortization of acquired intangible assets</td>
<td>1,201</td>
<td>1,218</td>
<td>-16</td>
<td>-1.3%</td>
</tr>
<tr>
<td>Adjustments1</td>
<td>114</td>
<td>191</td>
<td>-77</td>
<td>-40.4%</td>
</tr>
<tr>
<td>Net income pre1</td>
<td>2,680</td>
<td>2,703</td>
<td>-24</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Earnings per share pre (€)1</td>
<td>6.16</td>
<td>6.21</td>
<td>-0.05</td>
<td>-0.8%</td>
</tr>
</tbody>
</table>

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

**CREDIT RATING**

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

**DIVIDEND RATIO**

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

**Other relevant/non-financial performance measures**

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

**INNOVATION**

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

**TALENT RETENTION**

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

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

Strategy and management

Our corporate responsibility (CR) activities are steered by our CR Committee, which consists of representatives from our business sectors and relevant Group functions. Since September 2017, Stefan Oschmann, Chairman of the Executive Board and CEO, has been responsible for the committee, which is chaired by the head of the newly formed Corporate Affairs unit.

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: namely health, the environment, and culture & education. The focus here is 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. The development of new display technologies both with liquid crystals and organic light-emitting diodes (OLEDs) are an example. They lower the power consumption of televisions, smartphones, and tablet PCs.

**Education and culture:** Research and development throughout the world thus benefit from curiosity, creativity, and enthusiasm. Cultural offerings inspire people and expand their horizons. Cultural inspiration also opens people up to new ideas. It favorably influences society’s acceptance of science, technological progress and innovations. That is why we promote global educational offers and cultural initiatives.

Our commitment to corporate responsibility is aligned with the UN Sustainable Development Goals and we are attempting to contribute to this ambitious agenda by 2030. Furthermore, 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, safety, and security performance in the chemical industry. Furthermore, we are also a member of the Chemie³ 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 the Merck values.

Thanks to good performance with respect to responsible and sustainable entrepreneurial conduct, we were again included in the FTSE4Good index in 2017. To be included in this leading international sustainability index, a company must demonstrate socially conscientious, ecological and ethical conduct. In 2017, we also maintained our good standing in other major sustainability indices. For instance, we are 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 2017, EcoVadis, an independent rating agency, granted us gold status for our sustainability performance. EcoVadis assesses suppliers from 120 countries across the four categories of Environment, Labor Practices, Fair Business Practices, and Sustainable Procurement.

Strategic sphere of activity: Health

Ensuring access to health for underserved populations and communities in low- and middle-income countries 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. 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, focusing on four areas known as the “4As”: Availability, Affordability, Awareness, and Accessibility. In the Access to Medicine Index, which is published every two years, Merck ranked fourth in 2016, moving up two places.

Availability

Availability entails the research, development and refinement of health solutions that address unmet needs and are tailored to local environments.

With our newly formed Merck Global Health Institute, we seek to improve healthcare in developing countries. Our focus is on schistosomiasis, malaria, bacterial infections, and antimicrobial resistance. The Institute’s initiatives and programs particularly address key unmet medical needs of women and children. Our objective is not only to develop medicines, but also to improve diagnosis, disease control, and reduce disease transmission, as well as strengthen local health systems. The portfolio also covers the development of a new pediatric formulation of praziquantel to treat the worm disease schistosomiasis in children under the age of six through a public-private partnership. In addition, we are conducting research into innovative schistosomiasis diagnostics in partnership with key international stakeholders to identify vulnerable populations. And we are looking for new schistosomiasis biomarkers as well as new anti-schistosomiasis compounds.

We are developing a new anti-malarial compound that has the strong potential to not only treat, but also prevent malaria reinfection. Through a strategic collaboration with the University of Cape Town in South Africa and the Medicines for Malaria Venture, we are seeking to identify new compounds that are already efficacious in the liver stage and those that can provide long-lasting efficacy to improve post-treatment protection. We are currently developing a kit for malaria diagnosis based on our Muse® cell analyzer. This kit will accurately detect and type the malaria pathogen and identify the stage of infection. In 2017, we achieved promising results in preclinical trials.

Our product IR3535® is used in insect repellents to help protect against infections transmitted by mosquito and tick bites. Products containing this active ingredient stand out due to their particularly good tolerability in young children and pregnant women. They protect against Zika, Chikungunya and Dengue fever. Work is underway on a formulation to fight malaria. In several countries, products formulated with IR3535® were recently approved for head lice prophylaxis in school children.

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 in publicly available databases. To strengthen our commitment to the London Declaration to fight neglected tropical diseases, in 2017 we joined the DNDi NTD Drug Discovery Booster consortium and opened our compound library. The objective is to find potential cures for leishmaniasis and Chagas disease. Moreover, we are one of more than 100 members 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.

Apart from the collaboration already underway with the University of Buea in Cameroon, in 2017 we started cooperating under the auspices of this program with the University of California in San Diego. The focus is on potential treatments for leishmaniasis, Chagas disease, and African trypanosomiasis (sleeping sickness).

Furthermore, we continue to work with the World Health Organization (WHO) to combat the worm disease schistosomiasis in Africa. Through the Merck Praziquantel Donation program, we are donating Cesol® 600 tablets containing the active ingredient praziquantel to WHO. Since the start of this program, around 150 million patients – primarily school-aged children – have been treated. In total, we have donated nearly 700 million praziquantel tablets to WHO since 2007. As a founding member of the Global Schistosomiasis Alliance, we are helping to eliminate schistosomiasis worldwide.

Through our Merck Global Health Institute, we are also an active member of the Pediatric Praziquantel Consortium, a partnership we initiated. Within this consortium, we are working hand in hand with partners on developing a pediatric formulation of praziquantel to also treat children under six with this medicine.
Awareness
We help to raise awareness by empowering health professionals, communities and patients with the appropriate tools, knowledge and skills to make informed decisions with respect to prevention, diagnostics, treatment, and care. We regularly conduct campaigns to increase awareness of certain diseases globally. Here we are focusing on diseases that we have extensive expertise in, for instance cancer, thyroid disorders, diabetes and multiple sclerosis. In 2017, we established the Merck Foundation, a charitable organization that combines some of our activities in underserved regions of the world. Through our Access Dialogues series, we are promoting discourse on access-to-health challenges with numerous public and private stakeholders. In 2017, the topics of focus were intellectual property and supply chain challenges in developing countries.

Through our Su-Swastha project we are working with various non-governmental organizations and the Indian Health and Family Ministry to improve healthcare in rural India. Among other things, we provide inexpensive medicines while also educating the local population and health professionals on everyday health issues and their treatment. In 2017, more than 11,000 people were reached in 482 community meetings.

The Global Pharma Health Fund (GPHF), a non-profit organization funded by Merck, works to combat counterfeit medicines in developing and emerging countries. To date, the GPHF has supplied 836 Minilabs at cost to detect counterfeit medicines to around 100 countries; 41 Minilabs were provided in 2017 alone. According to a report published by WHO at the end of 2017, the Minilab made it possible to identify more than 1,000 counterfeit medicines out of 20,000 tested medicines.

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 are a founding member of the Accessibility Platform, an informal, private-sector initiative that is working on a comprehensive approach to meeting supply chain and distribution challenges in developing countries. The platform promotes information exchanges between the various stakeholders and creates joint options for action.

Together with two other Accessibility Platform members Roche and Novartis, in 2017 we co-hosted a panel session at the World Health Summit. Attendees included the Ghanaian Ministry of Health, the World Health Organization, and the Global Fund to Fight AIDS, Tuberculosis and Malaria. 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 2017, we funded the maintenance of the boat donated in the previous year. Additionally, in the northeastern Indian state of Jharkhand, we are funding a health center that gives the region’s approximately 20,000 inhabitants access to medical personnel. In 2017, the Merck Global Health Institute sponsored a new gynecology ward in the district hospital of Akonolinga in the African country Cameroon.

Strategic sphere of activity: Environment
Through our products, we are helping overcome global challenges such as climate impact and resource scarcity. In doing so, we are also helping our customers to reduce the negative impacts of their own activities and to achieve their own sustainability goals.

Performance Materials: Increasing the sustainability of manufacturing processes and final products
In 2017, our Performance Materials developed the new liquid crystal technology SA-VA (Self-Aligned Vertical Alignment) to market readiness. We have been developing the materials and process in the scope of close technical partnerships with our customers. SA-VA is an eco-friendly and resource-conserving technology that requires less energy and creates less waste products than conventional technologies during display manufacture. SA-VA also provides a more efficient display manufacturing process and could allow improved design features for display manufacturers. SA-VA can be used in all types of display applications, above all in large-size TVs.

To utilize our market and technological leadership in liquid crystals beyond applications in energy-saving displays, we opened a new production facility for liquid crystal window modules in Veldhoven in the Netherlands. According to initial measurement results, our smart windows can cut energy use in climate-controlled buildings by up to 40% and replace conventional sun shading solutions. In this way, we help builders to save resources and costs. The principle behind this is as follows: 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. In combination with customized dyes, the liquid crystals control the amount of incident light by either absorbing and blocking electromagnetic waves (dark state) or allowing them to pass through (transparent state). In contrast to competing technologies, our long-lasting licrivation™ materials switch within seconds and are highly color-neutral. Architects and builders can customize the desired color to suit the setting. For the semiconductor industry, we have developed a series of environmentally sustainable specialty chemicals and materials – including PFOS-free antireflective and photoresists. In the cosmetics industry, we are addressing the continuing trend for ingredients that meet stringent sustainability criteria. Our portfolio of fillers dispenses entirely with microplastic particles criticized for polluting waters and marine life enrichment. We are also committed to continuously increasing the energy efficiency of our production processes. Many of our cosmetic raw materials are registered and approved in accordance with the COSMOS standard. COSMOS is an international association that developed and manages the COSMOS standard AISBL, an international standard for organic and natural cosmetics.
Life Science: Reducing environmental impacts in various product life cycle stages

We want to lower the environmental and health impact of our products. This applies to the entire life cycle – from production and use through to the disposal of our products. With our Design for Sustainability (DfS) program implemented in 2014, we have developed a comprehensive approach for more sustainable life science products. It keeps sustainability criteria in the forefront during product development or re-engineering and documents them in a scorecard. Since the acquisition of Sigma-Aldrich, we have expanded the DfS program so that it is now an umbrella concept that encompasses all our portfolio offerings. The objective is to lower environmental impacts of devices and instruments, also during use by customers. Beginning with the concept stage, product teams identify potential environmental impacts and opportunities to make improvements. In 2017, we achieved improvements in 35% of our new Life Science product developments.

One of our notable product releases in 2017 was the new Milli-Q® IQ 7000 Ultrapure Lab Water System, which uses mercury-free UV oxidation lamps.

In addition, our researchers are developing innovative solutions in line with the “12 Principles of Green Chemistry” developed by chemists Paul T. Anastas and John C. Warner. The objective is to permit research that is as environmentally compatible as possible, and to minimize adverse effects on human health. With DOZN®, we have developed a web-based quantitative Green Chemistry analysis tool. We are working to make the DOZN® tool available for our customers so that they will also be able to measure their environmental footprint impact for life science research.

We are expanding our portfolio to include greener alternatives, such as the new solvent, Cyrene™. This product was named the “Bio-based Chemical Innovation of 2017” – an accolade that can be attributed to proving that safer, greener alternatives can also offer superior performance. Cyrene™ is derived from waste cellulose and is employed as an alternative to solvents that are widely used but are under increasing regulatory restriction due to their associated toxicity. We not only think about the current life of our products but also look ahead to end-of-life considerations and potential future product lives as well. The application of single-use products – many of which pose a challenge to recycle in the current infrastructure – is growing as life science markets are expanding and adopting new technologies. We have therefore developed innovative recycling programs which have led to the recycling of more than 1,300 tons of our customers’ products from 2015 to 2017.

Strategic sphere of activity: Education and culture

Cultural promotion is a core element of our commitment to society, building on our centuries-old tradition of supporting art and culture. We thus further characteristics that are essential to our business activities as a high-tech company: creativity, a passion for discovery, curiosity, as well as the courage to transcend boundaries.

Boosting scientific education

We view education as a key component of culture – and vice versa. Education can help us understand culture. But culture can also build a bridge to education; it can stimulate curiosity and creativity. We support educational projects at many of our sites and grant scholarships, for instance, or help define the curricula of selected classes in schools. We want to spark an interest in science, particularly among young people. This is why we have been supporting the “Jugend forscht” (Young Researchers) competition for more than 30 years. Since 1996, we have been organizing the state-level competition for the German Federal State of Hesse and have also hosted the nationals twice.

Through our Junior Labs, we want young people to enjoy conducting experiments. These learning labs at the Technical University of Darmstadt combine classroom instruction with trending topics and modern research methods. In 2017, around 2,500 school students used the chemistry laboratory with an extended program and around 1,000 school students experimented in the biology laboratory.

In 2017, we launched our first continuing education program for teachers outside Germany by conducting a project in India. Indian teachers were trained in organic electronics, with a special focus on energy-saving, sustainable technologies. As part of SPARK, our global volunteer program, employees from our Life Science business sector share their skills and experience with students and support our local communities. The program is intended to spark curiosity in science and inspire them to consider a STEM-related career. In 2017, more than 2,500 employees invested more than 13,700 hours in the SPARK program. As part of SPARK, in 2017 we sent a Curiosity Cube™ on a journey through the United States. This is a freight container that transforms into a mobile laboratory and is equipped with state-of-the-art technology. In 2017, the Cube traveled more than 29,000 km across the United States and made stops in over 85 schools and city centers. More than 38,000 students have visited the Cube. Each of the nearly 23,000 experiments conducted were supervised by one of our employees.
**The Deutsche Philharmonie Merck**

The Deutsche Philharmonie Merck is our musical ambassador. We consider classical music to be the universal language that brings people together; as such, it is an important part of our culture. The concerts of this professional ensemble represent an integral part of the cultural life in the vicinity of our Group headquarters in Darmstadt and remain highly popular, with around 21,000 people attending them in 2017. In addition, the orchestra again toured internationally. Concerts took place in Austria, the Czech Republic and Morocco in 2017. One particular aim is to make classical music more accessible to young people, for instance through special partnerships for children and adolescents as well as cooperation programs with schools, such as the orchestra workshop.

**Promoting literature**

Like music, literature is an important mediator between cultures. That is why we support five literary prizes around the world, some of which every two years: the Johann Heinrich Merck Award for Literary Critique and Essay in Germany, the Premio Letterario Merck in Italy, the Merck-Kakkehaki Literature Award in Japan, the Merck-Tagore Award in India, and the Merck Translation Award in Russia. The awards primarily recognize those authors who build bridges between cultures, as well as between literature and science.

The Johann Heinrich Merck Award for Literary Critique and Essay, which we have been presenting since 1964 and is worth €20,000, went to Jens Bisky, a culture editor at the Süddeutsche Zeitung. With the Premio Letterario Merck, we recognize authors in Italy who build bridges between literature and science with their works. The 2017 prize, worth €10,000, was awarded to U.S. writer Sam Kean for his work “The Violinist’s Thumb”. The jury decided on an honorable mention for Italian mathematician, author and professor Paolo Zellini.

**Responsibility for our products**

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

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

**Safety of our chemical products**

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

For the final REACH registration phase, we are also working to register all the relevant chemical substances within the stipulated period. We successfully completed the two registration phases in 2010 and in 2013. The next step, or phase III, requires us to evaluate and register by June 2018 all substances annually produced or imported in quantities ranging from one to 100 metric tons. This process also includes substances added to our portfolio from the Sigma-Aldrich acquisition and is 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. 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.

For products in our Allergopharma business, we have also developed comprehensive clinical efficacy and safety profiles that we continuously update. For the safety of patients, we have established a global pharmacovigilance system that we are always working to enhance.

**Quality of our products**

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

Due to the growing significance of emerging markets as sourcing markets for Merck, 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 so far have access to assessments for more than 730 of our most important suppliers. We initiated assessments of 463 of them in 2017.

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 the Merck 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 employee development, compensation, and performance management. We furthermore strive to foster diversity among our employees (more information can be found under “People at Merck”).

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 Environment, Health and Safety Policy, which is applicable Group-wide, we have defined our principles and strategies for environment, health and safety. It is an integral component of our EHS management system, which is certified annually by external auditors in accordance with the international standard OHSAS 18001. At all our sites, local EHS managers oversee operational environmental protection measures. These employees continually receive training and obtain additional qualifications. Since our businesses are constantly changing, our environmental management system is subject to internal and external audits on a regular basis to ensure that the ISO 14001 requirements are still being met. In 2017, we obtained an ISO 14001 group certificate for the ninth consecutive year. This certificate covers 83 sites around the world. Additionally, our environmental management system was successfully adapted to the new ISO standard 14001:2015. Our spending on environmental protection, health and safety efforts totaled € 200 million in 2017, which also includes investments made during the year.

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

Climate impact and resource scarcity are key challenges facing society in the 21st century. As a responsible company, it is especially important for us to do our part. We have therefore set ourselves the goal of reducing total direct and indirect greenhouse gas emissions by 20% by 2020 (2006 baseline), irrespective of production growth. In 2017, the CDP (formerly the Carbon Disclosure Project) gave our company a “B” rating (2016: A−). The CDP assesses companies in terms of their performance and transparency in climate impact and water management.

To achieve our climate impact mitigation goals, we have launched the EDISON program that consolidates all our climate impact mitigation and energy efficiency activities. Through the more than 300 EDISON projects initiated since 2012, we aim to annually save around 98 metric kilotons of CO₂ in the medium term. Overall, thanks to the EDISON projects we have saved approximately 75,000 megawatt hours of energy since 2012.

At the same time, we are pushing forward with the changeover to regenerative power generation. In 2017, we installed solar power panels at the Jigani and Peenya sites of our Life Science business sector in Bangalore, India. These generate a total of 1,265,000 kilowatt hours of power per year. Since each of the installations covers approximately 30% of the sites’ power requirements, we will lower our annual emissions by around 1,200 metric tons. We also installed a solar voltaic system in Burlington, Massachusetts (USA). With an output of 182 kilowatts, this is to generate 218,000 kilowatt hours of power annually, thus reducing our emissions by around 60 metric tons.


## ENERGY CONSUMPTION¹

<table>
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<tr>
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<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tr>
<td><strong>Total energy consumption</strong></td>
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<td>2,241</td>
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<td><strong>Direct energy consumption</strong></td>
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<td>1,207</td>
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<td>701</td>
<td>740</td>
</tr>
<tr>
<td>Steam, heat, cold</td>
<td>97</td>
<td>96</td>
<td>95</td>
<td>144</td>
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<tr>
<td><strong>Total energy sold</strong></td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Electricity</td>
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<tr>
<td>Steam, heat, cold</td>
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</tr>
</tbody>
</table>

### in gigawatt hours

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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</thead>
<tbody>
<tr>
<td><strong>Total energy consumption</strong></td>
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<tr>
<td><strong>Direct energy consumption</strong></td>
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<td>Natural gas</td>
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<td>4,342</td>
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<td>Liquid fossil fuels²</td>
<td>432</td>
<td>400</td>
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<tr>
<td>Biomass and self-generated renewable energy</td>
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<tr>
<td><strong>Indirect energy consumption</strong></td>
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<td>Steam, heat, cold</td>
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<tr>
<td><strong>Total energy sold</strong></td>
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<td>1.8</td>
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<td>1.1</td>
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<tr>
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<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Steam, heat, cold</td>
<td>0</td>
<td>0</td>
<td>0</td>
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¹In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the energy consumption has been calculated based on the current corporate structure of the reporting year and retroactively adjusted for acquisitions or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted).

²Light and heavy fuel oil, liquefied petroleum gas (LPG), diesel and gasoline.
TOTAL GREENHOUSE GAS EMISSIONS (SCOPE 1 AND 2 OF THE GHG PROTOCOL)\(^1\)

<table>
<thead>
<tr>
<th></th>
<th>2006(^2)</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tr>
<td>Total CO(_2),eq emissions</td>
<td>793</td>
<td>731</td>
<td>726</td>
<td>711</td>
<td>731</td>
</tr>
<tr>
<td>thereof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct CO(_2),eq emissions</td>
<td>379</td>
<td>390</td>
<td>393</td>
<td>387</td>
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<td>Indirect CO(_2),eq emissions</td>
<td>414</td>
<td>341</td>
<td>333</td>
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<td>Biogenic CO(_2) emissions</td>
<td>6</td>
<td>11</td>
<td>54</td>
<td>56</td>
<td>38</td>
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</tbody>
</table>

\(^1\) In line with the Greenhouse Gas Protocol, for all previous years (up to the 2006 baseline) the greenhouse gas emissions have been calculated based on the current corporate structure of the reporting year and retroactively adjusted for acquisitions (e.g. Sigma-Aldrich in 2015) or divestments of (parts of) companies, or for changes in emission factors (portfolio-adjusted). 
\(^2\) Baseline for our emission targets is 2006.
\(^3\) eq = equivalent.

Energy management plays a key role in our efforts for energy efficiency and climate impact mitigation. Our production sites in Darmstadt and Gernsheim account for around 28% of our global energy consumption. Both these facilities have fulfilled the international energy management standard ISO 50001 since 2012. Currently, 12 of our production sites have a certified energy management system. We intend to maintain our climate targets in the future. In 2017, the Executive Board confirmed the greenhouse gas reduction target and the required measures to achieve it, for instance through projects to raise energy efficiency levels and to reduce process-related greenhouse gas emissions.

In addition to energy, we also focused on the topic of water in 2017. Since 2016, we have been pursuing the goal of implementing a sustainable water management system at sites with high consumption levels by 2020. At sites with relevant water use located in areas of high water stress, we are aiming to cut our water consumption by 10% by 2020 (2014 baseline). At the end of 2017, we had lowered our water consumption at the relevant sites by around 9% in comparison with 2014. In 2017, the CDP gave our efforts to conserve water a “B”, two scores better than in the previous year.

Natural resources are becoming scarcer. We therefore want to use raw materials as efficiently as possible and to limit the loss of raw materials. Consequently, we intend to minimize the environmental impacts of our waste as far as possible. In 2016, we developed the Merck Waste Score, which allows us to compare the amount of waste our sites are producing and monitor the development of the amount of waste we produce. In 2017, the Executive Board resolved for the first time to reduce the environmental impact of our waste by 5% by 2025 (2016 baseline). For this purpose, we are analyzing the improvement potential of production processes and disposal routes employed by our sites. In principle, all sites are to contribute to the waste reduction efforts.

Responsibility for society

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

Our social responsibility activities are primarily focused on those areas in which we have problem-solving expertise stemming from our core businesses. We are thus engaged in health and 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 projects are made by our subsidiaries. In 2017, we spent a total of € 34 million on community engagement activities.
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.

Approximately 6,800 employees work for Merck researching innovations to serve long-term health and technology trends in both established and growth markets.

Merck spent around € 2.1 billion on research and development in 2017. In our research and development activities, 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 Merck with three business sectors.

Healthcare

BIOPHARMA

Oncology and Immuno-Oncology

In 2017, we achieved a number of significant milestones with avelumab, an anti-PD-L1 antibody that we are co-developing and co-commercializing with Pfizer. The first regulatory milestone took place in March, when the U.S. Food and Drug Administration (FDA) granted accelerated approval for avelumab under the brand name Bavencio® for the treatment of adults and pediatric patients 12 years and older with metastatic Merkel cell carcinoma (MCC), based on tumor response and duration of response. Continued approval for this indication may be contingent on verification and description of clinical benefit in confirmatory trials. Metastatic MCC is a rare and aggressive skin cancer that previously had no approved treatment options, making this the first indication for Bavencio® and the first FDA-approved treatment and immunotherapy for metastatic MCC. Since fewer than half of patients with metastatic MCC survive more than one year and less than 20% survive beyond five years, Bavencio® offers patients a much-needed treatment option that could make a meaningful difference in the treatment of this.

The FDA in 2015 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.

This FDA approval was based on data from JAVELIN Merkel 200, an international, multicenter, single-arm, open-label, Phase II study with two parts. The first, part A, included 88 patients with metastatic MCC whose disease had progressed after at least one chemotherapy treatment. The objective response rate was 33%, with 11% of patients experiencing a complete response and 22% of patients experiencing a partial response. At the time of analysis, tumor responses were durable, with 93% of responses lasting at least six months (n=25) and 71% of responses lasting at least 12 months (n=13). Duration of response ranged from 2.8 to more than 24.9 months.

The second, part B, at the time of the data cut-off included 39 patients with histologically confirmed metastatic MCC who were treatment-naïve to systemic therapy in the metastatic setting. The objective response rate was 62%, with 14% of patients experiencing a complete response and 48% of patients experiencing a partial response. 67% of patients experienced a progression-free survival rate of three months.

The next regulatory milestone followed in May, when the FDA granted Bavencio® accelerated approval for the treatment of patients with locally advanced or metastatic urothelial carcinoma (UC) who have disease progression during or following platinum-containing chemotherapy, or who have disease progression within 12 months of neoadjuvant or adjuvant treatment with platinum-containing chemotherapy. This indication was also approved under the Accelerated Approval Program based on tumor response and duration of response, and continued approval for this indication may be contingent upon verification and description of clinical benefit in confirmatory trials.
Advanced urothelial carcinoma is an aggressive disease with a high rate of recurrence. Bladder cancer accounts for approximately 90% of urothelial carcinomas and is the sixth most common cancer in the United States. Despite advances in the treatment of locally advanced or metastatic disease, the prognosis for patients remains poor, with the five-year survival rate at approximately 5%, meaning more treatment options are urgently needed.

The efficacy and safety of Bavencio® in urothelial carcinoma were demonstrated in the corresponding cohorts of the JAVELIN Solid Tumor trial, a Phase I, open-label, single-arm, multicenter study of Bavencio® in the treatment of various solid tumors. These urothelial carcinoma cohorts (n=242) enrolled patients with locally advanced or metastatic urothelial carcinoma with disease progression on or after platinum-containing chemotherapy, or who had disease progression within 12 months of treatment with a platinum-containing neoadjuvant or adjuvant chemotherapy regimen. Patients with six months or more of follow-up experienced an overall response rate of 16.1%. Duration of response was not precisely estimable, with a range of response from 1.4 to 17.4 months.

In September, we gained three further regulatory approvals for Bavencio®. The first was from the regulatory authority in Switzerland (Swissmedic) for the treatment of patients with metastatic MCC whose disease has progressed after at least one chemotherapy treatment. In mid-September, the European Commission granted approval for Bavencio® as a monotherapy for the treatment of adult patients with metastatic MCC, making it the first and only approved treatment for metastatic MCC in the 28 member states of the European Union as well as Liechtenstein, Iceland and Norway. A few days later, the Japanese Ministry of Health, Labour and Welfare (MHLW) granted the first Asian approval for Bavencio®, making it the first-ever treatment indicated for curatively unresectable MCC and the first anti-PD-L1 to become available in Japan. Regulatory approval for the treatment of metastatic MCC followed in December in Canada and in January 2018 in Australia as well as in Israel. In addition, Bavencio® was approved in Israel at the end of January to treat patients with urothelial carcinoma.

Through our strategic alliance with Pfizer, we continue to explore the therapeutic potential of avelumab. Our clinical development program known as JAVELIN involves more than 30 clinical programs, including various Phase III trials and over 7,000 patients being evaluated across more than 15 different tumor types. In addition to MCC and UC, these cancers include breast, gastric/gastro-esophageal junction, head and neck, Hodgkin’s lymphoma, melanoma, mesothelioma, non-small cell lung, ovarian, and renal cell carcinoma (RCC).

On December 21, the FDA granted Breakthrough Therapy Designation for avelumab in combination with INLYTA® (axitinib) for treatment-naive patients with advanced RCC.

In addition to the host of abstracts presented at key congresses in 2017 – including the 2017 American Society of Clinical Oncology (ASCO) Annual Meeting and the 2017 European Society for Medical Oncology (ESMO) Congress – we provided an update on our Phase III JAVELIN Gastric 300 study in November. The study is the first global trial of a checkpoint inhibitor versus an active chemotherapy comparator rather than placebo in patients with pre-treated advanced gastric cancer. The trial did not meet its pre-specified primary endpoint of superior overall survival. The data are being further examined in an effort to better understand the results and we will present them at a medical congress in 2018. We remain committed to our ongoing gastric clinical development program with avelumab.

As part of our commitment to developing new treatment options for patients with hard-to-treat cancers who would otherwise have a low chance of survival and to exploring all potential options, we entered into several strategic collaborations in 2017. The first of these was in March, when our collaboration with EpiThany to evaluate avelumab in combination with EP-101 STEMVAC, an investigational multi-antigen, polypeptide cancer vaccine, in a Phase II trial in women with breast cancer was announced. The second was announced in May, with Swiss/German biotech company VAXIMM AG to evaluate avelumab in combination with VAXIMM’s VXMO1. VXMO1 is an investigational oral T-cell immunotherapy designed to activate T-cells to attack the tumor vasculature, and, in several tumor types, attack cancer cells directly. Under the terms of the agreement, VAXIMM will be responsible for conducting two open-label Phase I/II trials – one in glioblastoma and one in metastatic colorectal cancer (CRC).

In June, we announced a collaboration with eFFECTOR Therapeutics to evaluate a novel immuno-oncology combination in microsatellite stable colorectal cancer. Together we plan to initiate a Phase II, open-label, randomized, non-comparative study to evaluate the safety, tolerability and efficacy of avelumab in combination with eFFECTOR’s investigational small molecule MNK1/2 inhibitor, eFT508, in microsatellite stable relapsed or refractory CRC patients.

In September, we entered into a collaboration with Phosplatin Therapeutics to evaluate avelumab in combination with PT-112, a novel small molecule inducer of apoptosis with evidence of downstream immunogenic cell death (ICD) properties, currently in Phase I development in solid tumors and hematological malignancies.

At the 53rd ASCO Annual Meeting (June 2 – 6 in Chicago), we shared results from our increasingly broad oncology portfolio, from immuno-oncology to DNA damage response (DDR) approaches, in a wide range of hard-to-treat cancers. Over 40 abstracts showcased the impact of our commitment to shaping cancer care today and tomorrow, including data for avelumab, Erbitux® (cetuximab), and pipeline updates on the anti-PD-L1/TGF-β trap M7824, the DNA-PK inhibitor M3814, the BTK inhibitor M7583, and tepotinib, an investigational small-molecule inhibitor of the c-Met receptor tyrosine kinase.
Multiple presentations on avelumab at ASCO included data in first-line metastatic Merkel cell carcinoma and previously treated metastatic urothelial carcinoma, as well as results from the Phase Ib trial of avelumab in combination with axitinib in RCC. Beyond metastatic MCC, locally advanced or metastatic UC and RCC, we also presented further avelumab abstracts in non-small cell lung cancer and metastatic castrate-resistant prostate cancer, locally advanced squamous cell carcinoma of the head and neck, and relapsed or refractory diffuse large B-cell lymphoma.

We also featured new research at ASCO on our investigational bifunctional immunotherapy anti-PD-L1/TGF-β trap (M7824), which is thought to have the potential to simultaneously block both PD-L1 and TGF-β. An oral presentation showcased dose escalation Phase I clinical data exploring the potential of M7824 in advanced solid tumors.

Pipeline updates at ASCO also included early clinical results for tepotinib, M7583, an oral, highly selective, covalent inhibitor of Bruton’s tyrosine kinase (BTK), and the first clinical data for M3814, an investigational DNA-dependent protein kinase (DNA-PK) inhibitor.

We are investing significant resources in the promising area of DDR. In January, we signed a licensing agreement with Boston-based Vertex Pharmaceuticals that covers the worldwide development and commercialization of four research and development programs that investigate novel approaches to the treatment of cancer. The addition of the DDR portfolio in-licensed from Vertex to our own in-house DDR platform has positioned us as one of the key players in the DDR field. Our broad DDR portfolio includes inhibitors for enzymes of major DDR pathways, such as Ataxia Telangiectasia and Rad3-related kinase (ATR), DNA-PK and Ataxia Telangiectasia Mutated kinase (ATM).

At the ESMO congress (September 8 – 12 in Madrid), we presented a total of 23 abstracts representing five therapeutic agents, which highlighted our company’s expanding scientific expertise. Data were presented on the role of established medicine Erbitux® (cetuximab), with quality of life (QoL) data in colorectal cancer and real-world data in both CRC and squamous cell carcinoma of the head and neck. With respect to avelumab, we presented updated efficacy and safety data in metastatic MCC and UC (12-month follow-up data in pre-treated patients with locally advanced or metastatic disease). We also presented new data and updates from our rapidly evolving pipeline, including first stand-alone data in metastatic triple negative breast cancer from potential first-in-class ATR inhibitor M6620. M6620 is currently being investigated in several ongoing Phase I trials across a variety of tumor types. Other pipeline updates included data on the potential first-in-class dual p70S6K/Atk inhibitor M2698 and tepotinib in patients with advanced hepatocellular carcinoma (HCC).

In January, we kicked off a collaboration and licensing agreement with Domain Therapeutics of Strasbourg, France, to explore the potential of adenosine inhibition in the development of novel immuno-oncology agents. Domain Therapeutics is a company focused on the discovery and development of first-in-class compounds against transmembrane targets, and in particular against G protein-coupled receptors (GPCRs). This collaboration strengthens our combination strategy in immuno-oncology and underscores our science-driven approach to discovering and developing novel compounds through both internal capabilities and external collaborations.

Also in January, we announced a three-year strategic collaboration with The University of Texas MD Anderson Cancer Center, the aim of which is to accelerate the development of investigational cancer therapies in four cancers – breast, colorectal, glioblastoma and leukemia. The collaboration will enhance the value of our future oncology/immuno-oncology pipeline, with a goal of starting multiple registration phase studies in novel indications in the next two to three years.

In June, we announced our entry into a new strategic collaboration with the biopharmaceutical company F-star of Cambridge, United Kingdom, for the development and commercialization of five bispecific immuno-oncology antibodies. Beyond these, we will have further rights to replace, as well as to add to these antibodies using F-star’s bispecific antibody platform. This collaboration will further strengthen our immuno-oncology pipeline and underscores our commitment to discovering and developing breakthrough cancer therapies that make a meaningful difference to patients’ lives.

On July 6, we introduced the winners of our seventh Biopharma Innovation Cup. The winning team received €20,000 for its innovative idea around the role of natural killer cells in cancer immunology. The Biopharma Innovation Cup is designed to support the professional development of post-graduate students and to foster innovation from a promising new generation of academic talent. It showcases our strong commitment to leveraging innovation, curiosity and collaboration. With more than 1,400 applications from 60 countries, the Biopharma Innovation Cup in 2017 achieved a new level of popularity.

In September, we announced the recipients of the fourth annual Grant for Oncology Innovation (GOI) awards. The three winners of this program shared prize money totaling €1 million to progress their research. A scientific steering committee of internationally renowned oncology experts selected the winning proposals from around 100 applicants worldwide based on relevance to patient care, innovative approach, scientific impact, feasibility and relevance for the personalization of treatment.
Neurology & Immunology

Multiple sclerosis (MS) is one of the world’s most common neurological disorders and there are still significant unmet needs for MS patients, particularly those with highly active relapsing MS (RMS).

Following a positive opinion from the Committee for Medicinal Products for Human Use (CHMP) of the European Medicines Agency (EMA) in June, the European Commission (EC) granted marketing authorization in August for Mavenclad® 10 mg (cladribine tablets) for the treatment of highly active relapsing multiple sclerosis in the 28 countries of the European Union (EU) as well as in Norway, Liechtenstein and Iceland. Mavenclad® is the first oral short-course treatment to have shown efficacy across key measures of disease activity in patients with highly active RMS, including disability progression, annualized relapse rate and magnetic resonance imaging (MRI) activity.

On November 30, Health Canada approved Mavenclad® as monotherapy for the treatment of adult patients with relapsing-remitting multiple sclerosis (RRMS) to reduce the frequency of clinical exacerbations and delay the progression of disability.

On December 7, Merck received approval (Updated Registration) for Mavenclad® in Australia. The Therapeutic Goods Administration (TGA) updated the registration including the indication, dosing and safety information of Mavenclad® for the treatment of RRMS in Australia. In January, the Israeli Ministry of Health approved Mavenclad® for the treatment of adult patients with highly active RMS as defined by clinical or imaging features.

The Mavenclad® marketing authorizations in Europe, Canada, Australia, and Israel are based on more than 10,000 patient-years of data with over 2,700 patients included in the clinical trial program, and up to ten years of observation in some patients. Mavenclad® is the first treatment in relapsing multiple sclerosis (RMS) to show sustained clinical efficacy for up to four years with a maximum of 20 days of oral treatment over two years. The efficacy and safety results of these studies allowed for a detailed characterization of its benefit-to-risk profile. Mavenclad® is a selective immune reconstitution therapy that simplifies treatment administration by giving patients two short annual courses of tablets in four years without the need for frequent monitoring. The most clinically relevant adverse reactions were lymphopenia and herpes zoster.

Several Mavenclad® submissions are currently under review and we plan to conduct additional filings for regulatory approval in other countries, including the United States.

Data for approved multiple sclerosis treatments Mavenclad® and Rebif® (interferon beta-1a) and investigational product evobrutinib were presented at the MSParis 2017, 7th Joint ECTRIMS-ACRIMS Meeting (October 25—28 in Paris). A post hoc analysis in high disease activity sub-groups from the two-year CLARITY study confirmed that Mavenclad® significantly increased the proportion of patients with no evidence of disease activity (NEDA) compared with placebo (43.7% vs 9.0%). Efficacy data from the CLARITY, CLARITY Extension and ORACLE-MS trials highlighted that Mavenclad® delivers and sustains four years of disease control with a maximum of 20 days of oral treatment in the first two years. An additional safety analysis assessing malignancy and infection risk was presented along with data for Mavenclad®, which further detailed how the treatment is thought to selectively target the adaptive immune system.

Additionally, the recipients of the fifth annual Grant for Multiple Sclerosis Innovation (GMSI) were announced during the 7th Joint ECTRIMS-ACRIMS Meeting. In 2017, 77 proposals from 25 countries were submitted. Three research teams from Canada, Portugal and the United States were selected to share the € 1 million grant.

We presented 11 abstracts in oral and poster sessions for clinical programs in systemic lupus erythematosus (SLE), osteoarthritis (OA), rheumatoid arthritis (RA) and fibrotic diseases, including one late-breaker, at the 2017 American College of Rheumatology/Association of Rheumatology Health Professionals (ACR/ARHP) Annual Meeting held from November 3–8, 2017 in San Diego. Noteworthy data included a late-breaking abstract on FORWARD, a five-year Phase II study of sprifermin in OA of the knee, providing insights into its potential disease-modifying properties. The study of 549 patients met its primary endpoint, demonstrating statistically significant, dose-dependent increases in MRI total femorotibial joint cartilage thickness from baseline in the two sprifermin groups receiving the highest doses as compared with the placebo group after the two-year treatment period. Demonstration of an increase in cartilage thickness as opposed to a delay in decreasing cartilage thickness has not been previously reported.

On September 12, we announced that a Phase Ib study of evobrutinib, a Bruton’s tyrosine kinase inhibitor (BTKi) discovered by Merck, had been initiated in rheumatoid arthritis (RA) following a Phase Ia study which met the pre-defined criteria for progressing to a dose-finding study in this disease. Evobrutinib is now in Phase Ib studies in three immunological indications: RA, MS, and SLE. Evobrutinib was discovered in our own laboratories and is an example of the innovation of our R&D activities within Healthcare.

We presented data at the American Academy of Neurology (AAN) 69th Annual Meeting (April 22–28 in Boston). A total of 15 abstracts on MS, including studies evaluating Rebif® (interferon beta-1a) and Mavenclad®, were presented.

On June 26, at the European Association of Neurology meeting held in Amsterdam, analyses of data from three clinical studies (CLARITY, CLARITY Extension and ORACLE-MS) were announced which suggest that Mavenclad® selectively and discontinuously reduces both B and T lymphocytes in patients with early and relapsing forms of MS. An early reduction of peripheral blood B cells was seen, with cell numbers reaching a nadir at 13 weeks after treatment, followed by a rapid reconstitution toward baseline. A moderate reduction in T cell counts was also shown, although to a lesser degree than B cells; this reduction was more pronounced in CD4+ than in CD8+ lymphocytes.
Fertility
In early 2017, the CHMP granted a positive opinion for the new Pergoveris® Pen, followed by a European Commission approval in May. The pen addresses an unmet medical need by providing a convenient and ready-to-use fertility combination treatment option for women with severe follicle stimulating hormone (FSH) and luteinizing hormone (LH) deficiency. The liquid version of Pergoveris® was created by evolving the original freeze-dried powder and solvent combination – which required patients to mix the product vials themselves before daily injection – towards a ready-to-use pre-filled Pen solution. The new Pergoveris® Pen is the only premixed combination of human FSH and human LH on the European market available in a pre-filled injection device for self-administration.

We further underscored our commitment to innovation in fertility in July, when we awarded € 1.25 million to external research projects, supporting the advancement of medical science through the Grant for Fertility Innovation (GFI). Launched as the first of the Merck Grants for Innovation in 2009, it is dedicated to transforming innovative translational fertility research projects into actual solutions aimed at improving fertility treatment outcomes. In 2017, the GFI Award Ceremony included the announcement of the Merck Lifetime Achievement Award in Fertility Innovation, granted to Professor Bruno Lunenfeld for his revolutionary work within the fertility field since 1954.

In November, the FDA approved a new version of Gonal-f® (follitropin alfa injection) pre-filled pen. Known as Gonal-f® RFF Redi-Ject™ pre-filled pen in the United States and originally approved by the FDA in 2013, the new version of the pen, based on input from people who use the pen, is easy both to learn and to use. Gonal-f® is the only gonadotropin that comes in a pre-filled, ready-to-use pen in the United States. The new Gonal-f® pen, like its predecessor, enables a fine-tuning of treatment allowing for minimum increments of 12.5 IU to titrate a wide range of doses and precisely target the dosing to patient needs. In addition, its new design features include an amendment to the dose display window for enhanced readability.

General Medicine & Endocrinology
In May, the Medicines and Healthcare Products Regulatory Agency (MHRA) in the United Kingdom authorized Glucophage® SR (sustained release formulation; metformin), for the reduction in the risk or delay of the onset of type 2 diabetes in adult, overweight patients with impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG), and/or increased glycated hemoglobin (HbA1c), when intensive lifestyle changes for 3 to 6 months have failed.

On September 18, we announced the recipients of the Grant for Growth Innovation (GGI) for 2017 during the 10th International Meeting of Pediatric Endocrinology in Washington, D.C. Sixty-five applications were received from 28 countries and reviewed by an independent scientific steering committee consisting of six internationally renowned endocrinologists and researchers. Research groups based in France and Denmark were each awarded a grant for innovation projects in the field of growth and growth disorders.

BIOPHARMA PIPELINE
as of December 31, 2017

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<td>Evobrutinib (BTK inhibitor)</td>
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<td>Oncology</td>
<td>Tepotinib (c-Met kinase inhibitor)</td>
<td>Non-small cell lung cancer</td>
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<td>M2698 (p70S6K and Akt inhibitor)</td>
<td>Solid tumors</td>
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<tr>
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<td>M3814 (DNA-PK inhibitor)</td>
<td>Solid tumors</td>
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</tr>
<tr>
<td></td>
<td>M9831 (VX-984, DNA-PK inhibitor)</td>
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<tr>
<td></td>
<td>M6620 (VX-970, ATR inhibitor)</td>
<td>Solid tumors</td>
<td>Phase I</td>
</tr>
<tr>
<td></td>
<td>M4344 (VX-803, ATR inhibitor)</td>
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<td>Phase I</td>
</tr>
<tr>
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<td>M3541 (ATM inhibitor)</td>
<td>Solid tumors</td>
<td>Phase I</td>
</tr>
<tr>
<td></td>
<td>M8891 (MetAP2 inhibitor)</td>
<td>Hematological malignancies</td>
<td>Phase I</td>
</tr>
<tr>
<td></td>
<td>M7583 (BTK inhibitor)</td>
<td></td>
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</tr>
</tbody>
</table>
### BIOPHARMA PIPELINE

**as of December 31, 2017**

<table>
<thead>
<tr>
<th>Therapeutic area</th>
<th>Compound</th>
<th>Indication</th>
<th>Status</th>
</tr>
</thead>
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<tr>
<td><strong>Immuno-Oncology</strong></td>
<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Non-small cell lung cancer, 1st line</td>
<td>Phase III</td>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Non-small cell lung cancer, 2nd line</td>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Gastric cancer, 1st line maintenance</td>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Ovarian cancer, 1st line maintenance</td>
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<tr>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Ovarian cancer platinum-resistant/-refractory</td>
<td>Phase III</td>
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<tr>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Urothelial cancer, 1st line maintenance</td>
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<tr>
<td></td>
<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Renal cell cancer, 1st line</td>
<td>Phase III</td>
</tr>
<tr>
<td></td>
<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Locally advanced head and neck cancer</td>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Merkel cell cancer, 1st line</td>
<td>Phase II</td>
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<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Solid tumors</td>
<td>Phase I</td>
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<tr>
<td></td>
<td>Avelumab (anti-PD-L1 mAb)</td>
<td>Hematological malignancies</td>
<td>Phase I</td>
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<tr>
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<td>M9241 (NHS-IL12, cancer immunotherapy)</td>
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<td>M7824 (anti-PD-L1/TGFβ trap)</td>
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<td>M4112 (cancer immunotherapy)</td>
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<tr>
<td><strong>Immunology</strong></td>
<td>Sprifermin (fibroblast growth factor 18)</td>
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<td>Atacicept (anti-BLyS/anti-APRIL fusion protein)</td>
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<td>Phase II</td>
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<tr>
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<td>Atacicept (anti-BLyS/anti-APRIL fusion protein)</td>
<td>IgA nephropathy</td>
<td>Phase II</td>
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<td>Abituzumab (anti-CD51 mAb)</td>
<td>Systemic sclerosis with interstitial lung disease</td>
<td>Phase II</td>
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<td></td>
<td>Evobrutinib (BTK inhibitor)</td>
<td>Rheumatoid arthritis</td>
<td>Phase II</td>
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<tr>
<td></td>
<td>Evobrutinib (BTK inhibitor)</td>
<td>Systemic lupus erythematosus</td>
<td>Phase II</td>
</tr>
<tr>
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<td>M1095 (ALX-0761, anti-IL-17A/F nanobody)</td>
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<td>M6495 (anti-ADAMTS-5 nanobody)</td>
<td>Osteoarthritis</td>
<td>Phase I</td>
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<tr>
<td><strong>General Medicine</strong></td>
<td>M5717 (PeEF2 inhibitor)</td>
<td>Malaria</td>
<td>Phase I</td>
</tr>
</tbody>
</table>

1. As announced on August 25, 2017, the European Commission has granted marketing authorization for cladribine tablets for the treatment of highly active relapsing multiple sclerosis in the 28 countries of the European Union in addition to Norway, Liechtenstein and Iceland.

2. Sponsored by the National Cancer Institute (USA).

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

More information on the ongoing clinical trials can be found at [www.clinicaltrials.gov](http://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.

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

Our Consumer Health business develops and sells over-the-counter medicines and food supplements as well as several prescription medicines in Europe, in particular in France, Germany and the United Kingdom, and in growth markets in Latin America, the Middle East, 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. For example, in 2016/2017 we successfully launched the all-new brand Vivera® across several Latin American markets, containing one of the most researched and most effective probiotics in the world for the treatment of gastro-intestinal upset. 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 consumers.

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, Allergopharma is developing a better understanding of the immunological mechanism that underlies the development of allergies and is working on the next generation of drugs for allergen immunotherapy.

Life Science

Across our three Life Science business units of Research Solutions, Process Solutions and Applied Solutions, our R&D teams are dedicated to finding innovative solutions to our customers’ toughest challenges. In the Life Science business sector, we invest significantly in R&D, with more than 1,500 employees working in various R&D functions around the world.

In 2017, we continued to focus on delivering the promise of accelerating access to health for people everywhere. We launched 15,000 products, including nearly 9,000 chemicals, while aiming to:

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

Improve and expand our portfolio

We launched innovations across all segments of our portfolio throughout 2017. In Research Solutions, we introduced a next-generation high-sensitivity protein detection platform, SMCxPRO™ technology, which allows scientists to detect and quantify low-abundance biomarkers that traditional methods cannot measure.

In addition, we introduced the Stericup® Quick Release 500mL vacuum filtration system, a filter bottle system ideally suited for sterile filtration of cell culture media, buffers and reagents. Even routine processes like microfiltration must be reliable and consistent because quality and reproducibility are critical to the cell culture process. The improved liquid sterile filtration system offers ergonomic design updates that optimize user control and streamline the filtration process, while safeguarding results with the proven performance of Millipore® membranes.

In Process Solutions, we launched CAN MultiFlow™ screening services to more accurately predict genotoxic and mode-of-action properties of substances, ingredients and drug compounds. We were the first company to provide this service in the United States. Assessing toxicity is one of the most important steps in the development of chemicals, ingredients and drugs for use in pharmaceuticals, agriculture or consumer goods.

We took a significant step towards increasing manufacturing flexibility and enabling higher productivity with the launch of the Ex-Cell® Advanced™ HD Perfusion Medium. This first off-the-shelf, high-density cell culture medium supports perfusion processes and facilitates high productivity at low perfusion rates, increasing production yield and speed to clinic.

We also introduced Millistak+® HC Pro, the first portfolio of high-capacity, fully synthetic depth filters for non-treated Chinese Hamster Ovary harvest clarification and downstream filtration applications. The product provides a cleaner and more consistent depth filtration process than traditional diatomaceous earth (DE) and cellulose-based filtration processes.

In Applied Solutions, we introduced a new testosterone calibrator kit for in vitro diagnostic use. The certified kit allows users to calibrate assays and verify calibrations and is the first of its kind to receive CE mark approval – indicating compliance with the European Union’s Medical Device Directive.

We also launched MC-Media Pads for convenient food and beverage testing. The product offers streamlined, convenient indicator organism testing for robust quality control of food and beverages, helping customers improve their sample-testing workflows by increasing efficiency without compromising quality.
Invest in new and disruptive technologies for the long term

CRISPR genome-editing technology is advancing treatment options for some of the toughest medical challenges faced today, including chronic illnesses and cancers for which there are limited or no treatment options. Merck has a 12-year history in the genome-editing field and was the first company to globally offer custom biomolecules for genome editing (TargetTron™ biomolecules and zinc finger nucleases), driving adoption of these techniques within the worldwide research community.

In 2017, we developed an alternative CRISPR genome-editing tool that makes CRISPR more efficient, flexible and specific, giving researchers more experimental options and faster results, which can accelerate drug development and access to new therapies. Our research on proxy-CRISPR, “Targeted Activation of Diverse CRISPR-Cas Systems for Mammalian Genome Editing Via Proximal CRISPR Targeting,” was published in the April 7, 2017, edition of Nature Communications.

The Australian Patent Office granted Merck patent rights relating to the use of CRISPR in a genomic-integration method for eukaryotic cells. With this CRISPR genomic-integration technology, scientists can replace a disease-associated mutation with a beneficial or functional sequence, a method important for creation of disease models and gene therapy. Additionally, scientists can use the method to insert transgenes that label endogenous proteins for visual tracking within cells.

We further strengthened our patent portfolio in August, when the European Patent Office (EPO) issued a “Notice of Intention to Grant” for a patent application covering our CRISPR technology used in a genomic-integration method for eukaryotic cells. The patent provides protection for our CRISPR technology, which gives scientists the ability to advance treatment options for the toughest medical challenges we face today.

In addition, the Canadian Patent Office issued a “Notice of Allowance” for the patent application covering CRISPR technology used in a genomic-integration method for eukaryotic cells. And, in December, we were granted a patent for CRISPR technology by the Singapore Intellectual Property Office. Patents have also been filed for the insertion CRISPR method in the United States, Brazil, China, India, Israel, Japan, and South Korea.

We recognize the potential benefits of conducting properly defined research with genome editing because of the breakthrough therapeutic potential. Therefore, we support research with genome editing under careful consideration of ethical and legal standards. The Group has established the Merck Bioethics Advisory Panel to provide guidance for research in which its businesses are involved, including research on or using genome editing.

Beyond basic gene-editing research, Merck supports development of gene- and cell-based therapeutics and manufacturing viral vectors. In October, our Carlsbad, California-based manufacturing facility for the production of BioReliance® viral and gene therapy products completed both a U.S. Food and Drug Administration pre-license inspection and a European Medicines Agency marketing authorization application inspection. As a leading contract manufacturing organization for the production of next-generation gene therapies, the achievement underscores our commitment to bring our customers closer to commercialization of novel therapies. In December, we signed a commercial supply agreement to manufacture viral vectors for blue-bird bio for use in potentially transformative gene therapies.

Partner with the global scientific community

In collaboration with Stelis Biopharma, we opened a new joint process scale-up lab in Bengaluru, India, to provide end-to-end solutions – from process development to scale-up manufacturing – for pre-clinical, clinical and commercial supply. Both companies bring technological expertise and an extensive bioprocess development and manufacturing portfolio that will help customers accelerate development of biopharmaceuticals for clinical trials and manufacturing with greater reliability and cost effectiveness.

In 2017, we also formed a strategic alliance with Baylor College of Medicine, Houston, Texas, and its vaccine product development partnership, Texas Children’s Hospital Center for Vaccine Development, to advance vaccine research and development for neglected and emerging infections. The collaboration focuses on bringing vaccines through development to efficiently deliver them to societies in need. Together, we are working to optimize the vaccine manufacturing process to increase vaccine stability and yield.

Progress continued within the scope of our participation in Horizon 2020, the EU Framework Program for Research and Innovation, to improve biopharmaceutical downstream processing. The nextBioPharmDSP, a consortium of seven organizations, is developing a more efficient, cost-effective and environmentally friendly downstream process to manufacture monoclonal antibodies and biosimilars. The biopharmaceutical industry faces pressures to reduce manufacturing costs and deliver greater efficiencies while being environmentally responsible. Through the Horizon 2020 program, consortium members are already delivering important advances for downstream processing.

In addition, we extended our strategic alliance with Samsung BioLogics after a memorandum of understanding (MoU) was signed in November. The alliance aims to accelerate process development and clinical material production at small biotech start-ups focusing on novel drug development for which Samsung BioLogics acts as a contract manufacturer. The new MoU is an extension of an MoU signed in 2014 that encompasses a long-term supply agreement under which we provide raw materials for biopharmaceutical manufacturing.
Meet customer needs
We expanded our BioReliance® End-to-End Biodevelopment Centers in North America, China and Europe to meet increasing customer demand for their turnkey portfolio of bioprocessing products, manufacturing capabilities and industry-leading technological expertise. The expansion includes the opening of two new process development centers, located in the United States and China, following the commercial success of our biodevelopment center in Martillac, France. The two new facilities provide a full range of process development capabilities and services, including cell line development services and both upstream and downstream process development, as well as non-GMP clinical production. The United States facility will be open to customers in 2018.

Angiex Inc., Cambridge, Massachusetts, will be the first project undertaken by the new U.S. BioReliance® End-to-End Biodevelopment Center. We formed a collaboration with Angiex Inc. to help accelerate clinical readiness of a new cancer therapy. Our goal is to support the biotechnology start-up’s ability to speed its lead oncology antibody drug candidate to clinical use by providing access to end-to-end process development tools, education programs and training.

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
In 2017, we continued to work with our customers, the display manufacturers, to further develop high-performance liquid crystal technologies. The systematic introduction of new liquid crystal materials and the development of higher-performance liquid crystal mixtures led to numerous newly qualified and commercialized products in all applications, including large-screen TVs, public information displays, as well as mobile devices and automotive applications. We developed and commercialized a number of new photoresist formulations for producing the thin-film transistor backplanes that are used for both LC and OLED display manufacture. Our high-resolution photoresist technology is especially important for the more complex and demanding electronic patterning required in increasingly high-resolution displays. Our innovative liquid crystal technology UB-FFS (ultra-brightness fringe-field switching) also saw growth in the mobile device display sector. UB-FFS is highly attractive for mobile applications. It provides the highest light efficiency as pixel sizes become increasingly smaller due to the demand for higher-resolution smartphones and tablets. We also further developed this energy-saving technology for larger display applications, including TVs and public information displays, where high light efficiency is particularly valuable in the highest-resolution displays, for example 8K.

Our new liquid crystal technology SA-VA (self-aligned vertical alignment) is eco-friendly and resource-conserving; it requires less energy and creates fewer waste products than conventional modes during display manufacture. We have been developing the materials and process within the scope of close technical partnerships. The technology also provides a more efficient display manufacturing process and could offer improved design features for display manufacturers. SA-VA has the potential to be used in all types of display applications, including mobile IT applications, but most importantly large-screen TVs. We expect the first products in mid-sized applications, but extending quickly to large-screen and high-end TV applications. We also made further progress with the development of new liquid crystal technologies to enable free-form LC displays. Here we aimed to enable the use of low-cost plastic substrates rather than the thin glass commonly used in LC displays to date. We are working closely with display makers in Asia to optimize the materials and process for our innovative polymer wall LC technology. This could provide robust and bendable plastic displays without the defect patterns that typically occur when an LC display is pressed or bent.

Beyond classic displays, 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 focusing on three variants: sun protection, glare protection, and privacy control where the windows switch to opaque. At the end of November, we opened our first production facility for switchable liquid crystal window modules in Veldhoven, the Netherlands. In addition, we presented our liquid crystal window technology for automotive sunroofs at the International Motor Show (IAA) in Frankfurt, Germany. We continued to advance the development of smart antennas, which can also be used in the automotive industry. Thanks to a thin functional layer of liquid crystals, the antenna can be electronically pointed to a satellite without the need to move the device mechanically. Together with Hella, a light and electronics expert, and other partners, we have developed a smart automotive headlight system based on an LC display. With a total of 30,000 pixels, the smart adaptive lighting can be set in a continuously variable manner and in real time to various driving situations. Hella is to bring the developed technology to series production.
To accelerate the development of free-form displays, Merck is cooperating with FlexEnable of the United Kingdom. This company is working in the field of conformable, large area, full color and video rate organic liquid crystal displays (LCDs) on polymer substrates. With a bend radius that can go below 30 millimeters, organic LCDs can meet new market requirements, for example in automotive applications, where thin, conformable and shapeable displays are needed. It will soon be possible to curve organic LCDs around complex surfaces and shapes when our innovative polymer wall LC technology is used. In order to develop new digital optical applications with liquid crystals, in May we entered into a five-year collaboration with the University of Leeds. This is one of the United Kingdom’s most renowned research institutions for liquid crystal applications and has recently built a reputation in particular for non-display applications such as switchable contact lenses.

### Integrated Circuit Materials

Gas-phase deposition materials are a growth area within our semiconductor chemicals business. To meet the constantly growing challenges in chip production, increasingly more chemical elements are being used in advanced semiconductor fabrication processes; this is often enabled by atomic layer deposition technology. For the deposition of layers that often are only a few atoms thick, novel materials such as precursor chemicals are required, which can be applied at lower temperatures and/or selectively to only certain parts of a wafer. Such surface-selective processes automatically carry the target materials to the right position. This provides advantages for our customers as they can eliminate costly photolithography steps and at the same time automatically avoid overlay registration errors.

In order to better support our customers in Asia, in 2017 we opened a new research center in Taiwan, where we are conducting research in atomic layer deposition and gas phase deposition for front-end applications, as well as very thermally conductive, economically sustainable, high-performance sinter pastes for chip packaging applications. At our sites in Shizuoka, Japan, and Darmstadt, Germany, we are developing innovative dielectrics that can be used at lower application temperatures and are thus suitable for novel chip types. Our thick-film photoresist technology found new applications for the production of 3D NAND storage chips that enable higher storage capacity than conventional planar technology with the same surface area. Besides other applications, these new-generation storage chips are increasingly being used in solid-state drives (SSDs), successors of classic hard drives.

### Pigments & Functional Materials

The exceptional color saturation and brilliance of M oxal® effect pigments based on aluminum flakes is finding increasing use in automotive and plastic coatings. In addition, Xirallic® N XT Cougar Red, a pure, bluish red pigment with an extraordinary sparkle, was introduced for automotive coatings as the latest addition to the Xirallic® N XT series. Further pigment developments support the market trend towards achromatic coatings. In the plastics field, the extremely pure, silver-white I riodin® 6163 WAY was added to the WAY series of weather-proof pigments for outdoor applications. For the cosmetics sector, both new sparkle effects and matte effect pigments were successfully launched as part of the Smart Effects initiative. In the fillers area, new formulations, such as an alcohol-free variant of the anti-aging active ingredient RonaCare® CPS, were added to the portfolio. Based on two-dimensional and three-dimensional skin models, we developed a technology to more efficiently assess new cosmetic actives. Particularly in efficacy testing of natural substances, we expect to already have marketable products in 2018.

In technical applications, we intensified our activities in additives for 3D laser direct structuring with a focus on 3D printing of plastics. Together with our partners, we also developed laboratory prototypes which we presented at the LASER World of Photonics 2017 in Munich, Germany and the International Motor Show (IAA) 2017 in Frankfurt, Germany. Laser additives enable computer-controlled fabrication of three-dimensional components with integrated electronic parts and laser-assisted circuit board bonding. 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 and qualify a novel material to shield generators and engines.

We further developed our range of fluorosurfactants, which strongly differentiates itself from competing products owing to its favorable ecotoxicological profile. In early 2017, Tivida® FL 3000 was added to our portfolio of nonionic surfactants. Even in very low concentrations, it significantly improves the flow and wetting behavior of coating systems.
Advanced Technologies

In 2017, we made significant progress with our material and technology developments for flexible displays. At major exhibitions, for example, together with strategic partners we presented prototypes demonstrating the market readiness of our materials and the related technologies. During SID Display Week in May, we additionally reported on the development of printing inks. In 2017, our printed red, green and blue layers demonstrated first-ever efficiency values comparable to those of vacuum evaporation technology. This will allow flexible or rollable screens to be manufactured in the future, such as for automotive applications or large-area displays. Printed displays achieve greater brightness and better energy efficiency. In reflective displays, our partner Clearink Displays won the prestigious Best in Show Award at SID 2017. To respond to the growing demand from the industry for our innovative material solutions, we started investing in our R&D site in Chilworth, United Kingdom, to increase our lab capacity.

In electronic packaging, we strengthened our research activities by participating in a consortium led by the Fraunhofer Institute for Reliability and Microintegration in Berlin. We are further advancing material and technology development in hybrid electronics. At the LOPEC 2017 exhibition in Munich in March, we presented the prototype of a flexible display consisting of a backplane with organic thin-film transistors as well as liquid crystals from Merck. We will continue to focus strongly on the development of these technologies.

In 2017, a number of lighthouse projects demonstrated the diversity of use of printable organic solar cells (OPV). For example, OPV modules integrated into a glass façade in São Paulo, Brazil, provide shade, innovative design and energy efficiency. We presented a novel façade concept combining OLED and OPV module design with functionality at the Biennale of Architecture and Urbanism in Seoul, Korea. The growing interest of architects in this innovative construction material was reflected in the Innovation Award for Architecture and Construction, which went to OPV at BAU 2017, the world’s leading exhibition for architecture, materials and systems. The upcoming technology trend in the LED lighting market – human centric lighting (HCL) – places the focus of light planning on people’s health and well-being. This trend is impressively confirmed by the 2017 Nobel Prize in Physiology or Medicine, which was awarded for discoveries of molecular mechanisms controlling the circadian rhythm, which is significantly affected by light. Our product developments specifically address this up-and-coming market for HCL LED lighting. Micro-LED displays are also currently attracting great attention. From our broad portfolio for the LED industry, we have already supplied our customers with first materials for this new application.

Strategic realignment

In 2018, we want to focus even more strongly on the needs of our customers and markets. Therefore, in December 2017, we announced that we will combine our expertise in three newly created business units aligned with our target markets: Display Solutions, Semiconductor Solutions, and Surface Solutions. In the future, all activities pertaining to research, business development and external partnerships will be united in a central research and innovation unit.
People at Merck

The success of our company depends crucially on the dedication of our employees. We want to offer them framework conditions that meet their individual needs. This encompasses an exciting range of tasks and advanced training possibilities, furthering flexible forms of cooperation and a culture of mutual esteem and respect. Our objective is to create a working environment in which curiosity can best unfold.

A career with Merck is enriching – both from a professional and a personal perspective. It is important to us to create an inclusive work environment in which all employees have the possibility to maximize their potential. To support our company’s growth and innovation course, the focus of our human resources work is on furthering engaged people, capable talents and empowered leaders.

In line with the new development of our corporate brand in 2015, we also adapted our employer brand and launched it globally in May 2017. At the core, it is based on the passion, creativity and curiosity of our employees, through whom Merck has become a global science and technology company. We are convinced that curiosity leads to positive outcomes.

Our promise as an employer is thus “Bring Your Curiosity To Life.” We have formulated four core messages that characterize our employer brand and are applicable to Merck as a whole. They determine how we collaborate, how we advance our business, how our employees can develop within the company and who we are:

• Experience the joy of curiosity
• Foster fruitful partnerships
• Fulfill your personal ambitions
• Advance technologies for life

OVERVIEW OF OUR HEADCOUNT FIGURES
As of December 31, 2017, we had 52,941 employees worldwide (2016: 50,414). In 2017, we were represented by a total of 217 legal entities with employees in 66 countries.1

DISTRIBUTION OF EMPLOYEES by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>10,520</td>
<td>19%</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>11,294</td>
<td>23%</td>
</tr>
<tr>
<td>Middle East and Africa</td>
<td>1,097</td>
<td>2%</td>
</tr>
<tr>
<td>Latin America</td>
<td>4,050</td>
<td>9%</td>
</tr>
</tbody>
</table>

25,980

Driving innovation through engaged people

Our human resources work is founded on a company culture that values and motivates people and promotes the right framework conditions for innovation and engagement.

REGULAR GLOBAL EMPLOYEE SURVEYS
To strengthen employee retention and generate impetus for the future of our company, we pay special attention to honest and continuous feedback. Having used various methods to obtain feedback for many years, in 2016 we reintroduced our global employee survey. Based on the results, strategic focal topics were identified and corresponding initiatives derived. In October 2017, another employee survey was conducted in 22 languages and the status of implementation reviewed. Around 42,100 employees (84%) took part. Our Group-wide score, which shows how attached our employees feel to the company, was 59%. We are thus on a par with other pharmaceutical and chemical companies. As of 2018, these results will be incorporated across the Group.

1 Merck also has employees at sites which are not fully consolidated subsidiaries. These figures refer to all people directly employed by Merck and therefore may deviate from figures in the financial section of this report.
FOSTERING INNOVATIVE POTENTIAL
Innovation is absolutely essential to the success of a science and technology company. Curiosity and a focus on new ideas provide a fruitful basis for innovation and have a positive impact on company performance. The modular Innovation Center in Darmstadt, which opened in 2015, offers our employees the opportunity to embrace new ideas and work on select projects in an inspiring environment. Sufficient scope and adequate support, also in the form of a suitable working environment, actively promote the innovative strength of our employees. Apart from initiatives to generate ideas and advance projects, the Innovation Center offers our employees various training courses on topics such as innovative methods and developing business models. Internal project teams, start-ups from our Accelerator program as well as many interested colleagues from various areas throughout Merck benefit from this offer. Recently, the training courses offered by the Innovation Center were digitalized, making them available to all employees worldwide.

VALUING CULTURAL DIVERSITY
Our success is based on courage, achievement, responsibility, respect, integrity and transparency. These values determine how we perform our work daily, the way in which we approach challenges, as well as our dealings with customers, business associates and colleagues. Openness and respect characterize our company culture. The objective is to create a culture of mutual respect and esteem in which the strengths of a diverse workforce and individual differences are appreciated.

The Chief Diversity Officer and a council of high-ranking executives from all business sectors and select Group functions play a key role in strategically defining and managing our diversity and inclusion policies. Their work focuses on operationalizing the resolutions we passed in 2015 on the topics of diversity and inclusion. Key elements of this are recruiting people representing a breadth of qualifications, skills and experiences, developing and retaining them. In addition, we support specific employee networks in order to foster exchange among like-minded individuals. Apart from our women's networks in various countries, we also support networks that promote the interests of the LGBTIQ community as well as Afro-American and foreign employees.

In September 2017, the Group-wide Diversity Days were held for the sixth time with a campaign entitled “Different Perspectives”. Various events and activities took place to heighten awareness of diversity and inclusion among our workforce. Globally, employees in 32 countries across six continents took part in numerous events and shared their experiences on the intranet and in social networks.

As a global employer with intercultural expertise, people from a total of 131 nations work for Merck; 23.2% of our employees are German citizens and 74.9% work outside Germany. At our headquarters in Darmstadt, 11% of our staff comes from 89 different countries. Women currently make up 43.1% of the workforce. However, the ratio of women to men varies widely across the different regions, businesses and functions. We are therefore working to raise the proportion of women wherever they are underrepresented, taking into account the situation typical for the industry as well as regional differences.

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

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

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

A HOLISTIC RECRUITMENT APPROACH
When filling job vacancies, we pursue a holistic recruitment approach coupled with globally uniform and binding procedures. This starts with an internal job posting before external channels such as job portals and recruitment agencies are used. On the one hand, this process enables us to offer employees better development opportunities, and on the other hand it minimizes the costs of external recruitment. For employees with leadership responsibility, we offer targeted interview coaching to support them in selecting candidates and to establish uniform quality standards.
A globally accessible welcome portal is available to new employees in order to help them prepare for their new job at Merck and to support their onboarding phase. To further improve the onboarding process, various initiatives were started in 2017. For instance, supervisors, Human Resources and new employees can already exchange information and documents before the employee’s first day of work. In addition, all new employees are assigned an experienced colleague who can help them to familiarize themselves with the daily working routine. Our managers are also given detailed information such as onboarding plans and process descriptions to support them with this task.

VOCATIONAL TRAINING TO RECRUIT YOUNG PEOPLE
In 2017, we again maintained a constant, high vocational training rate in Darmstadt, our largest site. A total of 535 young people were enrolled in apprenticeships in 23 different occupations at our headquarters in 2017. 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. We also offer vocational training at other sites in Germany, in which a total of 53 apprentices participated in 2017.

We promote the professional expertise of our apprentices through numerous regional and global project activities. In 2017, these included supporting a center for homeless children in South Africa. Furthermore, through our “Start in die Ausbildung” program, we help prepare young people who have not been able to find an apprenticeship. With a total of 20 young people between the ages of 16 and 25 in 2017, the number of participants was slightly lower than in the previous year. Although they have a school leaving qualification, they had been searching for an apprenticeship for at least one year without success.

Since 2016, we have also been working on a specially developed program to help refugees enter the job market. As part of the “Integrating refugees through training” program, a further group of 12 young people who were forced to flee their home countries started linguistic, technical, cultural, and job-specific training to prepare them for vocational training and thus for the labor market.

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

Global classroom training courses and workshops developed specifically for teams help our employees develop and build individual abilities in line with new requirements and perspectives. In 2017, more than 5,700 employees participated in global classroom training courses to prepare themselves for new opportunities and challenges. Digital solutions in the form of more than 4,000 e-learning and languages courses are available to our employees. To enable our employees to realize their full potential, we also provide local business- and function-related offers. All measures are documented in a development plan introduced globally.

Individual development opportunities are also supported by a new job architecture, which was introduced in 2017. It applies globally and enables us to harmonize all positions and to simplify their classification. This job architecture defines three fundamental and equivalent career paths: managers, experts and project managers. Employees who wish to advance in their careers and aim for a top position within the company can also do so via the expert and project manager career paths.

Building empowered leaders
One of the major duties of our leaders is to motivate and encourage employees to show their innovative strength. A dialogue in a spirit of partnership, the development of strategic competencies and the continuous further development of our leaders help to build trust and to strengthen our company’s success over the long term.
**STRATEGIC COMPETENCY DEVELOPMENT**
A transparent competency model is a further pillar of our personnel development efforts. Managers and employees should show strategic competence by being purposeful, future-oriented, innovative, results-driven, collaborative, and empowering. By demonstrating these qualities, our leaders can build a strong culture of collaboration based on curiosity, creativity and trust. In addition, our leaders are expected to set an example, for instance by living the Merck values and taking responsibility for their own decisions. To assess the performance and potential of every individual and to establish an effective leadership culture, regular and differentiated feedback is of utmost importance. This way, employees and supervisors can develop a shared vision, execute the business strategy and further develop a unifying culture.

**PERSONNEL DECISIONS BASED ON DATA AND FACTS**
Digitalization and data-based decisions are also taking hold in Human Resources management at Merck, particularly with respect to the development and use of personnel management tools. With People Analytics, Human Resources has developed a modern, data-supported approach that features greater transparency and deeper insights into relevant personnel information from the businesses and Group functions. It is based on globally integrated data management and state-of-the-art analytics. People Analytics supports our managers with data and facts that can serve as the basis for major personnel decisions. This makes it possible to advise the company management more precisely and purposefully in its decision-making. People Analytics helps Human Resources to build strategic advisory capacities.

Additionally, we introduced predictive analytics based on the data now available, which enables us, for example, to identify factors that have a substantial impact on employee turnover.

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

At Merck, many teams work across sites and internationally. The diversity of competencies and experiences among the team members offers tremendous potential that our leaders can make use of. Internationality and a global mindset characterize our company culture and are therefore mirrored by our international management team.

In 2017, 64.4% of our executives were not German citizens. Altogether, 65 different nationalities are represented in such positions. Our goal for the period until 2021 is to maintain the proportion of female leaders at a stable level of 30%, and we are working to further increase the representation of women in leadership positions and business units where they are still underrepresented. To achieve this objective, in 2017 we formed special teams that are responsible for developing goals and measures at departmental level to help us move female candidates into positions in different areas and hierarchies. At the end of 2017, women occupied 30.3% of leadership roles Group-wide. These figures are steadily increasing across the company as a whole, but not consistently across business units, Group functions and hierarchical levels. The report on stipulations to promote the proportion of women in leadership positions at Merck KGaA pursuant to section 76 (4) and section 111 (5) of the German Stock Corporation Act can be found in the Corporate Governance section of this report.

**MANAGEMENT PROGRAM FOR EXECUTIVES**
We use targeted advanced training to further the professional career paths of our top talent and senior executives. One of the aims of the nine-month International Management Program is to promote global thinking among aspiring executives and to strengthen their leadership competencies. In cooperation with top international universities, the Merck University has been offering a multi-regional, modular program since 1999. To date, 373 members of top management have taken part. Furthermore, Merck 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 people managers in India and Latin America, which focuses on business management and Merck-specific topics. This program is also offered in China as well as in Europe for the Middle East and Africa region, with participants from a variety of countries and regions such as Africa, the Middle East, Japan, and Russia. Moreover, in 2017 we ran the Managerial Foundation Program for new people managers in 21 countries with 917 participants, and the Advanced Management Program, which was attended by 179 experienced people managers in four countries.

In 2017, we once again 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 2017. In addition, we recruited highly qualified external executives in order to add new perspectives to our long-standing in-house expertise.
**Differentiated solutions to support employee well-being**

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

**FOSTERING WORK-LIFE BALANCE**

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

A healthy work-life balance is a crucial precondition for the performance ability and motivation of our people. That is why we offer our employees at many sites around the world flexible and innovative working models. The “mywork@merck” working model allows employees at the German sites in Darmstadt and Gernsheim to freely choose their working hours and location in agreement with their teams and supervisors. In addition, we also introduced “mywork@merck” for Merck Accounting Solutions & Services Europe GmbH, Merck Export GmbH, Merck Schuchardt OHG, Merck Selbstmedikation GmbH, Merck Versicherungsvermittlung GmbH and Merck Chemicals GmbH. Employees no longer record their time electronically and must only document their hours if they exceed their standard working hours within the agreed working time framework. At the end of December 2017, a total of 5,267 employees made use of this model. In 2017, 4.6% of our employees worldwide worked part-time, 10.7% of whom are men.

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

**A TRANSPARENT AND FLEXIBLE EMPLOYEE REWARD SYSTEM**

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

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

Worldwide, we offer various benefit packages to meet the different needs of our employees using well-established programs. Focusing more closely on individualized fringe and social benefits in the future will continue to enable our employees to individually choose those benefits that best meet their personal situation and stage of life.

**A CONSTANT FOCUS ON HEALTH AND SAFETY**

Workplace safety and health protection are a very high priority at Merck. It is especially important to us to do everything in our power to prevent workplace-related illnesses and accidents. We apply the lost time injury rate (LTIR) as an indicator to determine the success of measures aimed at accident prevention as well as occupational health and safety. This key performance indicator describes the number of workplace accidents resulting in lost time of one day or more per one million working hours. After having reached the goal of 2.5 that we had set in 2010, in 2015 we set ourselves a new, ambitious goal: By 2020 we intend to sustainably lower the LTIR to 1.5. With an LTIR of 1.5 in 2017, we attained this goal.

Since 2010, we have been using the “BeSafe!” program to further expand our occupational safety activities. Uniform standards as well as local modules to meet specific safety requirements at individual sites can help to improve conditions. 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 2017, we continued to sensitize our employees to workplace hazards through numerous awareness campaigns.

Since 2010, Merck 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 2017, it was awarded to 59 out of 97 sites.
### OVERVIEW OF EMPLOYEE FIGURES¹

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<tr>
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<tbody>
<tr>
<td><strong>Number of employees</strong></td>
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<td></td>
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<tr>
<td>by region</td>
<td></td>
<td></td>
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<tr>
<td>Asia-Pacific (APAC)</td>
<td>11,096</td>
<td>10,754</td>
<td>11,294</td>
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<tr>
<td>Europe</td>
<td>23,429</td>
<td>24,438</td>
<td>25,980</td>
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<td>Middle East and Africa (MEA)</td>
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<td>1,045</td>
<td>1,097</td>
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<tr>
<td>North America</td>
<td>9,794</td>
<td>10,037</td>
<td>10,520</td>
</tr>
<tr>
<td>global, total</td>
<td>49,613</td>
<td>50,414</td>
<td>52,941</td>
</tr>
<tr>
<td><strong>Number of employees (FTE - full-time equivalents)</strong></td>
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<td></td>
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<tr>
<td>by region</td>
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</tr>
<tr>
<td>Asia-Pacific (APAC)</td>
<td>11,068.2</td>
<td>10,725.3</td>
<td>11,272.1</td>
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<tr>
<td>Europe</td>
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<td>23,727.1</td>
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<td>Latin America</td>
<td>4,344.2</td>
<td>4,136.5</td>
<td>4,046.2</td>
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<tr>
<td>Middle East and Africa (MEA)</td>
<td>940.6</td>
<td>1,041.8</td>
<td>1,096.1</td>
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<tr>
<td>North America</td>
<td>9,772.4</td>
<td>10,022.0</td>
<td>10,506.7</td>
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<tr>
<td>global, total</td>
<td>48,911.1</td>
<td>49,652.7</td>
<td>52,223.5</td>
</tr>
</tbody>
</table>

| **Number of countries** | 66                             | 66                             | 66                             |
| **Number of legal entities** | global, total                  | 211                           | 215                           | 217                           |
| **Number of nationalities** | global, total                  | 122²                         | 129                           | 131                           |
| **Number of nationalities working in Germany** | 77²                           | 91                            | 97                            |
| **Percentage of employees with German citizenship** | 26.1%                         | 23.1%                         | 23.2%                         |
| **Percentage of employees working outside Germany** | 75.9%                         | 75.3%                         | 74.9%                         |
| **Percentage of employees with global managers** | 8.1%                          | 9.7%                          | 10.2%                         |
| **Percentage of women in the workforce** | global, total                  | 41.6%                        | 42.8%                         | 43.1%                         |
| **in Germany** | 38.2%                        | 38.6%                         | 39.1%                         |
| **Percentage of women in leadership positions (= role 4 or higher)** | global, total                  | 26.8%                        | 28.8%                         | 30.3%                         |
| **in Germany** | 27.3%                        | 28.7%                         | 29.7%                         |
| **Percentage of executives (= role 4 or higher)** | global, total                  | 5.9%                          | 5.7%                          | 7.9%                          |
| **Percentage of executives who are not German citizens** | 61.0%²                       | 64.7%                         | 64.4%                         |
| **Number of nationalities** | 64²                           | 70                            | 65                            |
| **Number of apprentices in Germany** | 506¹                         | 576¹                          | 588¹                          |
| **Vocational training rate** | 5.3%                           | 5.1%                          | 4.4%                          |
| **Number of employees in the “mywork@merck” model (Germany)** | 4,122                         | 4,507                         | 5,267                         |
| **Percentage of employees working part-time** | global, total                  | 4.7%                          | 4.7%                          | 4.6%                          |
| **Men** | 11.3%                        | 10.6%                         | 10.7%                         |
| **Percentage of employees aged 17-29 years** | global, total                  | 15.2%                         | 14.7%                         | 14.5%                         |
| **Percentage of employees aged 30-49 years** | global, total                  | 62.6%                         | 62.5%                         | 62.1%                         |
| **Percentage of employees aged 50+** | global, total                  | 22.2%                         | 22.8%                         | 23.4%                         |
| **Average age globally** | 41.1                          | 41.3                          | 41.4                          |
| **Asia-Pacific (APAC)** | 36.7                          | 36.7                          | 36.9                          |
| **Europe** | 42.4                          | 42.4                          | 42.5                          |
| **Latin America** | 39.5                          | 39.9                          | 40.3                          |
| **Middle East and Africa (MEA)** | 39.5                          | 39.3                          | 39.4                          |
| **North America** | 44.2                          | 44.3                          | 44.1                          |
| **Germany** | 43                            | 42.9                          | 43                            |
| **Average length of service** | global, total                  | 10.0                          | 9.9                            | 9.8                            |
| **Average length of service in Germany** | 14.4                          | 14.2                          | 14                            |

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

²Excluding Sigma-Aldrich.

³Relates only to Merck KGaA (around 19% of the workforce of the entire Group in 2015).

⁴All Merck sites in Germany (around 25% of the workforce of the entire Group in 2016 and 2017).

⁵Not including Sigma-Aldrich legal entities in Germany or Allergopharma.