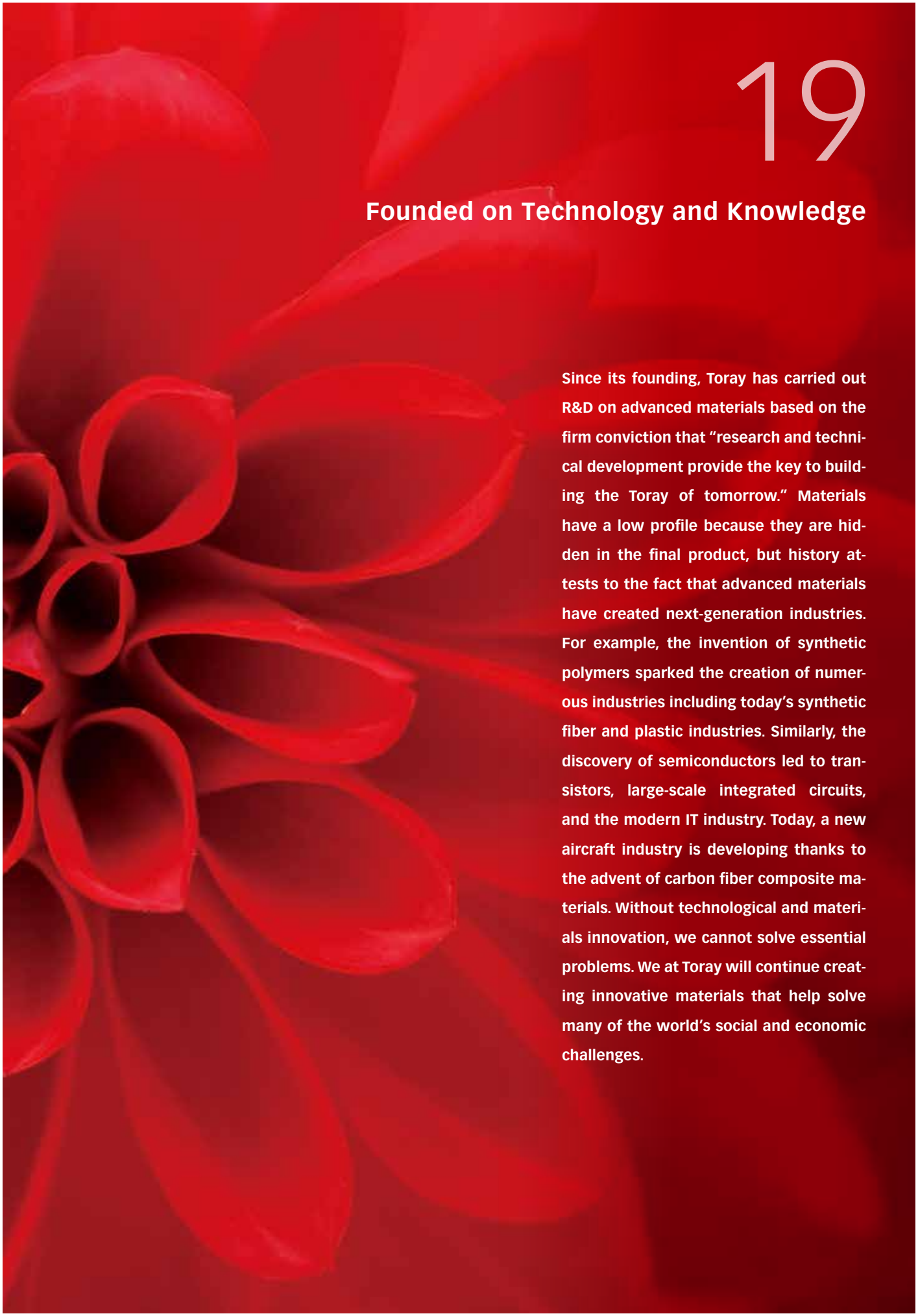

19

Founded on Technology and Knowledge

Since its founding, Toray has carried out R&D on advanced materials based on the firm conviction that "research and technical development provide the key to building the Toray of tomorrow." Materials have a low profile because they are hidden in the final product, but history attests to the fact that advanced materials have created next-generation industries. For example, the invention of synthetic polymers sparked the creation of numerous industries including today's synthetic fiber and plastic industries. Similarly, the discovery of semiconductors led to transistors, large-scale integrated circuits, and the modern IT industry. Today, a new aircraft industry is developing thanks to the advent of carbon fiber composite materials. Without technological and materials innovation, we cannot solve essential problems. We at Toray will continue creating innovative materials that help solve many of the world's social and economic challenges.

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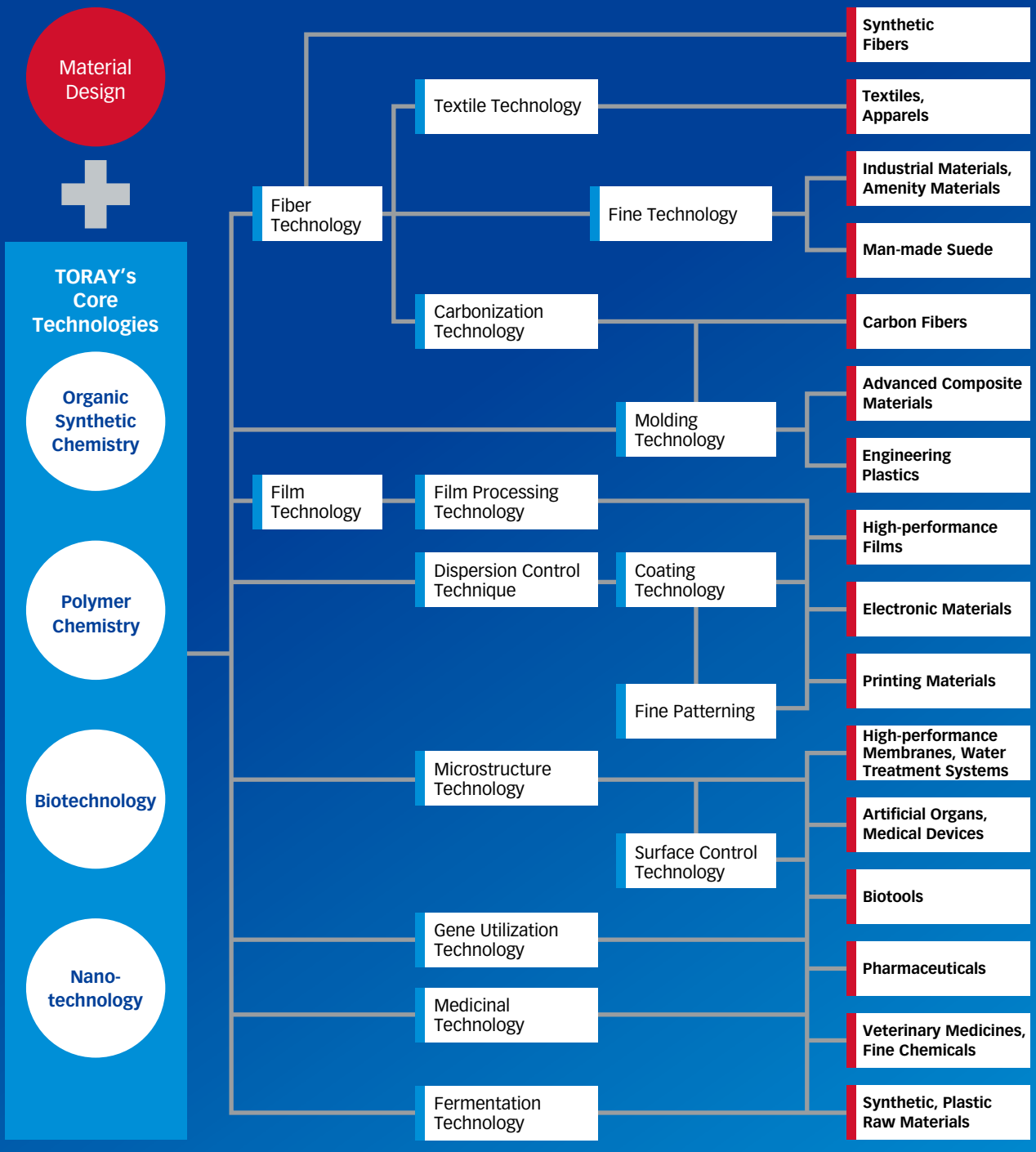
Toray's Technical Fields

Fusing Core Technologies to Develop Advanced Materials

Toray Group's core technologies are "organic synthetic chemistry," "polymer chemistry," "biotechnology" and "nanotechnology." Based on these, we are working toward greater depth and fusion of fundamental technologies such as polymerization, yarn-making, fibers application processing, film processing, and organic synthesis, while expanding our operations from fibers and textiles to films, chemicals, and plastic resins. We are also creating advanced materials and developing businesses in the fields of electronics & information materials, carbon fiber composite materials, pharmaceuticals, medical devices, and water treatment.



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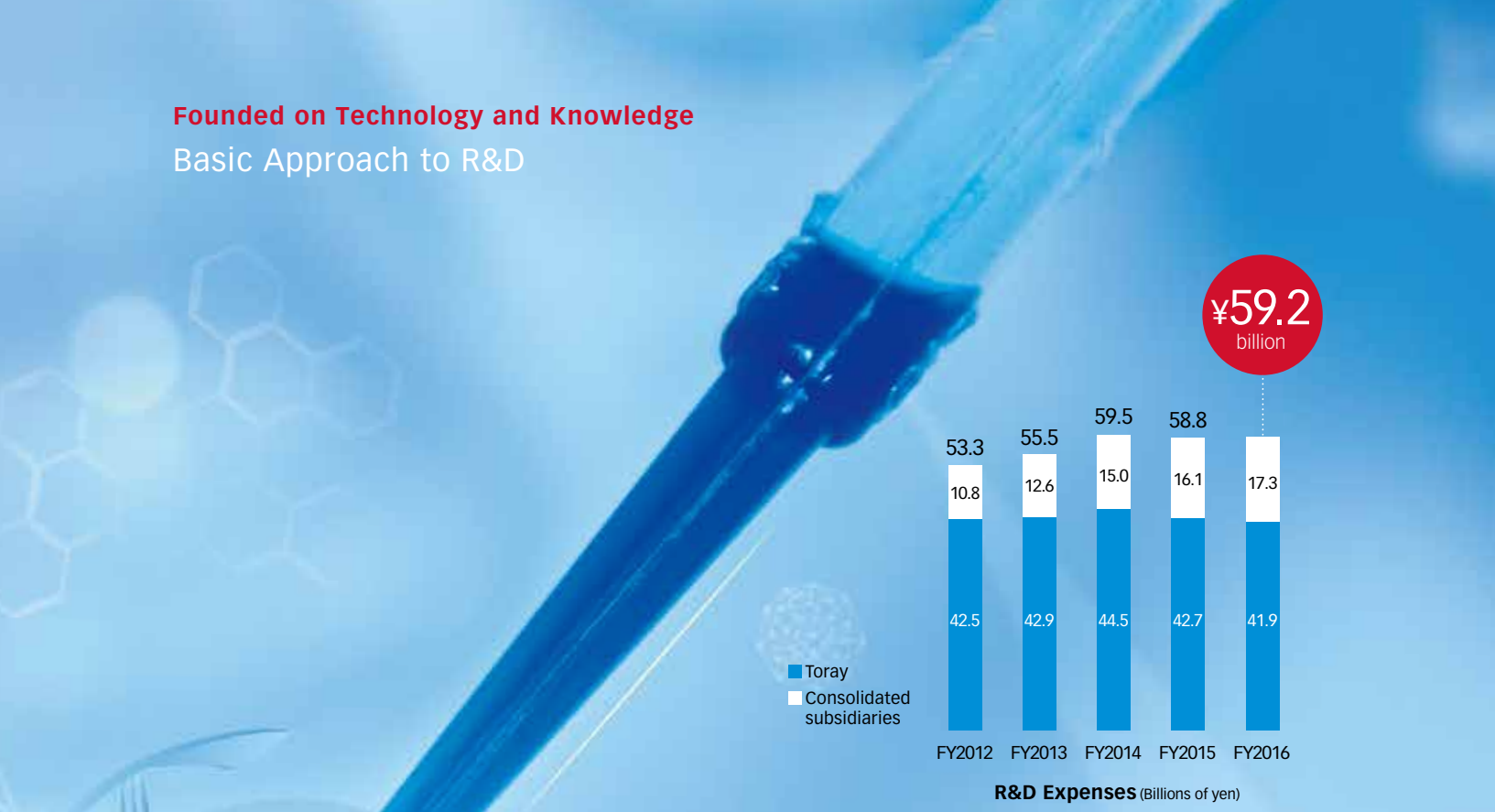
Basic Approach to R&D



R&D Expenses (Billions of yen)

Persistent Efforts Based on Insight into Material Value

It inevitably takes a certain amount of time to develop and commercialize a material. As an example, Toray began research on carbon fibers in 1961. Commercial production began 10 years later in 1971, and today these fibers are used in numerous aircraft, such as the Boeing 787. Many overseas chemical companies withdrew from development of carbon fibers or scaled down their efforts, but Toray saw their potential value as a material, and worked persistently, developing the business through applications such as fishing rods and golf shafts. While we were building cashflow and refining our technology, we worked with the long-term goal of the eventual application of carbon fibers in aircraft. This ability to foresee value in materials together with our strong commitment to persist forms the basic approach and real strength of our research and development at Toray.

The Philosophical DNA of Toray Researchers and Engineers: "The Deeper, the Newer"

The phrase, "The Deeper, the Newer," has been passed down as a key phrase at Toray, and is part of the philosophical DNA of our researchers and engineers. The concept underlying this is that when you dig deep into something, the result will be new discoveries and inventions. We are always in pursuit of the ultimate limits. This pursuit of R&D cannot be achieved with a complacent attitude; it must be based on an understanding of the needs of society and with a grand vision of the times. Only then can we create genuinely innovative materials that have value to society and the economy.

Basic Policies and Strategies

Our basic policy of research and development is to strengthen the stable revenue base and increase revenue of our Core Growth Driving Businesses while continuing to produce advanced materials in Strategically Expanding Businesses and Intensively Developing and Expanding Businesses. Fundamental to this is organic growth based on deepening and fusing our core technologies, and further, through open innovation with high synergistic effects. Based on our "Project AP-G 2019" medium-term management program, we will create new technologies and materials focusing on our Green Innovation and Life Innovation businesses. Moreover, we aim to put the intrinsic values of these new technologies and materials to practical use.

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Fiscal 2016 Topics

Development of TORAYCA® Prepreg for Next-generation Aerospace Applications

We at Toray have developed the world's highest performance prepreg (resin-impregnated carbon fiber sheet), TORAYCA®, which has 30% improved tensile strength and impact resistance compared with conventional materials, for next-generation aerospace applications. Toray has been supplying the aerospace industry with high-performance TORAYCA® 3900 series prepregs, particularly for primary aircraft structures, for more than 20 years. We have now developed a high-performance thermosetting matrix resin series, including the 3940 matrix resin, which solves a difficult trade-off problem and combines a high level of elasticity and toughness. A new composite material of this matrix resin and the world's highest strength carbon fiber, TORAYCA® T1100G provides an improved tensile strength and impact resistance of 30% over conventional materials, and greatly improves the mechanical properties such as compression strength and peel resistance. Depending on the type of application, there is a possible weight reduction of up to 20%. This is expected to further improve the efficiency and reliability of aircraft parts such as the main wing, fuselage and engine parts.

Technological Demonstration of Cellulosic Sugar-manufacturing System Using Membranes

Toray, in a joint venture with Mitsui Sugar Co., Ltd., has started a technological demonstration to manufacture cellulosic sugar—a raw material used for producing various biochemical products—from the bagasse (sugar cane biowaste) generated at sugar mills in Thailand. The technological demonstration is part of the research and technical development of a bioprocess using membranes that combines Toray's water treatment membrane and biotechnologies. The bioprocess using membranes is a technology enabling the production of high quality, low cost cellulosic sugar from inedible biomass. It also saves 50% energy in manufacturing by using water treatment membranes in the saccharification and refining processes.

Commencement of Clinical Trial of Cancer Drug in the United States

Toray was allowed by the United States Food and Drug Administration (FDA) in February 2017 to commence a Phase I clinical trial of TRK-950, a therapeutic agent for solid cancer, the first such trial to be originated by Toray. TRK-950 is a monoclonal antibody preparation that recognizes and attacks cancer cells. Currently, we are promoting its global clinical development, including in Europe and the United States, seeking prompt marketing approval of a first-in-class cancer treatment drug.

R&D Achievements by Segment

Fibers & Textiles

We at Toray have developed a polyester textile, which is moderately bulky and stretchable with a smooth and flexible texture characteristic of ultra-fine micro-crimped fibers, using our innovative composite spinning technology NANODESIGN®. We are also working on product development of hitoe®, a functional material for vital signs monitoring, and have started a service for protecting workers by continually monitoring the biological information of the wearer.

Plastics & Chemicals

We have made a world-first innovation by developing a super-tough polyamide material that is difficult to break, even under impact, and maintains its strength and rigidity. We achieved this by incorporating a movable cross-link structure in which the molecular bond can slide, enabling it to disperse applied force at the molecular level. Moreover, we have obtained approval to manufacture and market DORNER® to treat feline chronic kidney disease. This drug is the first of its kind in Japan and was developed utilizing much accumulated basic and clinical data for DORNER®.

IT-related Products

Toray has developed a waterless UV printing system using water-soluble inks, a very eco-friendly approach to printing as it uses no volatile organic solvents. The system is made possible through the use of a newly designed hydrophilic polymer and TORAY waterless plates. We also have been awarded the 63rd Okochi Memorial Production Prize (fiscal 2016) by the Okochi Memorial Foundation for our photosensitive polyimide for the insulating layer in an organic electro luminescence display.

Carbon Fiber Composite Materials

We have developed the world's highest performance TORAYCA® prepreg. We were awarded the 65th CSJ Award for Technical Development (fiscal 2016) by the Chemical Society of Japan for development of high performance CFRP with the use of epoxy resin NANOALLOY® technology applying reaction-induced phase separation.

Environment & Engineering

Toray, in collaboration with the University of Tokyo Institute for Solid State Physics, shed new light on water mobility in reverse osmosis (RO) membrane pores. This has opened the way for developing innovative energy saving RO membranes. Moreover, our development of highly functional RO membranes was awarded both the Minister of Economy, Trade and Industry Award and the Minister of the Environment Award at the 15th Green Sustainable Chemistry (GSC) Awards.

Life Science

Toray has commenced a Phase I clinical trial of TRK-950, a therapeutic agent for solid cancer, in the United States. In Japan, we have obtained manufacturing and marketing approval for OD tablets as an additional orally disintegrating tablet formulation of REMITCH® CAPSULES 2.5 μg, used for treating pruritus in hemodialysis and chronic liver disease patients.

– REMITCH® is a registered trademark of Torii Pharmaceutical Co., Ltd.

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Research and Development Framework

Technology Center: Our Headquarters for R&D

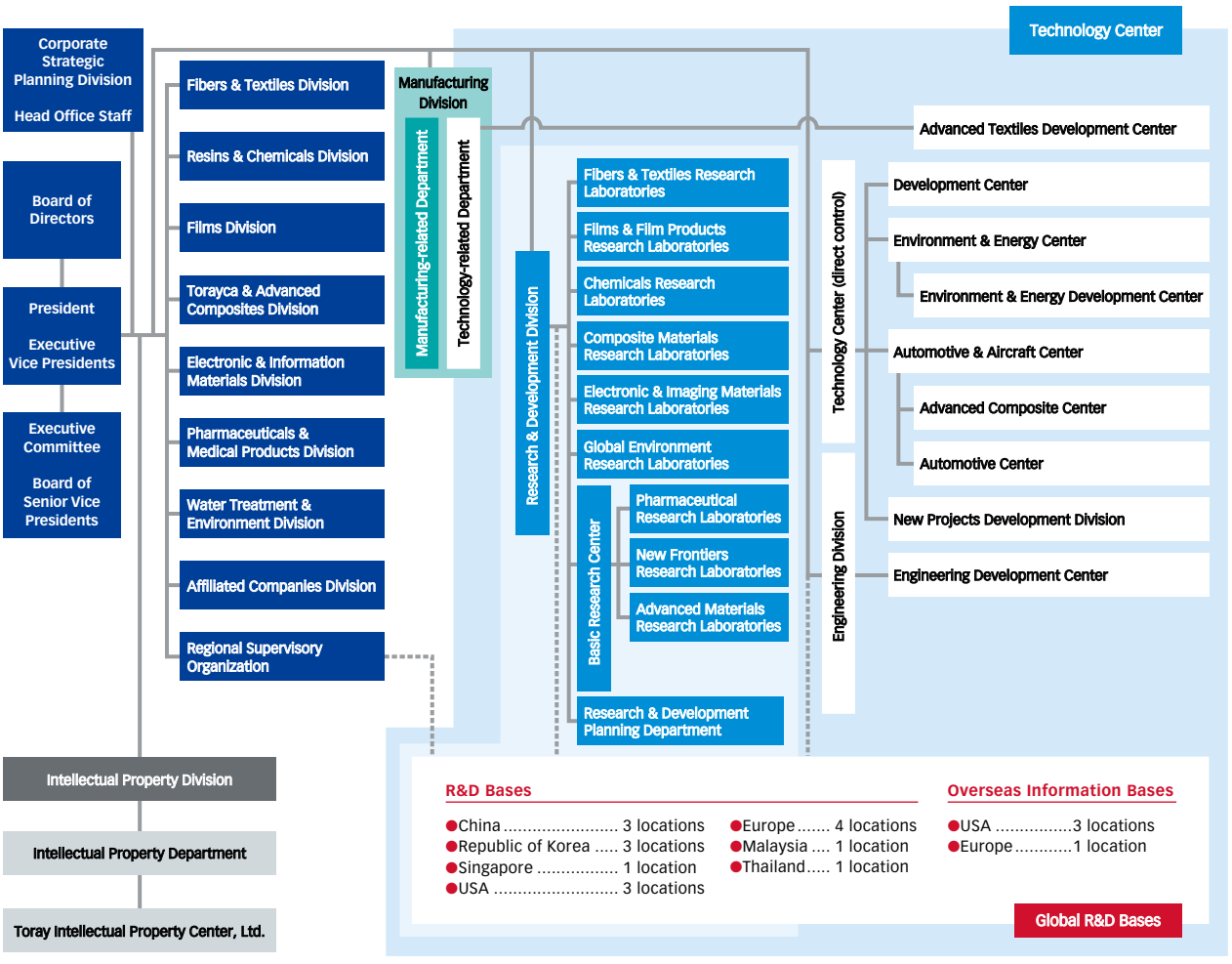
The Technology Center is the headquarters for all of our research and technical development capabilities at Toray Group, and it serves as our international headquarters for R&D. By having so many experts from so many fields in one undivided R&D organization, the fusion of technologies gives birth to new technologies, and we can solve an issue in one business field by applying the entirety of our technical expertise from a range of fields. Moreover, we are building a framework to enable various advanced materials and technologies created for use in one field to be rapidly applied to other fields.

Promoting Open Innovation

We are promoting open innovation in collaboration with customers, business partners and external organizations at our Automotive & Aircraft Center, our base for developing advanced materials for automotive and aircraft application, and at our Environment & Energy Center, which is an organization for technological collaboration in the environmental and energy fields.

Our center for life innovations is our Life Innovation Business Strategic Planning Department, with offices in Kobe, Hyogo Prefecture, Japan and Minnesota, U.S. It works closely with the Technology Center and with domestic and international medical institutions, laboratories and medical equipment companies.

Toray Group R&D Framework



(As of June 2017)

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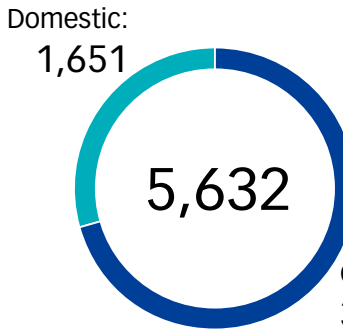
Intellectual Property

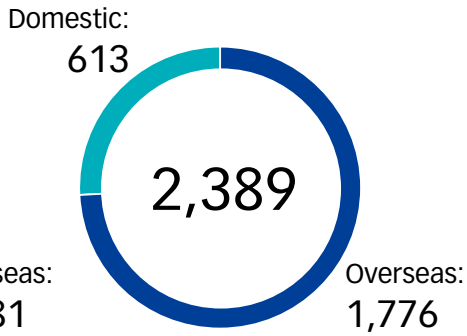
The Toray Group recognizes intellectual property as an important management resource. Our intellectual property strategy takes a trilateral approach, organically coordinating with our R&D strategies and business strategies. While continuing to create innovative new materials and technologies, Toray Group will promote intellectual property strategies consisting of the four points below in order to build barriers to entry that will protect the results of our R&D and firmly maintain our technological advantages.

1. **Further enhance the quality of patents**
2. **Construct a globally competitive patent portfolio**
3. **Protect the Company's technical advantages with effective measures including strategic patent applications**
4. **Cultivate personnel with deep knowledge of overseas intellectual property**

Toray Group is currently stepping up patent applications and rights acquisitions and constructing a strong patent portfolio with a priority in the growth areas of the "Project AP-G 2019" medium-term management program's Green Innovation Business Expansion (GR) Project and Life Innovation Business Expansion (LI) Project. Moreover, with an aim of expanding and advancing our business globally, Toray Group is formulating and pursuing intellectual property strategies correlated with the business strategies and R&D strategies we are implementing globally with a focus on growth countries and regions.



Toray Patents Filed in Fiscal 2016



Toray Patents Held to Date

Toray publishes an annual Intellectual Property Report describing the intellectual property initiatives by the Toray Group.

The report is available for download at:

➡ **http://www.toray.com/ir/library/lib_005.html**