75 YEARS

IMAGE: ABBERIOR INSTRUMENTS

PATENT SOLUTIONS

TEXT: ROLAND WENGENMAYR

Finding applications for scientific discoveries that hold promise for medicine and technology is the goal of Max Planck Innovation. The agency for technology transfer was a global pioneer in helping researchers patent and license inventions and found startups. Its history includes many successes, a financial crime thriller, and a major crisis.

An invention for new insights: The STED microscope depicts details of cells at a resolution previously thought impossible. Here it makes the tubulin filaments (yellow) and actin (blue) of a cytoskeleton visible in great detail, thus contributing to a better understanding of their role in cellular locomotion. Max Planck Innovation helped market the invention.

They are two of the most important inventions from the Max Planck Society: discoveries made by Axel Ullrich, Director at the Max Planck Institute of Biochemistry in Martinsried until 2016, are the reason people can survive kidney cancer today. And developments from a team led by Jens Frahm at the former Max Planck Institute for Biophysical Chemistry (Karl Friedrich Bonhoeffer Institute) have reduced from hours to minutes the amount of time patients have to lie still in MRI machines. Not only do both inventions contribute to progress in medicine, but the corresponding patents are among the most lucrative in the history of the Max Planck Society (MPG). Sutent® brought in EUR 165 million during its term, while the Flash technique Frahm helped develop earned EUR 155 million.

An ever increasing number of researchers at the MPG are contributing to patents or founding companies. However, technology transfer requires professional knowledge to succeed, because international patent registrations and company formations are complicated. That's where Max Planck Innovation GmbH (MI) in Munich comes in. After all, transferring technology to the economic sector from basic research at the Max Planck Institutes is a very unique challenge. It often involves completely new technologies, and developing them to the point of market readiness is like running a marathon. A scientific discovery that could lead to a new product must be patented as soon as it is made. "We might be 15 years away from market readiness," confirms Jörn Erselius, Managing Director of MI. The primary goal of basic research is to publish results in scientific journals, but a patent can't simply be registered later, because after publication the inventions are no longer patentable. As a result, with a patent term of 20 years, the inventors and the Max Planck Society are often left with only a few years to profit from licensing income. But Erselius emphasizes that MI is primarily concerned with benefiting society. "Of course

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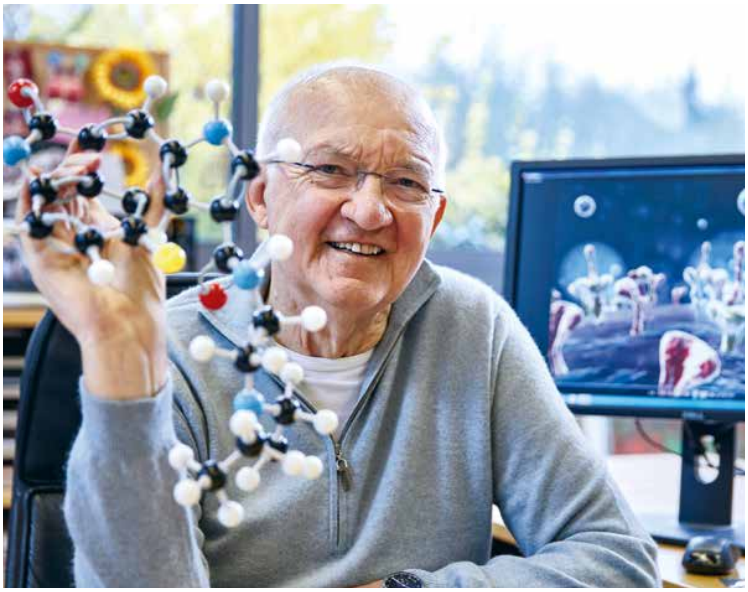

PHOTO: HEINZ TROLL

A basic researcher with an eye for applications: Axel Ullrich holds up a model of the substance Sunitinib, which causes some cancer cells to die off. It was developed based on findings from his group. Since 2006, Pfizer has marketed the active ingredient in the drug Sutent®.

we also want to earn money for the Max Planck Society, but we're more concerned with what becomes of the technologies."

The social benefit of technology transfer was known as far back as the 1970s. That decade saw the founding of Garching Instrumente GmbH, the precursor to Max Planck Innovation. Jaromír Balcar studied this early phase as a guest scientist at the Max Planck Institute for the History of Science. By international standards, the research organization was very early out of the gate with regard to technology transfer, explains Balcar. Especially compared to the U.S. "There were small technology transfer organizations at individual American universities, but the boom didn't come until the Bayh-Dole Act." The Act came into effect in the U.S. in 1980 and gave universities the right to market their inventions.

Balcar explains that the idea of founding an organization for technology transfer arose at the Max Planck Institute for Plasma Physics (IPP) in Garching. Because plasma research aims to generate energy from nuclear fusion, it breaks new ground technologically and develops new devices. This offers potential for the industry, which is why the IPP considered marketing as far back as 1967. Though initially hesitant, the MPG was likewise attracted to the idea of a central agency that could support the Institutes when registering patents. However, the question arose whether commercializing research results was compatible with the organization's public-benefit status. "It was a sore point," emphasizes Balcar. As a result, the MPG consulted the Bavarian state government to determine the most suitable legal structure. The Garching Instrumente Gesellschaft zur industriellen Nutzung von Forschungsergebnissen mbH, or GI for short, was founded on March 20, 1970.

The managing directors were Ernst Guilino, a physicist from the IPP, and Gunther Hoeltz, a businessman with industry experience. Together they built a company with 35 employees. Not only did it market patents from the Max Planck Society through licenses, but it also manufactured devices that had been developed at the Institutes. The equipment division was very important to both directors, because it brought in revenue immediately. With patents, however, it took many years before the money started flowing in. The external impact of Garching Instrumente in international professional circles was enormous. Before long, the directors were being invited to deliver lectures at European and American research facilities. "They were considered pioneers in the transfer of findings from basic research," explains Jaromír Balcar.

However, the device business was so unprofitable that a crisis occurred at the end of the 1970s. It would have spelled the end of Garching Instrumente, if a political wind favorable to technology transfer had not blown from the realm of science. The former Federal Ministry of Research praised the activities of the MPG as "exemplary." The latter therefore decided to downsize Garching Instrumente and continue it solely as a patenting and licensing agency. After restructuring, the portfolio of patents and licenses, which had been growing steadily since the 1970s, yielded enough income to cover the debts within a few years. Business didn't always go smoothly, however.

SUMMARY

Since 1970, the Max Planck Society's agency for technology transfer, known today as Max Planck Innovation GmbH, has commercialized knowledge and inventions from Max Planck Institutes and helped researchers patent and license inventions and found startups. The cancer drug Sutent®, which is based on a discovery at the Max Planck Institute of Biochemistry, earned a record-setting EUR 165 million in licensing income for Max Planck Innovation, while the Flash technique for improved MRI imaging earned EUR 155 million.

The mid-1980s even saw the beginnings of a real-life financial crime thriller involving the aforementioned Flash technology. The problem with magnetic resonance imaging (MRI) at the time was that patients had to lie still in the tube for a very long time for an image. A team in Göttingen led by physicist Jens Frahm overcame this disadvantage. Bernhard Hertel at Garching Instrumente helped register the Flash method for a patent as quickly as possible. Just how wise that was would become clear that very same year. "It must have been in August 1985, at a conference in London," Hertel recalls. "General Electric had already implemented the procedure in a showroom model there!" A patent dispute began in the U.S. and Europe and would go on for seven years. To the industrial giant's surprise, the MPG could not be intimidated. Drawing on the internal competence at the Max Planck Society, it won an initial trial. After that, the big manufacturers gave in: first Siemens, then Philips, and eventually General Electric. From the mid-90s onward, licensing income flowed bountifully for the Max Planck Society.

Just a few years earlier, a paradigm shift had occurred in the organization's approach to technology transfer. "Up to that point, no Max Planck scientist had been allowed to participate in the founding of a company," says Erselius. The reasoning behind this was to avoid possible conflicts of interest. That changed in 1988, when Axel Ullrich was appointed Director of the Max Planck Institute of Biochemistry in Martinsried. The biochemist was a pioneer in the production of genetically engineered insulin and had optimized the procedure at the American company Genentech. That was the big breakthrough in the industrial production of human insulin.

In consequence, Ullrich knew the American ethos with regard to founding companies, and he only agreed to accept the appointment if allowed to found and participate in companies as a Max Planck scientist. "And so the spell was broken," says Erselius. In Martinsried, Ullrich's team discovered a class of kinases that, among other things, play a role in the blood supply of tumors. Garching Instrumente initially contacted the now-defunct pharma giant Hoechst and other pharmaceutical companies in Germany, reports Erselius, "but none wanted to cooperate." As a result, Ullrich's team partnered with New York University to found the startup Sugen in San Francisco. Based on Ullrich's research, Sugen developed the active ingredient Sunitinib for a cancer drug now marketed by Pfizer under the name Sutent®. In 1993, shortly after Sugen began, a company was finally founded in Germany. Under the name Evotec, it, too, was active in the life sciences industry. Its primary driving force, with support from GI, was Manfred Eigen, Director of the Max Planck Institute for Biophysical Chemistry (Karl Friedrich Bonhoeffer Institute) in Göttingen. In 1967 he had already received a Nobel Prize in Chemistry at 40. The founding was based on a high throughput method Eigen had developed to efficiently test the biological effects of countless substances in an evolutionary process. It speeds up the search for new pharmaceutical agents, for example. Today, Evotec has more than 5000 employees worldwide and is based in Hamburg.

"We've made it our motto to be trendsetters in technology transfer in Germany."

JÖRN ERSELIUS

The 1990s saw a boom in life sciences, which accounted for around 70 percent of all spin-offs at the time. That's according to Ulrich Mahr, who is responsible for spin-offs as Deputy Managing Director of MI. As the dot-com bubble burst at the end of the millennium, however, it became harder to find investors for biotech startups. "Today, this area accounts for around 50 percent of total investment," says Mahr. Other startups were founded, for example, in the field of physics. Two Nobel Prize winners come into play again here: Theodor Hänsch, Director at the Max Planck Institute of Quantum Optics in Garching, and Stefan Hell, Director at the Max Planck Institute of Biophysical Chemistry in Göttingen, which in 2022 became part of the new Max Planck Institute for Multidisciplinary Sciences.

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THE RESEARCH PROGRAM "HISTORY OF THE MAX PLANCK SOCIETY"

From 2014 to 2022, independent historians reconstructed the development of the Max Planck Society between 1948 and 2002, placing the history of the MPG within the contemporary history of the Federal Republic in the context of European and global developments.

Theodor Hänsch, who was awarded the Nobel Prize in Physics in 2005, had developed a laser technique he dubbed the "frequency comb." This method allows light frequencies to be measured optically. It had never been possible before, because light oscillates very quickly. To market the frequency-comb technique, Hänsch founded Menlo Systems in Planegg in 2001 with his two former doctoral researchers, Ronald Holzwarth and Michael Mei. Now numbering almost 200 employees, the company quickly established itself on the market for ultra-precise measurement. Its customers include metrological institutes around the globe, for example, the National Metrology Institute (Physikalisch-Technische Bundesanstalt) in Braunschweig.

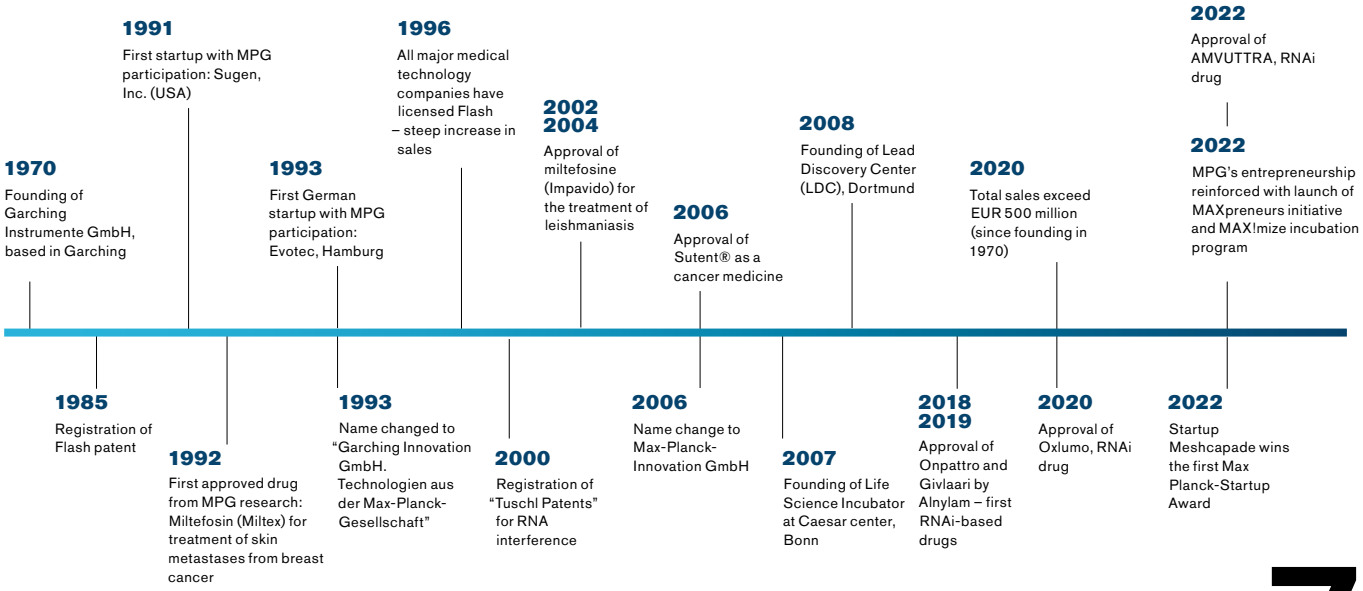
High resolution microscopy technique

Stefan Hell achieved a breakthrough much like Theodor Hänsch's – one that had long been considered impossible. The physicist, who received the Nobel Prize in Chemistry in 2014, did away with the Abbe diffraction limit. Formulated by Ernst Abbe in 1873, this law asserted that the wavelength of light limits the resolution of optical microscopes. And because it is much larger than an individual molecule, it should not be possible to observe the latter with light microscopes. In life sciences, molecules are labeled with fluorescent dyes, so that their activities in living cells can be observed. The microscope images remained blurry due to the diffraction limit, however. Hell managed to circumvent this limit using quantum physics and specially shaped laser light. This technique facilitates images of the molecular inner workings of a cell with hitherto unrivaled sharpness. On the basis of this invention, Hell founded two companies in the early 2010s with physicist Gerald Donnert as managing director: Abberior Instruments manufactured supermicroscopes that worked with lasers, and Abberior produced new fluorescent dyes. "With their own shareholder capital, both companies established themselves in a market where they had to compete against major players such as Zeiss, Leica, and Olympus," says Mahr.

Up to this point, technology transfer has clearly been dominated by men. However, female scientists have been closing the gap ever since. One example is chemist Katharina Landfester, Director of the Max Planck Institute for Polymer Research in Mainz. She holds around 60 patents and has developed, for instance, a refined method for manufacturing tiny nanocapsules. These are useful, for example, in viticulture, where they can ensure that fungicides are applied in precise and environmentally friendly doses. Another area of application is the targeted transport of medicinal agents in the body. Landfester is working on this with Mainz-based vaccine developer Biontech, among others.

The agency for technology transfer has changed its name twice in more than fifty years. In 1993, the misleading term "Instrumente" was removed from the name and the company was renamed Garching Innovation GmbH. Technologien aus der Max-Planck-Gesellschaft. In 2006, the company was rechristened with the name it still holds, Max-Planck-Innovation GmbH. By that time, the MPG had overcome its concerns

OVER 50 YEARS OF MAX PLANCK INNOVATION

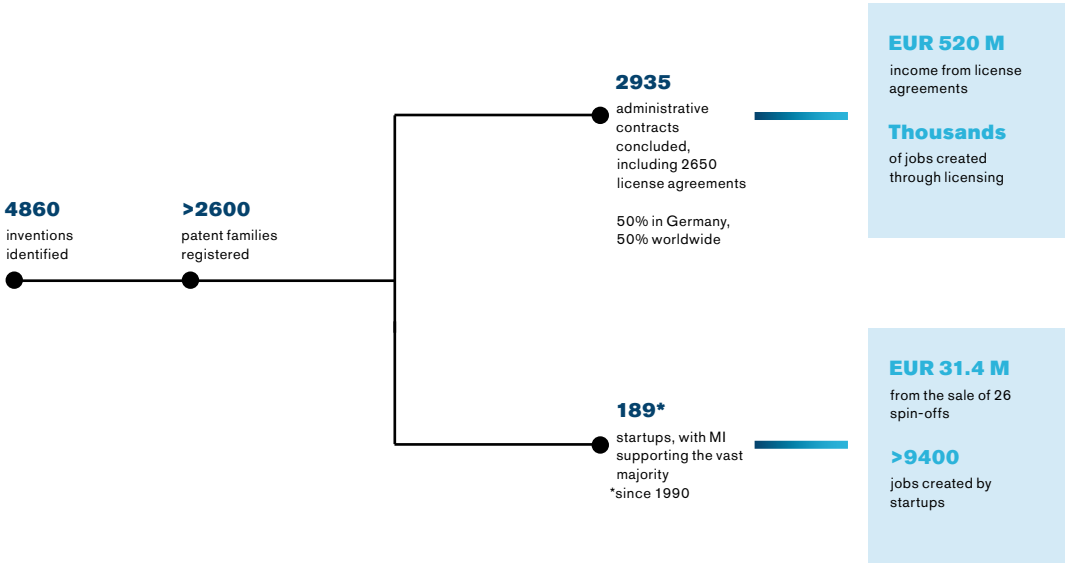


about appearing in a company name. From then on, technology transfer would be unmistakably connected with it. In the new millennium, a milestone was set in 2008 with the founding of the Lead Discovery Center (LDC) in Dortmund. This was a response by Axel Ullrich and Max Planck Innovation to the fact that, since 2000, it had become increasingly difficult to interest the pharmaceutical industry in early inventions from basic research. Together they established the LDC, for early drug development with the MPG as a stakeholder. "Lead" stands for the lead structure of an agent. "Such a substance is already optimized," explains Erselius, "and has exhibited the correct function in animal models." That reduces the risk for pharmaceutical companies that may be interested. This strategy hardly suffices anymore, however, which is why the Lead Discovery Center in addition began founding startups with support from MI. These companies develop the active ingredients up to the clinical stages, and big companies can then license them later or even purchase the startup. The most recent milestone for MI is the MAX!mize initiative, launched in 2022. This incubation program provides even more intensive support for the founding of companies from Max Planck Institutes. Researchers can apply here with ideas, which then receive support from MI until a company is founded. One important aspect is early contact with potential customers, even while the founders are still developing the business idea. This reality check plays a decisive role in success. And indeed, incubators like these help increase the number of spin-offs. "Five to ten years ago we typically had five to seven spin-offs a year. The numbers fluctuated, of course," explains Mahr. "Today it's eight to ten, with an upward trend." Most of the companies form in Germany, but several highly successful ones were founded in the U.S., where there is significantly more capital for startups. "Roughly speaking, 50 percent of the technologies developed in the Max Planck Society are licensed abroad, and 50 percent stay here," says Erselius. "We've made it our motto to be trendsetters in technology transfer in Germany." LDC and MAX!mize from Max Planck Innovation is yet one more example.

PHOTO: KIMBERLY KOBER

Maximum support: Dandan Li (left) and Philipp Schmidt (center), who in 2023 founded Quantitative Surgical, a spin-off of the Max Planck Institute for Intelligent Systems, get advice from Carolin Wichmann of Max Planck Innovation (right) as part of the MAX!mize program. The company provides organ models for training surgeons.

MAX PLANCK INNOVATION IN FIGURES



GRAPHIC: GCO, BASED ON MAX PLANCK INNOVATION