MAX PLANCK News

PHOTO: CORBIS

From the world of science to the business arena: More and more researchers are charting this course. Every fourth scientist who takes his or her findings to the patent stage goes on to found a company.

PATENTS PAY THEIR WAY

Business Ideas from the Laboratory

Every fourth scientist whose research findings flow into patents goes on to found his or her own company. In other words, successful scientists are also active as entrepreneurs – as a survey conducted by the Max Planck Institute of Economics in Jena has ascertained. This means that Nobel Prize laureate Theodor Hänsch is in good company: the physicist is the co-founder of MenloSystems, the company that transforms his invention – the frequency comb – into marketable products.

Of course it is worthwhile to invest in research – after all, knowledge is the resource of the 21st century. At least, that is what is reiterated in every future-oriented speech. Whether advances in science actually generate more economic growth, however, is not quite as clear. There are also a number of politicians who criticize that the essential motivation that drives the work of many scientists is to excel in the number of their publications in renowned journals – and the prospect of a Nobel Prize nomination. According to the

critics, the output of the knowledge factories at universities and independent research organizations is basically being stockpiled, as the scientific findings are not disseminated beyond the circles of the initiated, and are not in demand or required by the economy and society.

David Audretsch and his colleagues at the Max Planck Institute of Economics have disproved this position – at least with regard to those scientists who apply for patents. Here, a quarter of the applicants go on to found their own company, exploiting their findings and inventions as business ideas. While the survey focuses on cancer researchers in the United States, the scientists in Jena are convinced that their results can basically be applied to Germany as well.

Audretsch and his team analyzed data provided by the American National Cancer Institute, which commits a major share of its annual budget of 4.8 billion dollars to supporting cancer research. Among the funded projects, the German researchers picked the fifth that had attracted the largest funding sums between 1998 and 2002 – which represents just under 1,700 scientists, 400 of which had applied for their own patents.

"Scientific excellence is a prerequisite for economic success," says David Audretsch, Director at the Max Planck Institute of Economics.

Photo: Norbert Michalke

"We are aware that our random sample may have affected the results of the survey," states David Audretsch. It may well be that the researchers who receive the most funding also produce the best results, which, in turn, can be best exploited in economic terms. "Personally, I feel that scientific excellence is a prerequisite for economic success, and that mediocre or average scientists found fewer companies," continues Audretsch. "On the other hand, some experts hold the opinion that outstanding scientists have no time to commercialize their findings in a company."

The Max Planck researchers investigated primarily how scientists go about exploiting their findings economically. In the United States, this usually involves offices that organize the technology transfer from research facilities to the business arena. In most instances, companies acquire licenses in order to advance inventions to the stage of profit generation. "These organizations operate with widely varying degrees of success," explains Audretsch. The relevant office at Stanford University is very enterprising and ensures that companies pick up on a wealth of scientific findings – as Theodor Hänsch recalls from his time at Stanford. In addition, many companies are founded in the vicinity of the university, which comes as no surprise for David Audretsch. "Scientists from a renowned university will find it a great deal easier to access venture capital." In addition to venture capital, which is actually disbursed as liquid funds, researchers also need "social capital" if they want to become entrepreneurs. For David Audretsch and his colleagues, this means how readily and how well a scientist is capable of communicating and cooperating with colleagues. "In such cases, the scientist then tends to profit from the experience of others, and can access the knowledge he lacks through others," explains Audretsch. "Unfortunately, we have very limited data about this."

Among other things, his group evaluated the number of patents company founders applied for, as well as the frequency with which they published their findings with other authors – compared to scientists who had not ventured into the business world. Company founders had in fact applied for more patents and also participated in issuing more joint publications. Audretsch assumes that German researchers are also active as entrepreneurs; their number, however, remains to be determined. "The conditions for founding companies are probably better in the United States at present," the economist relates, "but the conditions here can also be changed."

Physicist Theodor Hänsch is convinced, however, that the spirit of enterprise is generally less pronounced in Germany than in the United States. And this must change, as Peter Gruss, President of the Max Planck Society, is also convinced. "It is not enough to have ideas; they have to be put into practice. The current study shows the conditions under which knowledge and findings from basic research can be transformed into applications and find economic utilization."

Just how knowledge transfer from laboratories to enterprises can be facilitated is David Audretsch's central focus. And he also has a solution at hand: "What we need is better knowledge filters." This denotes the criteria to be applied in assessing the economic viability of ideas. The "Innovation Fund for German Research" (IFDF) could also work with these criteria. The concept behind the fund was designed by Garching Innovation, a subsidiary of the Max Planck Society that was set up to pave the way for the economic utilization of technologies stemming from the Max Planck institutes. In many instances, the respective ideas have not yet been developed to the stage of market maturity.

And this is precisely where the newly initiated funds enter the picture, contributing public sector means. Naturally, not every idea will be eligible for funding, as not every idea will be suitable for generating sound profits. "But researchers should be spared the fate of SAP's founders," says Audretsch. They originally presented their ideas to IBM, but were shown the door. Not a bad thing in the end: they simply founded their own company. ●

Foundation Board Adopts Concept

Approval for caesar

In a meeting held at the beginning of June, the "caesar foundation board" decided in favor of the structural concept presented by the Max Planck Society for the further strategic development of the research center in Bonn. The concept entails a connection to the Max Planck Society while retaining the status of caesar as a registered foundation with legal capacity, as well as a scientific focus on the key fields of neurodegeneration, neuroregeneration and neurosensors/neuroprosthetics, and close integration into the regional environment.

The caesar (center of advanced european studies and research) research center was founded in 1995 as a registered foundation with legal status based on the Berlin/Bonn Act. In establishing and operating a research center oriented to natural sciences and engineering sciences based in Bonn, the aim was to promote forward-looking and pioneering technologies.

The Scientific Council conducted an evaluation in 2004. According to the resulting assessment, "all in all, caesar has failed to meet its ambitious aims in a satisfactory manner," and a lack of integration into the national and international research environment was perceived. Consequently, the Council recommended defining a new orientation of the institution with regard to content and organization.

At the end of 2004, the founders requested the Max Planck Society, within the context of a Presidential Commission, to devise a viable structural concept for the future strategic development of the research center, giving special consideration to economic aspects and existing competencies.

In January 2006, the report of the Presidential Commission, on which the current adopted concept is based, was presented to the founders. According to this concept, in the future, caesar will be more strongly networked throughout the region. Both the scientific and the structural arrangement enable and require close cooperation with research facilities within and outside of universities, as well as with the economy. In addition, there are also plans to establish a life sciences incubator.

The successful implementation of these plans hinges on the support and the commitment of the federal state of North Rhine-Westphalia, as well as on regional facilities. All researchers who will not be able to remain with caesar in the future due to their particular topic focus will be given the opportunity to complete their work in an appropriate manner.

The founders, as well as other facilities in the region, have promised their assistance and support in this context. The new concept is to be realized incrementally. In the next step to be taken, the governing bodies of the Max Planck Society will be addressing the proposals. Subsequently, a temporary scientific head will be appointed.

"In transferring the scientific responsibility to the Max Planck Society and applying its proven scientific principles to the research center, the core competencies of the Max Planck Society – namely conducting excellent basic research in a manner that encourages ensuing applications – will be fully utilized," as Peter Gruss, President of the Max Planck Society stated.

The Max Planck Society appreciates the trust demonstrated by the founders of the caesar research center. In connection with the transfer of responsibility by the founders, the MPS will be implementing the present concept and the associated new scientific orientation of caesar "in the very near future." ●

Photo: Ullstein Bild – Intro Flohe

Charting a new course: In the future, the caesar research center will focus on the fields of neurodegeneration, neuroregeneration and neurosensors/neuroprosthetics.

THE HALO PROJECT

Climate Research Is Gaining Altitude

German climate researchers are looking forward to taking their work into completely new dimensions: At the German Aerospace Center (DLR), the scientists and numerous guests attending a welcoming event were able to gain a first impression of HALO, the ultra-modern, high-altitude research aircraft of the future. As a so-called "green aircraft," the Gulfstream G 550 had just landed in Oberpfaffenhofen and taxied to park in front of the DLR hangar. Starting in 2009, the modified business jet will join the German Aerospace Center's fleet and undertake measurement flights on a global scale – also in the service of the Max Planck Society.

Leading-edge science investigating the atmosphere at high altitudes: the new HALO research aircraft.

HALO: These four letters stand for High Altitude and Long Range Research Aircraft and are a clear mission statement – top notch, leading-edge research for the benefit of society as a whole . Together with the other centers of the Helmholtz Association, the Max Planck Society and the German Research Foundation, the German Aerospace Center is ushering in a new generation of aircraft. In terms of ceiling height, range and payload, HALO offers major advantages over the research aircraft operating to date.

HALO will be able to take twice the volume of scientific equipment on board by comparison with the Falcon 20-E research aircraft that has been serving the German Aerospace Center for the last 30 years and that is now reaching the end of its service life. With a ceiling in excess of 15 kilometers and a range of more than 8,000 kilometers, HALO will, for the first time, enable measurements to be conducted on a continental scale, in all latitudes from the tropics to the poles, and at altitudes extending up to the lower stratosphere.

The climate researchers hope that the work they will be conducting on board the jet will deliver a wealth of new findings – for example on the transition zone between the troposphere and the stratosphere, which has previously been difficult to access. Extending up to an altitude of 16 kilometers, this region has a major influence on the atmospheric energy balance and the transport of trace gases. Moreover, the influence of cirrus clouds at high altitudes also holds tremendous significance: they can amplify or attenuate climatic effects, and the vapor trails and aerosols from the continuously rising number of commercial aircraft impacts these cirrus clouds with as-yet-unknown consequences. Operating at high altitudes, HALO will conduct measurements geared toward quantifying these critical factors.

The company RUAG Aerospace, based on the airport grounds at Oberpfaffenhofen, has been tasked with making the modifications required to transform the business jet into a full-fledged research aircraft. Over the course of the next one and a half years, it will cut special apertures for air intakes and outlets into the jet's fuselage, as well as windows for remote sensing equipment, and set up a special power supply system for scientific applications. Then the aircraft will be painted in the colors of the German Aerospace Center at the Gulfstream plant in Savannah (USA). Following the respective testing and approval flights, the aircraft will be commissioned in 2008.

The HALO project has been enabled by the Max Planck Society, the members of the Helmholtz Association of National Research Centers, and a number of scientific institutes engaged in research on the atmosphere. A total of 31 research institutes are participating in the project. As the operator of Europe's largest civil fleet of research aircraft, the German Aerospace Center will be acting as the general coordinator in the conversion of the Gulfstream jet to the HALO research aircraft.

Committing a sum of 47.5 million euros, the Federal Ministry for Research and Technology will be covering the lion's share of total costs for HALO, equal to some 70 percent. The Helmholtz Association and the Max Planck Society will assume the remaining costs, while the federal state of Bavaria will contribute 1.8 million euros. ●

PHOTO: DLR

"JUGEND FORSCHT" COMPETITION

Of Maggots, Bacteria and Algae

In mid-May, 135 boys and 49 girls traveled to Freiburg, where the final round of the government-sponsored "Jugend forscht" (youth research) competition was decided. Taking place for the 41st time, the high-profile competition awards work performed in seven different research areas. This year's event featured a completely new dramaturgy, which was designed to better highlight the award donors and recipients alike. As a donor, the Max Planck Society was called on for the first time to honor all of the award winners in the biology category. Matthias Hölzer (19) from Thuringia emerged as this year's winner and received the winner's certificate as well as the 1,500 euros in prize money directly from Max Planck Director and Nobel laureate Erwin Neher.

In deciding on the first five places in the various subject categories, the jury was faced with a highly informative, but also arduous task: over three days, the best junior researchers from the individual German states presented a total of 108 projects at their small, trade-fair-like stands. The frontrunners were then announced in a ceremony skillfully presented by ZDF news anchor Steffen Seibert.

Instead of the prior year's procedure of proceeding through the subject categories of the world of work and ergonomics, chemistry, mathematics/information technology, biology, physics and technology, as well as geo- and aerospace sciences, this year's approach took a more exciting excursion through all categories according to placements. To start, all of the fifth- to second-placed participants were called on stage before the winners of each category gathered together.

Flies as a source of antibiotics? The mention in the brochure on the winners of the "Jugend forscht" competition sounds like a case of imagination run wild. Flies carry and transmit bacteria and fungi. But what kind of resistance do the insects develop against these pathogens? In answering these questions, the winner of the biology category, Matthias Hölzer, initially identified the pathogens found on flies. Subsequently, he positioned various types of flies on different nutrient substrates that were inoculated with bacteria or fungi.

The young laboratory technician from the vocational school for health and social professions in Jena discovered that the emerging maggots were actually able to eliminate the pathogens on one of the experimental substrates. The strongest antibiotic potential was evident during the pupal stage. Matthias Hölzer sees the potential to extract active agents from fly maggots in the future, and to systematically employ them to combat diseases caused by microorganisms.

Fly maggots as a source of antibiotics? The fact that hatched maggots not only transmit fungi and bacteria, but can also combat them, was proved by 19-year-old Matthias Hölzer from Jena, whose work took first place in the biology category of the nationwide "Jugend forscht" competition.

Carsten Reinhard (18) from the Lloyd-Gymnasium in Bremerhaven took second place. In observing butterflies for over a year in Bremerhaven's Speckenbüttel Park and the adjacent railroad areas, he determined their preferred food plants and collected weather data and information on changes in the biotopes. In doing so, the young biologist found types of butterflies that had never been documented in northern Germany before, and developed measures to improve their habitat conditions.

In third place, Romy Kunzmann (16), from the Carl-Friedrich-Gauß-Gymnasium in Frankfurt an der Oder, focused on 150 of her fellow students. She prepared nasal swabs to determine the share of persons infected with *Staphylococcus aureus* bacteria or with the related MRSA bacteria. While the latter were conspicuous by their absence, she identified *Staphylococcus aureus* bacteria that, in a number of cases, proved resistant to antibiotics – a characteristic more typical of MRSA bacteria. As possible causes, the young researcher was able to identify frequent medication, smoking, vaccination, various immunodeficiences and intensive competitive sports.

Florian Freier from the Mildred-Scheel-Schule in Böblingen took fourth place in the biology segment. In his scientific work, the 20-year-old investigated whether dihydroartemisinin (DHA), a highly reactive derivative of the active agent artemisinin, which stems from *Artemisia annua* plants, is effective against cancer cells. He succeeded in demonstrating that the radical generator DHA acts on the cell cycle regulation of tumor cells, triggers programmed cell death, and even increases the effectiveness of radiation.

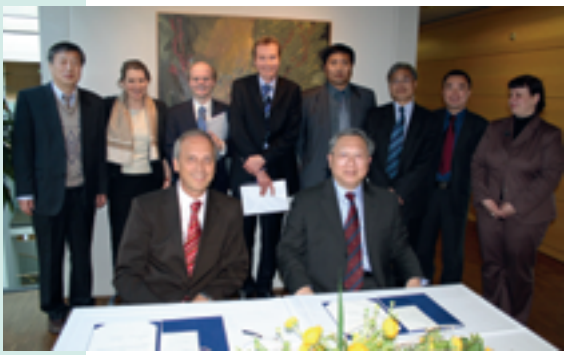
Christina Kronenberg, Kim Annchen Tappe and Marielouise Sander, a trio of girls from Wilhelmshaven, took fifth place in the biology segment. The junior researchers took a closer look at Lake Banter, which is plagued every summer by phytoplankton blooms and ensuing bans on recreational use and swimming. The growth experiments conducted with the toxic cyanobacterium *Nodularia spumigen*, proved that the warm summer weather periods, as well as the combination of phosphate and nitrate in the water, induce the massive proliferation. ●

PHOTO: JUGEND FORSCHT

Pinboard

FRANZ-ULRICH HARTL has a penchant for chaperones – not only as a pure object of research, but also as a rewarding pursuit. The Körber Foundation has now honored the Director at the Max Planck Institute of Biochemistry in Martinsried with the European Research Prize, which is endowed with 750,000 euros. The award recognizes his discoveries in the area of protein folding, in which helper molecules, or so-called chaperones, play a key role. In biological systems, protein molecules regulate nearly all vital functions. But before they become active in cells, the individual sections of the protein must first acquire a certain three-dimensional form. In most instances, the proteins need chaperones for this, as Hartl and his team first proved in 1989. The chaperones prevent faulty folding or undesirable contact with other molecules that would subsequently agglomerate. Hartl's findings are not only key for the biotechnological production of protein molecules, but they are also especially important for the treatment of diseases such as Alzheimer's or Parkinson's disease. The experiments conducted by the Max Planck researchers proved that the artificial proliferation of chaperones prevents the malformation of important key proteins.

THE PRESIDENTS of the Max Planck Society and the Chinese Academy of Sciences, Peter Gruss and Lu Yongxiang, have now forged a bridge for junior scientists. They recently signed an agreement in Munich on the joint education and training of doctoral students at Max Planck institutes and International Max Planck Research Schools. By way of the targeted introduction of excellent Chinese doctoral students to research facilities and universities in Germany and Europe, the aim is to further extend the cooperation between the two partner organizations. And the President of the Chinese Academy of Sciences (CAS) is certainly well aware of the significance and scientific value of this exchange. Lu Yongxiang, who studied mechanical engineering in Hangzhou, went on to earn his doctorate at RWTH Aachen University. The presidents agreed on the following arrangement: the 20 best doctoral students out of the 5,000 doctoral students admitted annually to the Chinese doctorate program will be offered the opportunity to conduct their doctoral studies at the Max Planck Society. The program will commence in the fall of 2006, with each organization assuming an equal share of funding.



Agreement concluded: Max Planck President Peter Gruss and President of the Chinese Academy of Sciences (CAS) Lu Yongxiang signed an agreement on the joint education and training of Chinese doctoral students.

A QUARTER OF A CENTURY after its foundation, the Max Planck Institute for Mathematics in Bonn staged a major celebration – and confirmed a frequently heard rumor. Word has it that keen minds for mathematics are often endowed with considerable musical talent. Consequently, the event's background program featured performing artists whose mathematical prowess was matched by their superb musicality. Founding Director Friedrich Hirzebruch gave an account of the early years of the institute, which emerged from a special research area of the University of Bonn and was subsequently conceived as a guest research institute based on the example of the American Institute of Advanced Studies in Princeton and the French Institut des Hautes Ètudes Scientifiques in Bures-sur-Yvette. Here, mathematicians from all over the world have the opportunity to devote themselves to their own research projects, free of the constraints of duties at their own institutions and universities. The fact that this opportunity is wholeheartedly welcomed is reflected by the following figures: every year, an average of 350 to 400 foreign scientists make their way to the Max Planck building that is located in the center of Bonn and that offers structured doctoral student education in connection with the International Max Planck Research School for Moduli Spaces. Considering the achievements of the past 25 years, it comes as no great surprise that Gerhard Faltings, Managing Director at the Max Planck institute, proudly claims: "The heart of mathematical research beats in North Rhine-Westphalia."

ATHLETES aren't the only professionals who aspire to gold medals – scientists like them too. Since May, Simon White, Director at the Max Planck Institute for Astrophysics, is the proud holder of a very special distinction. The UK native and currently most frequently cited astrophysicist recently received the highest honor bestowed by the Royal Astronomical Society of England (founded in 1820) for his essential research on the emergence of cosmic structures in the early phases of the universe. His work paved the way for the development of the model of cold dark matter with a cosmological constant, which has since become the established standard model of the universe.

Photo: Susanne Beer