

NEW MEASURING TOWER IN SIBERIA

Climate Researchers Aloft

In the no-man's-land of the endless Siberian taiga, the Max Planck Society has constructed a steel tower measuring 300 meters tall. Its purpose is to measure Siberia's carbon balance and the impact of the European continent on the world's climate. Packed with analytical equipment, the structure is about as tall as the Eiffel Tower, soaring above a region of forest that still remains largely untouched by human hand. Researchers at the Max Planck Institutes for Biogeochemistry in Jena and for Chemistry in Mainz are now beginning their measurements.

There's not a soul to be seen far and wide: this was the principal reason for selecting this location at the remote intersection of the 60th parallel with the 90th meridian. Chemists, ecologists and atmospheric researchers needed a site undisturbed by industrial fumes and other effects of civilization to measure the concentration, mixture ratios and fluctuations in gases and aerosols that affect our climate, including carbon dioxide (CO₂), methane and nitrous oxide. This project, which is scheduled to run for at least 30 years, will shed light on Siberia's contribution to climate change. The vast forests that cover this area are of enormous importance for the global carbon cycle. According to the Max Planck researchers from Jena, they hold around 10 percent of all organic carbon and account for between 5 and 10 percent of global photosynthesis.

Some 65 percent of Siberia's forests are growing on permafrost. Only the surface of these soils thaws during the warmer seasons; a few meters below, the ground remains frozen. Plant matter rots extremely slowly, and as a result, these re-



High in the sky above the Siberian taiga soars the steel tower of the ZOTTO research station. Max Planck researchers at the station are investigating the interaction between global warming and greenhouse gases. The 300-meter-high mast allows measurements to be taken in the "mixed layer," a homogeneous layer of air that screens out the fluctuating greenhouse gas effects of ground level vegetation.

For the climate experts at the ZOTTO station, this is science at the end of the world. Krasnoyarsk, the nearest town of any size, is 500 kilometers away.



gions hold large quantities of wood and other matter, and therefore also CO₂. If rising temperatures were to make the soil thaw to a greater depth or for longer periods, bacteria could mount a more sustained attack on the humus, releasing more methane, CO₂ and other gases – "with potentially serious consequences," warn the Max Planck researchers and many of their colleagues worldwide. On the other hand, higher temperatures could lead to more plant growth, which, in turn, would store more CO₂. Whether the Siberian boreal forest absorbs or releases more climate-damaging gases is as yet unclear.

Apart from their impact on greenhouse gases, however, the Siberian woods also contribute to atmospheric aerosol pollution. Particularly the numerous forest fires in Siberia create vast smoke plumes charged with soot particles, which affect the radiation balance, cloud formation and precipitation. The impact of these processes on the regional and global climate is also not yet completely understood. The new mast – named ZOTTO (Zotino Tall Tower Observation Facility) – is expected to provide an important supply of data. The huge structure also complements an already existing network of around 30 measuring stations that are dotted across Europe. These, in turn, are part of the CarboEurope project through which the EU aims to clarify the role of the European continent in the global carbon cycle.

The Max Planck Society is partnered in Siberia by the Forest Institute of the Russian Academy of Sciences in Krasnoyarsk, since foreigners are not permitted to purchase land in Russia. "Our Russian colleagues also want to be involved in operating the station," says Claudia Hillinger, research coordinator at the MPI for Biogeochemistry in Jena. It was here that the idea for the project was born.

It is essential for the mast to soar high above the Siberian pine forest so the measuring instruments truly record only the wide-area gas concentrations. Close to ground level there are far too many fluctuations: soil bacteria release nu-

merous gases as they breathe, and plants engage in photosynthesis; the resulting short-term changes in the ground level CO₂ concentration affect the analysis of gas flows and balances.

Such local fluctuations cannot be excluded even with measuring instruments positioned slightly above the tree canopy. "That's why the new tower is so much higher, in an attempt to measure at the next level, the so-called planetary boundary layer of the atmosphere," Hillinger explains. There is much more turbulence in

these high-altitude layers, so measurements produce the desired average values. They can yield meaningful results for an area of up to a million square kilometers.

"And we also need the data to test and improve our computer simulations," says the research coordinator. Many scientists use computers to model the distribution of temperature, gas, vegetation and clouds for forecasting purposes. However, these numerical models have to be tested at regular intervals to confirm whether the calculations coincide with actual readings.

Apart from the inhabitants of a small village 15 kilometers away and the researchers themselves, very few people are likely to get near the 1.7-million-euro mast. A map of the world shows China and Mongolia lying some 1,200 kilometers to the south. The Kara Sea lies 1,800 kilometers to the north, and the Urals are equally far to the west. To the east of the tower, the most notable feature of the map is its emptiness – until one comes to the Sea of Okhotsk, 3,000 kilometers away. The only features suitable as landmarks are the Yenisei River and the town of Krasnoyarsk 580 kilometers to the south. Satellite photos show the tower surrounded by nothing but marsh and forests of evergreen conifers.

The red and white structure is triangular with extensive internal bracing. Steel ropes guy the mast to the ground to withstand the severe storms of winter. Due to the extreme temperature fluctuations, from plus 30 degrees Celsius in summer to minus 50 degrees Celsius in winter, much of the highly sensitive instrumentation is housed in an underground bunker. The station also has its own electrical power supply, a satellite communications link and living accommodations for the scientists.

Further information about the tower:
www.bgc-jena.mpg.de/bgc-systems/projects/zotto/index.shtml

Web site of the CarboEurope project:
www.carboeurope.org



EXCELLENCE FOUNDATION ESTABLISHED

Private Sponsors Support Leading-Edge Research

Publisher Stefan von Holtzbrinck has dedicated himself to a good cause: his mission is to inspire his wealthy fellow citizens with an enthusiasm for basic research and encourage them to make a financial commitment. Holtzbrinck heads the newly formed Excellence Foundation to promote the Max Planck Society, in the role of Chairman of the Foundation Supervisory Board. The Management Board spokesman is Munich attorney Reinhard Pöllath. With the support of private patrons, the Foundation aims to promote leading-edge research with speed and flexibility.



"In times of fierce global competition for the best scientists, we need additional financial resources and instruments here in Germany. We must do everything we can to maintain or improve the international top rankings of our education and research institutions," says Stefan von Holtzbrinck. Private assistance is also called for, especially where state support is lacking. Only the highest quality will safeguard Germany's position as a science location. This is the purpose of the newly established Excellence Foundation.

The initiators of the Foundation have set themselves an ambitious goal: they aim to attract 100 million euros in funding. "Compared with the private sponsorship sums of several times this amount that are available in the USA, this figure really should be achievable," believes management board spokesman Reinhard Pöllath. He is confident that the Foundation will enjoy continuing support. Not least because the internationally recognized reputation of the Max Planck Society and its successful career spanning more than 50 years are bound to ensure that this target will be reached. This assessment naturally delights Max Planck President Peter Gruss: "We need patrons who are willing to invest in pioneering research. This will allow us to explore avenues of innovation beyond the limits of public funding."

The initiative can already boast its first success. With the aid of private funding, it has made sure that Nobel laureate Theodor W. Hänsch will be able to contin-

ue his research beyond the age of 65 at the Max Planck Institute of Quantum Optics in Garching. Hänsch had already received attractive offers that would have taken him to the US following his retirement, where successful scientists are allowed to continue working beyond retirement age.

A program for winners of the Otto Hahn Medal is aimed specifically at junior scientists. The program offers the best postdocs who have been recognized for their outstanding dissertations at a Max Planck institute the chance to work at institutions abroad before setting up their own research group in Germany. It is hoped that this will further the cause of international networking, as well as counter the migration of scientists from Germany.

The establishment of this charitable foundation followed an initiative by the Max Planck Society aimed at attracting private funding. A group of influential sponsors including Alexander Dibelius (Goldman Sachs), Stefan von Holtzbrinck (publishing group Holtzbrinck), Klaus Neugebauer (founder of softlab), Heinrich v. Pierer (Siemens), Jan Philipp Reemtsma (Hamburg Institute for So-



ILLUSTRATION: CORBIS

cial Research), Randolf Rodenstock (Rodenstock Group), Reinhard Pöllath (Pöllath + Partner) and Martin Winterkorn (Audi) set themselves the task of supporting the basic research conducted by the Max Planck Society. This initiative led to the establishment of the Excellence Foundation, which has since attracted further donors.

Stefan von Holtzbrinck is joined on the Foundation Supervisory Board by Max Planck President Peter Gruss and Rüdiger Wolfrum, Director at the Max Planck Institute for Comparative Public Law

and International Law. The Management Board is composed of Reinhard Pöllath, the Secretary General of the Max Planck Society, Barbara Bludau, and former President of the German Rector's Conference and erstwhile Berlin Senator for Science, George Turner. The Foundation's business manager is Beatrice Melot, head of the Private Research Sponsorship department. The scientific independence and organizational autonomy of the Max Planck Society are guaranteed by the Statutes. ●

"The unplannable fascinates me"

Publisher Stefan von Holtzbrinck (DIE ZEIT, HANDELSBLATT, S. FISCHER VERLAG, ROWOHLT VERLAG) is Chairman of the Foundation Supervisory Board of the newly established Excellence Foundation to promote the Max Planck Society. He talks about his motives in an interview with MAXPLANCKRESEARCH.

MAXPLANCKRESEARCH: What caused you to make this socio-political commitment?

STEFAN VON HOLTZBRINCK: Businessmen, whether they are managers or owners, ought to show, by their actions, how important science and research are for our country. All of our businesses have profited from Germany's outstanding achievements in the field of research and development. By making a commitment to the leading scientific institutions – the Max Planck Society among them – we can express our thanks for the efforts that have contributed to our past and present prosperity. It is now a question of going that extra mile for Germany. If we wish to retain our top international position or, where this is not the case, if we wish to attain it, more support is needed than that provided by the government. And it is essential to create a general awareness of the need to make science our highest priority for the future of our country.

MPR: Of the approximately 14,000 legally constituted foundations in Germany, only a handful are devoted to sponsoring the sciences. The new Excellence Foundation has precisely this objective. Why basic research in particular?

VON HOLTZBRINCK: There are indeed plenty of opportunities to follow



PHOTO: PRIVATE

Stefan von Holtzbrinck

one's personal interests and commit both time and money to good causes. The Max Planck Society is my ideal of an institution that gives scientific curiosity free rein and whose basic research often leads it to break unexpected new ground. The very fact that the starting point needn't always be a specific application or a utilitarian purpose is, in my opinion, an advantage. After all, many great works – of literature, art, and yes, science, too – were not created or developed with a market in mind.

MPR: What personal connection do you have with science?

VON HOLTZBRINCK: The unplannable fascinates me. Even if, to use NATURE magazine jargon, my understanding often does not extend beyond level 1 articles – that is, articles written for laymen with a scientific background – it is the mental stimulation, the surprise, the revelation that attracts me to science. I am a lawyer by training, I did my doctorate under Prof. Lerche on the award of cable frequencies, and I also studied German philolo-

gy. The most wonderful time, and the one that made the most lasting impression on me, was the three-year period in which I managed the Nature Publishing Group.

MPR: In the US, private sponsorship of universities and research institutions has long been common practice. In Germany, on the other hand, the process has only just begun. How do you intend to raise awareness in our society?

VON HOLTZBRINCK: In quantitative terms, our contribution will be smaller in comparison with state funding. But in individual cases, even small amounts make a big difference. Consider the case of Theodor Hänsch's compulsory retirement, a problem that was financially resolved by the Foundation. Fortunately, our lawmakers have since also responded. There are many other cases in the same vein. By devoting our resources to science, we, the Foundation members and trustees, hope to set an example. By taking the initiative to establish the Excellence Foundation, we are seeking to motivate primarily private individuals to follow our lead.

MPR: Which areas of science are you particularly interested in?

VON HOLTZBRINCK: That's a difficult question to answer. But if I had to prioritize, I would say that, in the natural sciences, nanotechnology and genetic engineering interest me most. Among the humanities, I am drawn to the study of demographic change and behavioral economics. However, I am also fascinated by all of the research that is contributing to the promotion and preservation of our historical and cultural heritage.

NEW MAX PLANCK RESEARCH GROUP

An X-ray Laser in the Spotlight

Molecules swap electrons faster than scientists can see – at least until now. Soon, however, researchers will be able to track chemical reactions with ultra-short, intense laser pulses of X-ray light emitted by high-speed free electrons. At the University of Hamburg, the Max Planck Society is setting up a research group that will join with working groups at the university and at the German Electron Synchrotron (DESY) to form the Centre of Free Electron Laser Studies (CFEL), which will be investigating the potential of the X-ray laser beginning in 2008.

The XFEL X-ray laser that DESY is currently building will give scientists entirely new insight into the molecular world, paving the way for new discoveries in medicine, biology and physics, as well as in atmospheric research, chemistry and materials science. "It provides for very high resolution in terms of both time and space," explains Robert Schlögl, Chairman of the Chemistry, Physics and Technology Section of the Max Planck Society. He was a member of the commission that developed the scientific concept for the Max Planck Research Group at the CFEL.

The X-ray laser light flashes for just a few femtoseconds (a millionth of a billionth of a second). In this amount of time, even light travels only a few microns. Thus, with the aid of these pulses, it is possible to observe how electrons regroup during chemical reactions. These electrons switch from one reagent to another so rapidly that their trace is blurred in longer pulses of light. Although there are already lasers that deliver femtosecond pulses, they lack the energy to make the electrons in atoms of different elements visible.

In order to generate X-ray laser light, the researchers need to resort to special means: over a distance of 3.4 kilometers, they accelerate electrons through a tube almost to the speed of light,

and then force them over the last third of the way to slalom over magnets. On their wavering journey, the electrons constantly absorb energy – in return for which they are forced to emit energy in the form of X-ray pulses. A synchrotron, which accelerates electrons on a circular path, works on the same principle.

The German Federal Ministry of Research decided back in 2003 to support XFEL after the German Science Council lobbied in favor of the project. It is expected to cost 900 million euros, 60 percent of which will be funded by the federal government. The remaining 40 percent is expected to come from the 13 European partner countries. Some of the groups that will work with the X-ray laser on the German side include the Max Planck Society, the Helmholtz Association, to which DESY belongs, and various universities.

At the Centre of Free Electron Studies, work will be conducted not just by the Max Planck research group, but by two other departments and seven other groups. The Max Planck research group itself comprises two scientific departments, as well as two experimental and one theoretical junior group. In addition, several Max Planck institutes are sending scientists to join an Advanced Study Group, which will start work at the CFEL in late 2006. A Max Planck research group is a facility of the respective universities with which the Max Planck Society is involved. Support for such research groups has a time limit of five years; the CFEL will receive funding for this period in the amount of some eight million euros per annum from the Max Planck Society and the State of Hamburg.

As promising as the prospects for X-ray lasers are, scientists' experiences with these instruments have so far been limited. For example, it is not yet clear how samples will react to the X-ray pulses: "We must first find out whether we can even see the matter afterwards in its previous form," says

Schlögl. It is possible that the high-energy radiation pulses could simply destroy the molecules. Short pulses don't damage the object under examination, but they present scientists with their next task: How can a light signal be detected if it leaves no trace behind in the molecule being examined? The Munich-based Semiconductor Laboratory operated by the Max Planck Institutes for Physics and Extraterrestrial Physics is currently studying this problem.

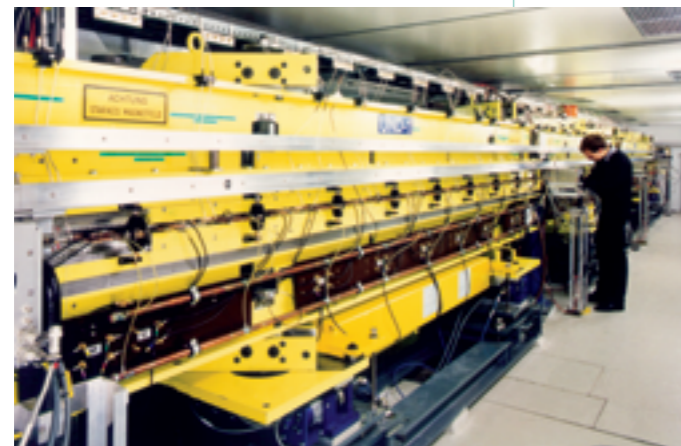


PHOTO: DESY

Caution, strong magnetic field! This device, which generates short-wave laser light, is called an undulator. In the future, the XFEL X-ray laser is expected to provide new insights into the molecular world.

SUCCESSFUL AUDIT

Family-Friendly Commitment

The non-profit company *berufundfamilie*, a subsidiary of the Hertie Foundation, has awarded initial certificates to the Max Planck Society in recognition of its goal of achieving a more comprehensive family-friendly orientation. To this end, the Society took part in an audit process that initially looked at and assessed its existing



family-oriented policies. Thereafter, trials were held at selected Max Planck institutes to determine how career and family considerations could be better combined.

If a child is too sick to attend kindergarten, or the daycare worker is unavailable, or if the school is closed due to a heat wave, parents are often left with no other choice: one of them must stay at home. Flexible working hours, working from home or emergency childcare can help stabilize the delicate balance between career and family. The Max Planck Society recognized this fact long ago, leading to the development of effective family-oriented policies that also take due account of business interests.

In addition, the Society is at pains to provide equal opportunities for men and women in its scientific operations – with success. Female employees at the Max Planck Society account for an above-average 31.5 percent of personnel, both among scientific staff overall (average 26.9 percent) and in scientific management positions. The ratio here stands at 10.6 percent, against an average of 7.7 percent at all four of the research organizations included in the study (besides the Max Planck Society, the Fraunhofer-Gesellschaft, the Helmholtz Association and the Leibniz Association were also audited).

However, there is still room for improvement: The idea of carrying out this process together with all employees, male and female, listening to their requirements and setting specific targets is what led to participation in the *berufundfamilie* audit. "If the audit contributes to the recognition of the needs of a heterogeneous workforce at the institute level, to a willingness to show tolerance and to the breaking down of internal discrimination where such exists, this can only benefit the Max Planck Society as a whole," says Secretary General Barbara Bludau. Over the longer term, the

idea is also to make the Society more attractive both to employees and to the international community.

The audit workshops were conducted with six project teams that replicated the hierarchical, organizational and social structures of the individual institutes in the three Sections and were supported by external, independent auditors. The workshops

afforded an opportunity to present proven measures and discuss how career and family considerations might be better harmonized in the future. The topics discussed included a flexible choice of when and where to work and the option of working part-time, not just in the administrative sphere, but also in scientific capacities.

It was agreed that an Internet portal would be developed on which existing institute guidelines and agreements on issues related to career and family would be posted. A "babysitter exchange" is also being planned. It will be investigated whether the working hours for male and female scientists engaged in projects can be managed more flexibly. Should an individual employee's family circumstances change during the course of a research project, it would then be easier to find solutions that would ensure the project's completion. In practice, it is also intended to take account of the fact that male employees, too, are often dissatisfied with the options open to them to reconcile their career and family, but rarely admit this.

Barbara Bludau takes a positive view of the audit: "It is already clear that even this verbal exchange of ideas on how to reconcile career and family has triggered a discussion process at the institutes." The audit culminated in mid-June with a ceremony in Berlin at which all of this year's participating businesses and universities received their initial certificates from Federal Minister for the Family, Ursula von der Leyen, and Minister of Economic Affairs, Michael Glos.

The Max Planck Society became the first scientific organization to be fully audited with six certificates and is now entitled to promote itself with the audit seal of quality. Nevertheless, *berufundfamilie* will be checking each year to confirm that the targets developed are being implemented in practice. Only if the MPS successfully passes a repeat audit in three years will the Society be fully certified.

Recognition: Federal Minister for the Family, Ursula von der Leyen, presents Herbert Jäckle, Vice President of the Max Planck Society, with the initial certificates for the successfully completed audit.

Pinboard

JÜRGEN BAUMERT, Director at the Max Planck Institute for Human Development in Berlin, is the new Vice President of the Max Planck Society. He was elected at the annual assembly in Frankfurt to succeed Rüdiger Wolfrum. Legal sciences expert Wolfrum remains Director at the Max Planck Institute for Comparative Public Law and International Law in Heidelberg, but he has given up the honorary position of Vice President following his appointment as head of the International Tribunal for the Law of the Sea in Hamburg. Like his predecessor, Jürgen Baumert's role on the Presidium will be to represent the Humanities Section to which 19 of the 78 Max Planck institutes belong. Baumert headed up the first part – the German section – of the Pisa

study in which the OECD compared the school education available to young people in 32 countries. Wolfrum's legal expertise will not, however, be lost to the Max Planck Society. He will continue to advise President Peter Gruss on the conduct of negotiations and entry into contracts with partner universities.

JUST HOW EXCITING humanities research can be was demonstrated when German Federal Minister of Research Annette Schavan presented the Max Planck Research Award bestowed jointly by the Alexander von Humboldt Foundation and the Max Planck Society. This year's award went to two experts in the history of art, Horst Bredekamp (Humboldt University, Berlin) and Alina Payne (Harvard University, Cambridge, USA). The two internationally recognized prize winners, also noted for their interdisciplinary work, took center stage at the Frankfurt Congress Center and managed to win the hearts and minds of their audience in no time with their short talks. Horst Bredekamp (59), a universal expert on images as well as a multi-faceted cultural specialist, has, for example, shown Darwin's drawings of a coral to be a forerunner of the theory of evolution. He also believes that the engravings for Thomas Hobbes' "Leviathan" contain a preview of the latter's political philosophy. Bredekamp is currently involved in a project at the Hermann von Helmholtz Center, which he co-founded at Humboldt University. The aim of the project – the first of its kind – is to collect, order and analyze technical illustrations from the 16th century onward. Architect Alina Payne (51) is pri-

marily interested in early theoretical treatises on architecture that, with the aid of her outstanding knowledge of Italian and Latin, she has critically read and reviewed with both literary and scientific precision. Canadian by nationality and Romanian by birth, she is regarded as a leading figure in the architectural history of the Renaissance. Commencing with the significance of ornamentation, whether as the essence of a building or an accessory, Payne explores the architectural aesthetic that she is researching on an international scale in interdisciplinary projects.

THE WINNERS of the 2006 Zülch Prize, which carries an endowment of 50,000 euros, are David Julius and Peter Joseph Jannetta. The awards were presented to these two scientists in recognition of their work in two areas of pain research: David Julius, who has served as professor in the Department of Cellular and Molecular Pharmacology at the University of California in San Francisco since 1999, has been concerned primarily with decoding the molecular mechanisms of pain and temperature sensation. Peter Joseph Jannetta, who holds a chair at Drexel University in Philadelphia and works as a neurosurgeon at Allegheny General Hospital in Pittsburgh, developed the concept of neurovascular compression, from which he derived an operative procedure to treat trigeminal neuralgia and other neurovascular compression syndromes. The Zülch Prize is awarded by the Gertrud Reemtsma Foundation, which, in turn, is managed in trust by the Max Planck Society. The award was established in memory of the late Director of the Max Planck Institute for Brain Research, Klaus Joachim Zülch, and is presented for outstanding achievements in basic neurological research.

PLAYING ATOMIC BILLIARDS – on the trail of the smallest particles: that was how the Philipp Morris Foundation described the work of Joachim Ullrich and Robert Moshhammer, which earned them a share in the Philipp Morris Research Prize for 2006. The awards, bestowed annually since 1983, were presented in Munich in mid-July to two pairs of researchers and two individual scientists, including the team from the Max Planck Institute for Nuclear Physics in Heidelberg. Ullrich and Moshhammer developed a reaction microscope that precisely measures processes of an atomic magnitude, such as the formation of chemical bonds. According to the award citation, this quantum microscope will play a key role in the emerging field of nanotechnology. The prize carries a total endowment of 100,000 euros, which is divided between the recipients. ●



Change of staff on the team headed by Max Planck President Peter Gruss (center): As the new Vice President, Jürgen Baumert (right) will represent the Humanities Section. His predecessor, Rüdiger Wolfrum, is giving up this honorary post following his appointment as head of the International Tribunal for the Law of the Sea in Hamburg.

PHOTO: SUSANNE BEER