

Insights and Exchange in Berlin

Annual Meeting of the Max Planck Society with Nobel laureate Stefan Hell and 700 guests



In a celebratory mood: Max Planck President Martin Stratmann, Federal Minister of Research and Education Johanna Wanka and Nobel laureate Stefan Hell (from left) at the Annual Meeting.

vided a positive assessment of the funding programs launched by the federal government. At the end of the event, Stefan Hell, the Max Planck Society's 18th and youngest Nobel Prize winner, provided insight into his extremely rocky career path in a podium discussion with science journalist Ranga Yogeshwar.

Beforehand, the Executive Committee and Senate, Directors and Supporting Members had met for their working sessions and a summer party at the Max Planck Society's newly renovated Harnack House. With a view to the conference venue's history, President Stratmann remarked: "The building underscores just how significant Berlin remains as a hub of exchange for international scientists." Max Planck Director Lothar Willmitzer was also presented with the Stifterverband 2015 Science Prize at the Annual Meeting.

The Plenary Assembly in the Great Orangery at Charlottenburg Palace marked the end and was also the highlight of the Max Planck Society's two-day Annual Meeting in mid-June. In his speech, President Martin Strat-

mann proposed the creation of new, nationwide education and research networks (the abridged version is printed in this issue, see page 10 ff.). Johanna Wanka, German Federal Minister of Research and Education, pro-

Springer Takes Over Open Access Journals

Living Reviews to become part of major publishing group

The Max Planck Society launched a unique model of scientific publications in 1998 with its *Living Reviews*: The articles are updated by the authors when required, or in other words are "kept alive," and do not therefore don't become outdated like other review contributions. Springer is now taking over three of these Open Access journals: *Living Reviews in Relativity*, *Living*

Reviews in Solar Physics and *Living Reviews in Computational Astrophysics*. From the publishing house's perspective, the journals will complement both its Open Access portfolio and other "living" publications.

Bruce Allen, Managing Director of the Max Planck Institute for Gravitational Physics, believes the *Living Reviews* stand to gain from integration

into an important publishing house: "The journals will remain Open Access but at the same time will benefit from the latest developments in publishing and enjoy long-term success." The Max Planck Institutes will continue to be involved in the three journals, primarily through their right of nomination and the make-up of the editorial teams.

“Chaperones seal landfill sites”

Franz-Ulrich Hartl explains how protein deposits in the brain protect cells in old age

They were long regarded as harmful and the catalysts of age-related diseases, such as Alzheimer's, Parkinson's and Chorea Huntington. However, protein deposits in the brain can also slow down aging processes under certain circumstances. Franz-Ulrich Hartl, Director at the Max Planck Institute of Biochemistry in Martinsried, explains how this works.

Were you surprised that protein deposits in cells could also have a beneficial effect?

Franz-Ulrich Hartl: Yes, very much so, despite the literature containing indications that they are not generally harmful. Scientists originally assumed that neurodegenerative diseases were triggered by large, insoluble protein aggregates detected as deposits in the brain. The investigation of the brains of people who had died at a very old age nevertheless revealed significant protein deposits relatively frequently despite there being no dementia symptoms.

Which protein deposits are harmful?

Over the past five years, it has become increasingly evident that it isn't large deposits in the brain that are generally toxic, but rather the smaller forms known as oligomers. If the cells fail to prevent the formation of protein aggregates at the outset – which appears to be the case during old age – these smaller forms are combined into larger, insoluble aggregates and deposited in certain locations in the cell. This bears comparison with a landfill site. In this way, the material that would otherwise have been left lying around is collected and rendered harmless to some extent.

To gain better insight into this process, you examined roundworms, which are short- and long-lived animals.

The roundworm *Caenorhabditis elegans* is extremely well suited as a model organism for the aging process. Its organism consists of many cells and it has clear organ structures, such as nervous, muscular and digestive systems. The researchers observed the animals over many genera-

tions and were easily able to conduct genetic experiments on them. We recorded over 5,000 proteins in short- and long-lived animals at several points in time during the aging process. This revealed that the long-lived animals, which survived for around 30 days on average, accumulated significant quantities of protein aggregates in insoluble form. In contrast, less aggregate was found in the short-lived control worms that stayed alive for around 14 days.

Did the composition of the protein deposits differ?

Yes, the protein aggregates of the long-lived animals was extremely rich in chaperones. They usually help cells to fold proteins correctly so that they can't clump together. They also contribute to ensuring that misfolded proteins can be removed from the cells. We now assume that the chaperones also seal the existing landfill sites by attaching themselves to the active surface of the protein aggregates. If this is the case, the toxic processes taking place on the surface of the large protein deposits may be minimized.

What mechanism lies behind this?

We don't know exactly. It is nevertheless likely that a special class of chaperone plays a part here: the small heat-shock proteins. Researchers previously assumed that their function was to prevent aggregation. However, the literature also contains indications that they could also investigate and even assist aggregation under certain conditions. As we found different small heat-shock proteins in the aggregates of the long-lived worms than those in the short-lived species, we assume that the properties of these heat-shock proteins could have something to do with this phenomenon.

How do you intend to investigate this mechanism?

One way is through a biochemical approach. We want to create extracts from the long-



Franz-Ulrich Hartl

lived worms and then put these with the extracts of short-lived or normal worms. It will be interesting to see whether we can trigger a stronger formation of aggregates in the test tube. We may then be able to isolate and identify the active substance from these extracts. As we suspect this may have something to do with the small heat-shock proteins, we will of course pay particular attention to them.

You are conducting research into chemical substances that may one day be suitable for use as drugs to combat Alzheimer's, Parkinson's and Chorea Huntington. If the protein deposits are broken up, couldn't this prove counterproductive or even harmful?

The molecular chaperones could be deployed to prevent or slow down the formation of toxic aggregates. It's not so much about breaking up the existing large aggregates. You have to be extremely careful here, otherwise there's a risk of creating toxic forms again. Activating a process that increasingly amasses oligomers in larger-sized aggregates is also conceivable. If a medical treatment were to be produced one day, it would have to be applied at an early stage, as the protective cellular mechanisms become increasingly weak in old age.

Interview: Barbara Abrell

New Max Planck Centre in Canada

Cooperation in photonics and optics research

The Max Planck Society and the University of Ottawa have set the wheels in motion to establish the Max Planck-University of Ottawa Centre for Extreme and Quantum Photonics. The Centre will link up two of the world's foremost research teams in the field of photonics. Ferdi Schüth, Vice

President of the Max Planck Society, and Allan Rock, University of Ottawa President, recently signed a memorandum of understanding.

The new Centre will be at the forefront of research in photonics and optics, in activities including the development of very high intensity laser sources, a quintessential technology for future advanced manufacturing processes, optical methods for quantum information science and the fabrication of devices for use in classical and quantum photonics. However, a cornerstone of this partnership will be to provide young researchers with the opportunity to explore different scientific cultures early on in their professional development.

The principal Max Planck researchers in the new Centre will include Professor Gerd Leuchs, Professor Philip Russell and Professor Vahid Sandoghdar, all from the Max Planck Institute for the Science of Light. The principal investigators from the University of Ottawa will be Professor Paul Corkum, Professor Robert Boyd, and Professor Pierre Berini.

Ambitious program of cooperation: Ferdi Schüth, Vice President of the Max Planck Society, during his speech at the University of Ottawa.



Physics Until You Drop

The Max Planck Society congratulates the winner of the Jugend forscht competition

Is it possible to construct a robot that can stand steadily on just one leg and hop? Anselm von Wangenheim from the Schülerforschungszentrum Kassel took up the challenge of finding out. Using complex simulations, the 18-year-old demonstrated that the construction of such a monopod is physically feasible. The student also enjoyed success experimentally: using skewers, wood glue and sensors, he constructed a duopod, a two-legged robot.

The jury of the 50th Jugend forscht federal competition was impressed by

how the young researcher independently deployed sophisticated cybernetics. The laudation stated that his project illustrated how a theoretical concept can be fleshed out in detail and then coherently followed through to practical demonstration. The jury awarded Anselm von Wangenheim first prize in the physics category. Max Planck Society Vice President Ferdi Schüth presented the certificate in Ludwigshafen. The Max Planck Society has donated the prize money for the winners in the physics category for several years now.



Outstanding: Max Planck Vice President Ferdi Schüth (left) with Anselm von Wangenheim, the winner in the physics category.

Sweet Vaccines on Track for Application

Start-up is set to make research results ready for market

Vaxxilon is the name of the new enterprise founded by the Max Planck Society together with the Swiss pharmaceutical company Actelion. It will carry out research into, develop and market vaccines based on glycans – natural polysaccharides that play an important role in many cellular processes. Such glycans for vaccines were previously produced from cultured bacteria – a process that complicates production and often makes it unfeasible.

The team headed by Peter Seeberger, Director at the Max Planck Institute of Colloids and Interfaces, has established the scientific foundation for the manufacture of glycans on a com-

pletely synthetic basis. This enables the production of new vaccines, including against bacteria, that cannot be cultured or whose sugar cannot be isolated. Vaxxilon is seeking to exploit this potential. With a financing commitment of up to 30 million euros, Actelion is the main investor and principal shareholder in Vaxxilon. The first studies on humans involving the application of a new vaccine are scheduled to take place within the next three years.

For an interview on the topic, visit:

 www.mpg.de/9317940/interview-erselius-vaxxilon



Protective jabs: Sugar not only makes inoculations sweet – some vaccines owe their effect to so-called polysaccharides.

On the Net



Everybody is from Somewhere

How can people live together with an increasing number of diverse characteristics in the world's rapidly expanding cities? What are the similarities and differences in social and spatial patterns that arise when new diversity meets old diversity? The documentary film "GlobaldiverCities" by Dörte U. Engelke provides insight into the large-scale multidisciplinary, international and comparative research project of the same name conducted by Max Planck Director Steven Vertovec between 2011 and 2015. Pay a visit to the website of Max Planck Institute for the Study of Religious and Ethnic Diversity, Göttingen, for more information: www.mmg.mpg.de/de/subsites/globaldivercities/about

Career in Science

The Max Planck Society offers junior scientists the possibility to apply for a position as a Max Planck Research Group Leader. Over 80 research institutes conduct basic research in Biology and Medicine, Chemistry, Physics and Technology, as well as in the Humanities, Social Sciences and Law. The MPG particularly addresses new, innovative and interdisciplinary research areas. To achieve this, we need you: outstanding postdocs in all of the research fields pursued in our organization. We invite you to work with us and apply for a position as a Max Planck Research Group Leader. Application deadline is October 28, 2015.

www.mpg.de/career/max-planck-research-groups/applications

Vaccines with Cookie Monsters

Junior scientists at the Max Planck Institute for Dynamics of Complex Technical Systems in Magdeburg show what makes their day in the lab. Udo Reichl's Bioprocess Engineering Research Group uses the capabilities of microorganisms to produce viral vaccines. This is amusingly demonstrated with a hungry Cookie Monster (virus) diving into a bunch of cookies (cell substrate) in order to grow and multiply. The Monster's mouth is then taped over with a red band to illustrate his inactivation (vaccine). Enjoy!

www.youtube.com/watch?v=PZItz6BHtzo