

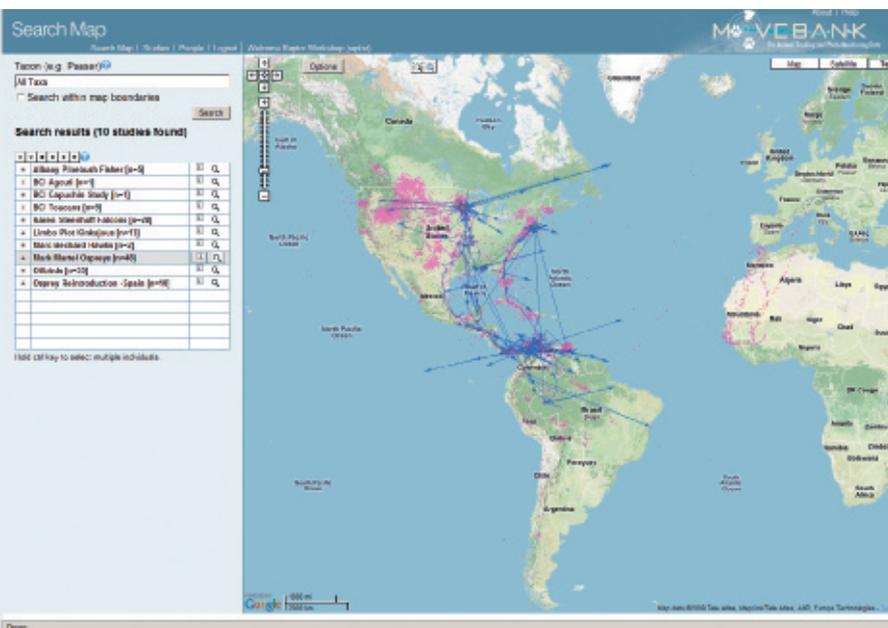
# Global Animal Migration Database

Scientists worldwide are studying the movement patterns of migrating animal species. Changes in the routes they follow are an indicator of changing environmental conditions. However, it is extremely difficult to compare the data gained from ringing, radio telemetry, and other methods. An internationally accessible database is now set to remedy this situation. The project, undertaken jointly by the National Science Foundation in the US and the Max Planck Society,

was initiated by Martin Wikelski, who has been a Director at the Max Planck Institute for Ornithology in Radolfzell since 2008, and is also a professor at the University of Konstanz.

In the future, the MOVEBANK database will serve as a data warehouse in which researchers can store and present all historical and current information on global animal migrations. A preliminary beta version has been available since January 2009 (<http://www.movebank.org>). As an example, the database allows users to check on the movements of Venezuelan oilbirds, and even pinpoint the location of a single individual bird using *Google Maps*. The final version of MOVEBANK is expected to be available starting in July 2009. This will not only aid cooperation between scientists, but it will also provide a platform for discussion.

In order to safeguard the authorship of the raw data, the database will provide for various types of access. "This project will enable us to register changes in the migratory movements of various species, particularly in areas that are not otherwise accessible," says Martin Wikelski. "Based on the general principles of animal migrations, we will then be able to develop mathematical models that will also allow us to forecast, for example, the spread of infectious diseases such as avian flu."



A screenshot of MOVEBANK

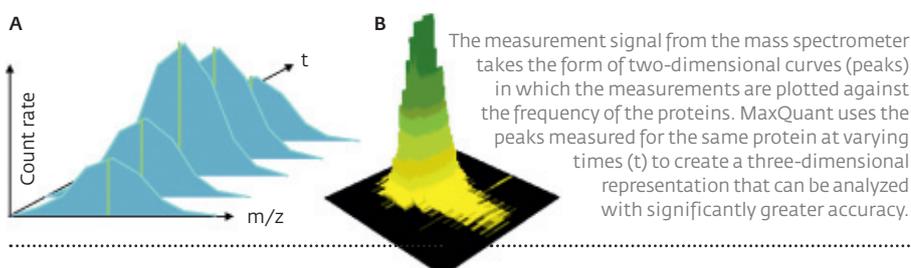
## MaxQuant Delivers a Breakthrough in Proteome Research

Baker's yeast and homemade software helped scientists at the Max Planck Institute of Biochemistry achieve a breakthrough in their study of proteomes. By targeting this fungus, which is also popular with brewers, Matthias Mann and his colleagues were able to identify for the first time all of the proteins in an organism. Their resulting publication was hailed by international experts as one of the most important

scientific breakthroughs of the past year. The researchers owe their success to "MaxQuant," a software program they had developed as a tool for rapidly decoding proteomes, which comprise the entire arsenal of proteins in a cell.

The process involves labeling the proteins in the usual way and passing them to a mass spectrometer for analysis. The resulting several hundred thousand measured values must then

be assigned to specific molecules. Previously, this process was hugely time-consuming. Because much of the task had to be laboriously performed by hand, this part of the work could take up to half a year. Thanks to the new software, dealing with the flood of data from the mass spectrometer is now child's play by comparison. "MaxQuant" is also more accurate than any previous method in identifying which proteins are produced in a cell: instead of the previous 10 to 20 percent of proteins, the yield is now up to 73 percent. Apparently other scientists are keen to get their hands on the software from Martinsried, too: the free download available from [www.maxquant.org](http://www.maxquant.org) is drawing substantial traffic.



## Sensitive Nose for the Atmosphere

New horizons in atmospheric research will soon be revealed with the arrival of HALO. With a range of 12,000 kilometers, the *High Altitude and Long Range Research Aircraft* will carry three tons of scientific equipment up to an altitude of 15.5 kilometers. "For years, I have been concerned at the lack of a German research aircraft that would allow us to study processes in the entire atmosphere, including the border area between the troposphere and stratosphere," commented Meinrat O. Andreae, Director at the Max Planck Institute for Chemistry in Mainz. This region in particular plays a critical role in the reciprocal relationship between the climate and atmospheric changes, yet to date, there is virtually no data available from this altitude in the tropical and subtropical regions.

HALO is intended to fill this gap, and will begin its first OMO (oxidation mechanism observations) campaign in summer. The measurements will concentrate mainly on the "detergents of the atmosphere" – hydroxyl (OH) radicals



HALO will open up new perspectives for researchers studying the atmosphere. The nose-mounted measuring probe is clearly visible in the photo.

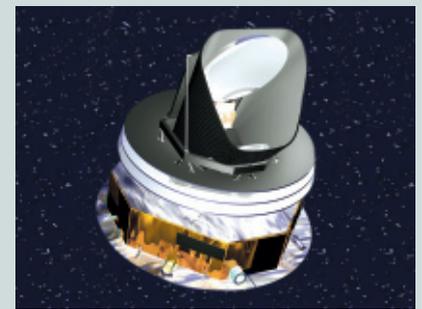
that clean up the atmosphere by removing natural and man-made substances such as nitrogen dioxide, sulfur dioxide, carbon monoxide and hydrocarbons. The *Gulfstream G550* aircraft recently landed at its new base in Oberpfaffenhofen, where it will be operated by the German Aerospace Center (DLR). The bulk of the funding for this project is being provided by the German federal government, as well as the Max Planck Society and the Helmholtz Association.

## Planck and Herschel – We Have Lift Off!

The *Planck* satellite is set to eavesdrop with as yet unsurpassed precision on the echo of the Big Bang, providing a sharp image of the infancy of the universe. The satellite was launched on board an *Ariane 5* rocket on May 14, 2009. The aim of this international mission managed by the European Space Agency (ESA) is to map the cosmic microwave background. Also taking part in the project is the Max Planck Institute for Astrophysics in Garching, where researchers have been developing some important software components.

It was around 380,000 years after the Big Bang that the universe became transparent. The light that was released in the process is still traveling through space today and is measurable as cosmic microwave radiation. The *Planck* space telescope will measure this radiation for between eighteen months and two years from its location near the so-called second Lagrange point in the Sun-Earth system.

This is also where the infrared satellite *Herschel* will take up position, which was also released from the *Ariane 5* rocket. Two of the three scientific instruments on board *Herschel* were co-developed by researchers from the Max Planck Institutes for Extraterrestrial Physics, for Astronomy, for Radio Astronomy and for Solar System Research. The 3.5-meter telescope of *Herschel* will investigate space in the wavelength range between 55 and 672 micrometers. Scientists want to use this satellite to resolve the diffuse cosmic infrared background into its individual sources. Other objectives: to study remote galaxies, the infancy of stars, as well as objects in the trans-Neptunian region at the edge of our solar system.



Looking back 13.8 billion years in time: The *Planck* satellite will capture cosmic radiation with as yet unsurpassed precision and provide insight into the birth of the universe.

## Max Planck Researchers Take on Children's Television

The new cartoon series "Cosmic Quantum Ray" that children's TV channel KI.KA has been airing since January – just in time for the "International Year of Astronomy 2009" – actually originates in the US. When 12-year-old Robbie and TEAM QUANTUM set out to save the universe from cosmic crooks and

galactic catastrophes, they're up against Black Holes, Big Bangs, Gravitation and Dark Matter. To ensure that the German version is scientifically correct, Werner Becker and his colleagues at the Max Planck Institute for Extraterrestrial Physics in Garching have been advising the KI.KA editors on how to adapt the American format for German kids. The Max Planck experts also came up with the idea of accompanying each episode with a "knowledge trailer" that explains the sort of physical phenomena mentioned above in a way that the young audience will understand.

Excerpt from the cartoon series



## “We still know far too little”

Bernhard Fuchs, a researcher at the Max Planck Institute for Marine Microbiology, and chief scientist Victor Smetacek answered some questions on the LOHAFEX experiment from on board the research vessel **Polarstern**.



Victor Smetacek, Bernhard Fuchs

*LOHAFEX is designed to provide information on the effects of iron fertilization on the ecosystem in the Southern Ocean.*

*How much iron is being applied there?*

**Fuchs:** An area of 300 km<sup>2</sup> was fertilized with 10 tons of iron sulfate at intervals of three weeks. The experiment takes place in an enclosed swirling current, called an eddy. This allows us to test a constant, coherent body of water. The trial is conducted under controlled conditions, as if in a test tube, and can be tracked over a period of time.

*What is the effect of this iron fertilization?*

**Smetacek:** In the Southern Ocean, iron is a limiting nutrient for the algae known as phytoplankton. Previous experiments have shown that iron fertilization encourages rapid algae growth. The phytoplankton grew to a density comparable with the strong natural algal blooms that occur in this region. As they grow, the algae fix major quantities of CO<sub>2</sub> that they extract from the water, and this is balanced out by absorption from the atmosphere. As for what happens at the end of such algal blooms, there are two possible scenarios: Either the dying algal bloom sinks down into the deep ocean layers and transfers the fixed CO<sub>2</sub> from the atmosphere into the deep sea, where it remains for centuries. From a global perspective, this could provide an opposing effect to the rising concentrations of CO<sub>2</sub> in the atmosphere. Alternatively, the algae

could undergo microbial decay on a massive scale in the uppermost layers of water, thus releasing the fixed CO<sub>2</sub> back into the atmosphere.

*Assuming that the first scenario is correct, are scientists hoping to use this to slow down climate change?*

**Fuchs:** No, we are far from understanding the processes that take place during such algal blooms. There may well be a variety of effects on the climate. The byproducts of the decay of these algal blooms could even have a negative impact. We still know too little about what influence these blooms have, for example on biodiversity.

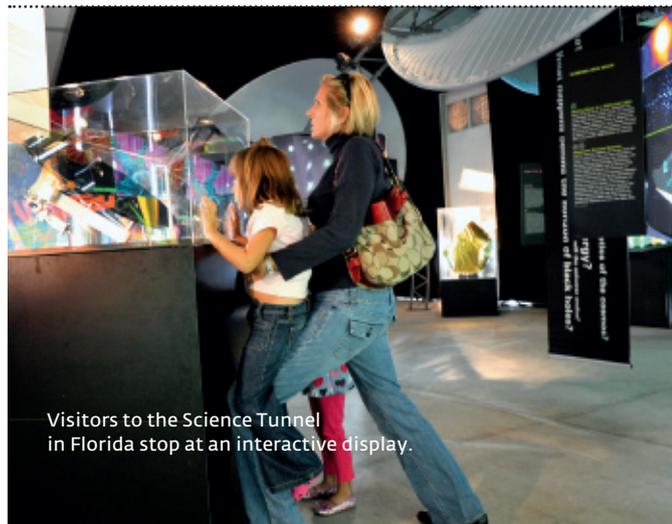
*So what are the primary objectives of the experiment?*

**Fuchs:** Above all, we want to use LOHAFEX to study the varied biological processes that control the plankton ecosystems in the ocean. The addition of iron increases productivity and alters the balance between algae, bacteria and zooplankton initially in favor of the algae. We want to find out which byproducts are created in what quantities during the growth and decay of the algae, and how the zooplankton, especially the krill, react to iron fertilization. Krill stocks – the main food source for penguins, seals and whales – have declined by 80 percent in recent decades. The reaction of zooplankton to the iron-fertilized bloom might give us a clue as to whether

this collapse can be explained by a decline in the region's productivity. Looking far ahead into the future, iron fertilization in the krill's habitat could help restore stocks to their former levels and facilitate the long-term recovery of decimated whale populations.

*And how is the experiment going?*

**Smetacek:** We spent the first two weeks on location looking for a suitable eddy for our experiment. Oceanic eddies have a lifespan ranging from several weeks to months. They appear on satellite images of sea surface height as elevations or depressions and must then be analyzed in greater detail by measuring the current fields in order to estimate how stable they are. We finally chose an eddy in a region in which a large zooplankton stock had established itself as a result of previous blooms. So far, the experiment has been very successful: We fertilized a patch that we are now tracking for the third week in the center of the eddy. Our bloom is being created by a different group of algae than in previous experiments, and the grazing pressure of the zooplankton is also different. A new balance appears to have been struck between the increased productivity of the algae and the rate at which they are grazed by the zooplankton. We are curious to see what will happen next.



Visitors to the Science Tunnel in Florida stop at an interactive display.

## Science Tunnel in Florida

Backed by financial support from Bank of America, the Max Planck Society's Science Tunnel has been on display at the *South Florida Science Museum* since the middle of January. After stops in Tokyo, Singapore, Shanghai, Brussels, Johannesburg, Seoul and Berlin, this marks the science exhibition's debut on the American continent. And there is a very good reason for this: the Max Planck Florida Institute is now also being established in Palm Beach County.

# Sharp-Eared Software and Sensitive Prostheses

Max Planck Society and Fraunhofer Gesellschaft extend their cooperation in the development of new technologies.

In the interest of increasing the speed with which the findings of basic research are put to work, the Max Planck Society is promoting three new joint ventures with the Fraunhofer Gesellschaft.

This brings the number of joint projects to 14. In the future, funding will also be provided for cooperation between the Max Planck Institutes for Psycholinguistics and for Social Anthropology and the Fraunhofer Institutes for Intelligent Analysis and Information Systems (IAIS) and for the telecommunications area (Heinrich Hertz Institute). This is the first time two Max Planck Institutes dedicated to the humanities have worked together with Fraunhofer institutions. The scientists taking part will be developing new voice and image recognition tools in order to partially automate the analysis of audio and video recordings

used in linguistic and ethnological research. Some of the challenges they must overcome: voice recognition must function independently of any specific language, and be effective even in a loud environment, and the image recognition software must also recognize gestures rather than just objects.

There is huge commercial potential in solving these problems. Software with a highly tuned sense of hearing could ease the work of call centers, for example. In another project, scientists from the Max Planck Institutes for Metals Research and for Polymer Research, the Fraunhofer Institute for Interfacial Engineering and Biotechnology, and the University of Stuttgart will be developing new materials for prostheses. Their surfaces are expected to encourage the growth of bone and cartilage so that the synthetic material becomes better integrated into the tissue.

## A Cradle of Astronomy



The outside matches what's inside: Its designers modeled the House of Astronomy in Heidelberg on a spiral galaxy.

The Klaus Tschira Foundation and the Max Planck Society are building a House of Astronomy in Heidelberg. The project is supported by the city of Heidelberg, the state of Baden-Württemberg and the University of Heidelberg. The spectacular building, which is modeled on a galaxy, is to be erected on the Königstuhl mountain right next to the Max Planck Institute for Astronomy. The facility will be operated by the Max Planck Society and, starting in 2011, will introduce school students and the general public to the fascination of astronomy.

### On the Net



#### Learning Made Easy with Dr. Axolotl

The Max Planck Institute for Molecular Cell Biology and Genetics has launched some new online games to teach young people about biology. In "Die Zellstadt" (Cell City), players learn a lot about organelles and their functions. "Dr. Axolotl" asks some tricky questions, and in the "Lab Race," a scientist must battle characters representing a fatal error, a ghostly guard dog and a virus to get his test tubes by safety:

<http://www.mpi-cbg.de/en/fun/games.html>

#### Who Actually Plays the Lottery?

Jens Beckert of the Max Planck Institute for the Study of Societies in Cologne conducted numerous interviews with people who regularly play the lottery in Germany and still hope to get all six numbers right. In doing so, he identified four types of players – with widely differing motives. His research findings in film format are available at:

<http://www.filme.mpg.de>

#### Close-up on the Stars

Precisely 400 years ago, in 1609, Italian natural scientist Galileo first used a telescope to observe the stars. What better reason could there be to celebrate the "International Year of Astronomy" in 2009? A solar eclipse, meteorite showers, Jupiter in the twilight – even the sky itself is adding its own spectacular touches to the anniversary that will be marked with events worldwide:

<http://www.astronomy2009.de/>