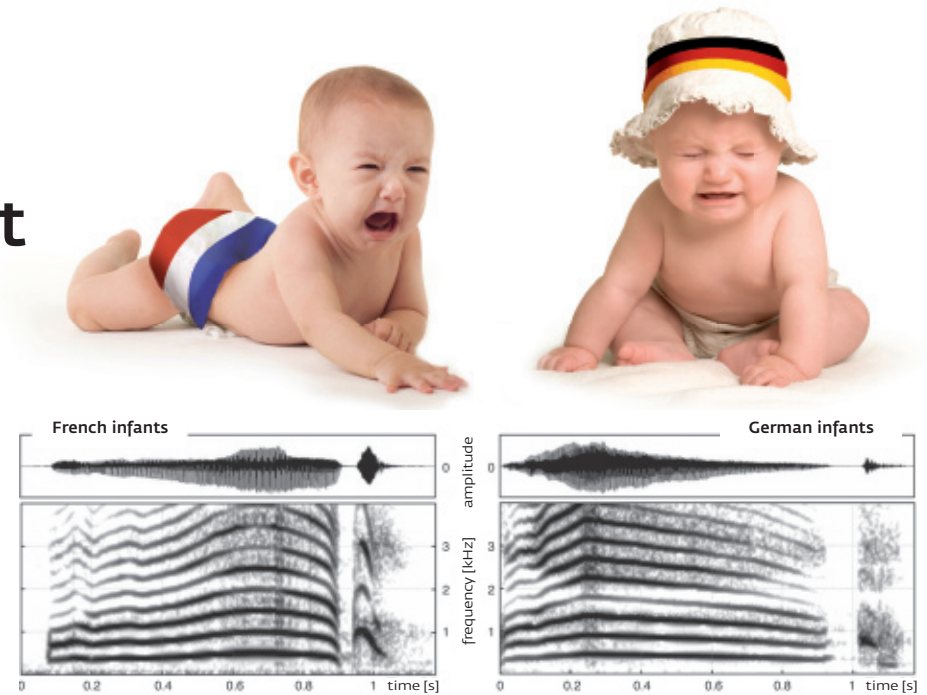


Crying in a Foreign Accent

Babies, even newborns, make different sounds depending on their native language

The wailing of French and German babies is not the same – right from the first days of life. This is the finding of a study by researchers from the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, the Centre for Pre-language Development and Developmental Disorders at the University Clinic in Würzburg, and the Laboratory of Cognitive Sciences and Linguistics at the Ecole Normale Supérieure in Paris. The scientists compared recordings of 30 French and 30 German babies aged between two and five days. While the French newborns more frequently produced rising melodies, the German infants cried with a falling pitch. The reason for this is presumably



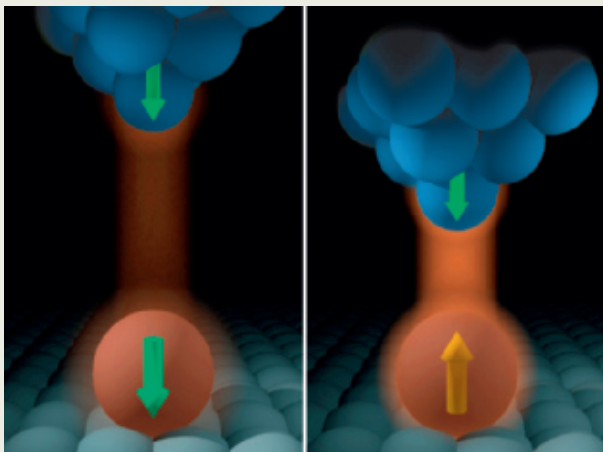
The melody of wailing: French babies cry with a rising frequency, or pitch, and German babies with a falling one.

the differing intonation patterns of the two languages, which the infants perceive while they are still in the womb and which they later imitate. The researchers believe that the evolutionary roots of this behavior extend back to

long before the emergence of spoken language. The imitation of melodies developed over millions of years and, in all likelihood, plays a role in mother-child bonding in the first few days of life. (CURRENT BIOLOGY, November 5, 2009)

A Switch for Atomic Bits

Fine work, indeed: Researchers at the Max Planck Institute for Microstructure Physics in Halle have found a way to manipulate the magnetization of single atoms. Using simula-



tions, they established that single atoms can be switched from "spin up" to "spin down" with the tip of a scanning tunneling microscope simply by varying the distance between the tip and the atom. The magnetic moment of the spin acts like a tiny bar magnet. Depending on the direction in which its north pole points, a bar magnet, and therefore an atom, can store "0" or "1" for a bit. The work conducted by the Halle-based physicists thus represents an advancement in the area of spintronics. This technology works with the spins of electrons and not, as in traditional electronics, with their charges. It is hoped that the technology will enable the production of computers that are smaller, faster and more energy efficient. After all, electronic processes are slower than spin processes, and the bits are stored in tens of thousands of atoms. (PHYSICAL REVIEW LETTERS, July 30, 2009)

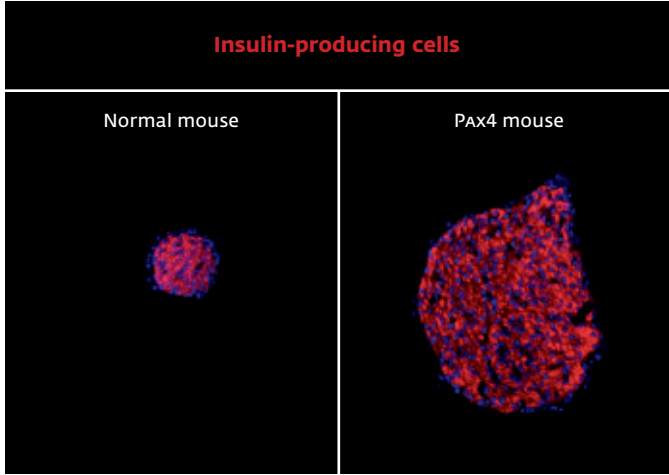
A question of distance: With longer distances, the magnetic moment in the atom aligns itself parallel to the one in the tip of the scanning tunnelling microscope (left). If the distance is shorter, it aligns itself in the opposite direction (right).

Insulin Responds to a Signal

A single genetic factor stimulates the cells in the pancreas to produce insulin

In the future, it might be possible for a diseased pancreas to very easily heal itself. Scientists at the Max Planck Institute for Biophysical Chemistry have stimulated insulin production in the pancreas of diabetic mice by switching on a single gene called Pax4. The gene launches a chain of signals that reprogram progenitor cells or cells with other functions so that they manufacture insulin. Just a few days after the researchers activated Pax4, new insulin-producing cells formed in the pancreas. Before this procedure can also help diabetes sufferers, the scientists must first find another switch that will halt the reprogramming. Without a stop button, too many insulin-producing cells would develop in the pancreas, which would then neglect its other duties.

Compared with a normal mouse (left), the researchers increase the number of insulin-producing cells in the pancreas significantly when they activate the Pax4 gene in mice.

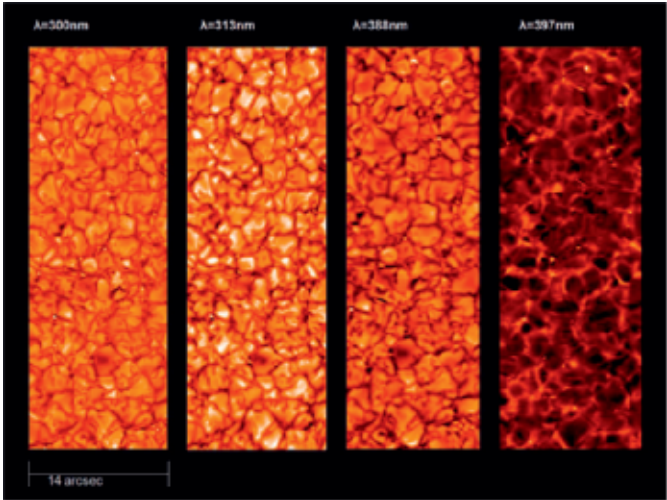


Photos: MPI for Biophysical Chemistry – Collombat, Mansouri

Closer to the Bubbling Ball of Gas

The Sun is bubbling. Accumulations of gas rise and fall, giving the Sun its grainy surface structure, its granulation. Dark spots appear and disappear, clouds of matter billow upwards – and all of these phenomena are driven by magnetic fields. The SUNRISE balloon telescope, a joint project headed by the Max Planck Institute for Solar System Research in Katlenburg-Lindau with partners in Germany, Spain and the

USA, has now provided images that show the complex interplay on the visible surface of the Sun in an unprecedented level of detail. The researchers used a helium balloon to lift the six-ton SUNRISE telescope to an altitude of 37 kilometers, where it collected data on the Sun’s magnetic field and the ultraviolet light that is absorbed by the atmosphere down below. The researchers want to use the images to explain the Sun’s activity in detail, in particular the connection between brightness and the strength of the magnetic field.



Photos: MPI for Solar System Research (left), MPI for Solar System Research – S. Solanki (right)

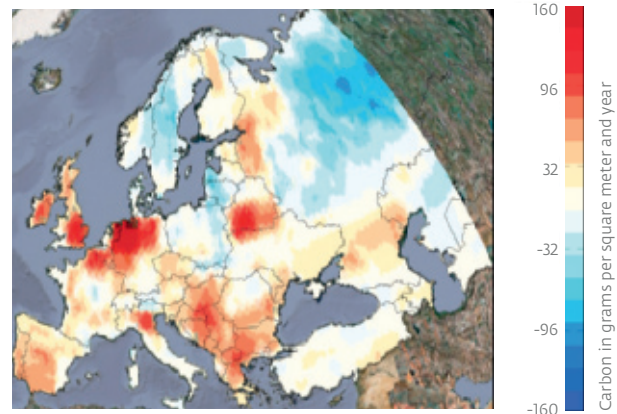
The grainy Sun: The images show the Sun’s granulation in four different colors in ultraviolet light. The section represents 1/20,000 of the total surface. The light structures are the basic elements of the magnetic fields.

Europe's Rural Regions Are Damaging the Climate

Nitrous oxides and methane from farming are causing the climate balance in Europe to deteriorate drastically

More greenhouse gases are rising over Europe than was previously believed to be the case. These include not only the carbon dioxide emitted by industry and traffic, but also methane and nitrous oxides. A group of European researchers working with scientists at the Max Planck Institute for Biogeochemistry in Jena has now drawn up a balance sheet that also takes these significant greenhouse gases into account for the first time. The gases are generated mainly by livestock breeding and intensive farming, and have an extremely negative impact on the European climate balance. Until now, Europe's terrestrial ecosystems, including forests, grasslands and moors, were thought to act by and large as sinks for greenhouse gases.

However, the researchers have found that this is not the case. Although forests do indeed absorb 19 percent of the carbon dioxide that is released into the air, the cultivation of other types of land generates such large quantities of climate-damaging gases that this effect is nearly negated. And taken alone, the rural EU regions, not including the forests in eastern countries like Russia, actually have a negative impact on the atmosphere. (NATURE GEOSCIENCE, NOVEMBER 22, 2009)



Balance of greenhouse gases by region in CO₂ equivalents

Poor balance: If methane and nitrous oxides are accounted for as carbon dioxide equivalents, the rural areas of Central Europe are net producers of greenhouse gases (red) and cancel out the sink effect of predominantly Russian forests.

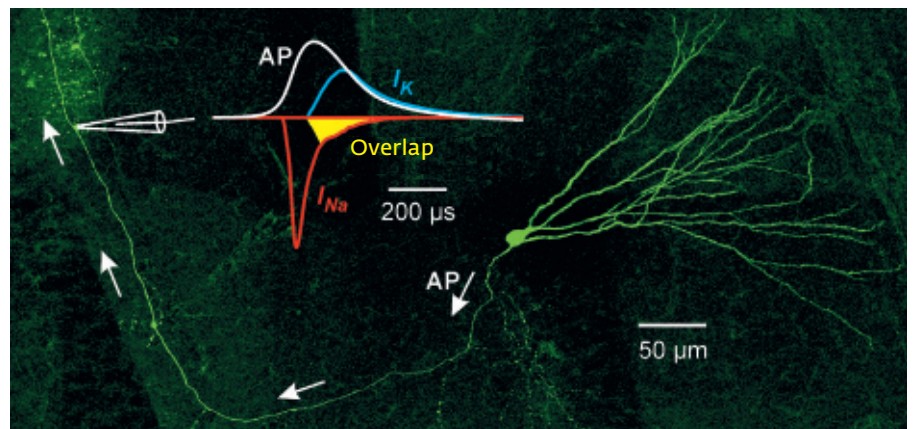
Graphic: CarboEuropeTeam

A Head Start for Energy Saving

Mammals' brains work extremely efficiently. Neurobiologists at the Max Planck Institute for Brain Research in Frankfurt and the University of London have found that mammalian nerve cells need three times less energy to conduct signals than do the nerve cells of an octopus. The axon, the long fibrous extension of a nerve cell, transmits signals using an action potential that travels along it, briefly changing the voltage between the inside and the outside of the cell. Sodium ions flow through specialized channels into the cell and increase the membrane potential from minus 70 to plus 30 millivolts. The potassium ions flow out of the cell to compensate for the flow of sodium. The scientists have now established that the interaction of the ion flows in mammals saves considerable amounts of energy. The duration of the sodium flow and that of the potassium flow counteracting it hardly overlap: the sodium channels close before the potas-

sium channels open. Thus, in mammals, far fewer sodium ions enter into the cell to create the action potential than is the case in invertebrates, such

as octopi. As a result, the cell need not expend a lot of energy pumping them back again in readiness for the next action potential. (SCIENCE, September 11, 2009)



Thrifty signal: An action potential (AP – white curve) travels along the axon of a nerve cell from a rat's brain. It is created because sodium ions flow into the cell (I_{Na} – red curve) and potassium ions (I_K – blue curve) flow out of it. The less the ion flows overlap (yellow area), the less energy the signal needs.

Graphic: H. Alle, J.R.P. Geiger

Blossoming in Old Age

Plants also flower on short dark days

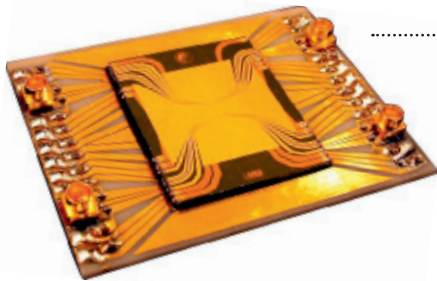
It's just a month away – higher temperatures and more hours of daylight will awaken life in the first spring flowers. But plants also know when it is time to flower without these signals. Max Planck scientists at the Institute for Developmental Biology in Tübingen have discovered a new signal path in the shoot cells of thale cress that allow the plants to bloom even if the prevailing conditions are unfavorable. The micro-RNA156 molecule prevents genes that are important for flower formation from being translated into proteins, thus stopping flower formation.

However, according to the developmental biologists in Tübingen, the concentration of micro-RNA156 decreases with age, meaning that the flowering genes can stimulate flower growth independently of external factors. This ensures that the plants do not wait forever for the ideal time to flower and miss their time to reproduce. (CELL, August 21, 2009)

Photo: MPI for Developmental Biology – Jürgen Berger



Scanning microscope image of a thale cress flower, *Arabidopsis thaliana*.



Compact and precise: Atom interferometers on such microchips are suitable for measuring rotational movement or the gravitational field of the Earth.

Measuring with Small Atomic Clouds

Scientists at the Max Planck Institute for Quantum Optics in Garching and at the Ludwig Maximilian University in Munich have succeeded in making something good even better. They manipulated atoms on a special microchip, an “atom chip,” with microwave fields to construct an atom interferometer. An atom interferometer is a very sensitive piece of measuring equipment that uses the quantum mechanical wave properties of atoms. Two small clouds of atoms are laid one on top of the other, just like light waves in a traditional interferometer. These create an interference pattern that depends on the external forces acting on the atomic clouds. In this way, the atom interferometer can record rotational movement very precisely, in an airplane, for example, or measure the gravitational field of the Earth and thus possibly help in the search for raw materials. It can be used in many different ways on atom chips, as they are robust and compact. (NATURE PHYSICS, August 2009)

Photo: Philipp Treutlein – LMU Munich

Ill-Informed about Cancer Screening

The benefits of cancer screening are overestimated in Germany. A Europe-wide study by the Harding Center for Risk Literacy and the market research company Gesellschaft für Konsumforschung revealed that most German citizens are not aware of the real benefits and risks of early cancer detection. Doctors and health associations recommend regular screening so that cancers can be detected and treated at an early stage. However, around 90 percent of those surveyed in Germany overestimate the benefits of mammograms for breast cancer screening and PSA tests for prostate cancer screening, making for a very poor showing in a European comparison. One reason for this could be misleading information brochures. The study showed that 40 percent of Germans regularly use these as sources of advice – twice as many as the European average. It is these individuals in particular who tend to overestimate the benefits of early detection. Furthermore, doctors in Germany are evidently not providing their patients with adequate statistical information regarding benefits and risks. (JOURNAL OF THE NATIONAL CANCER INSTITUTE, September 2, 2009)

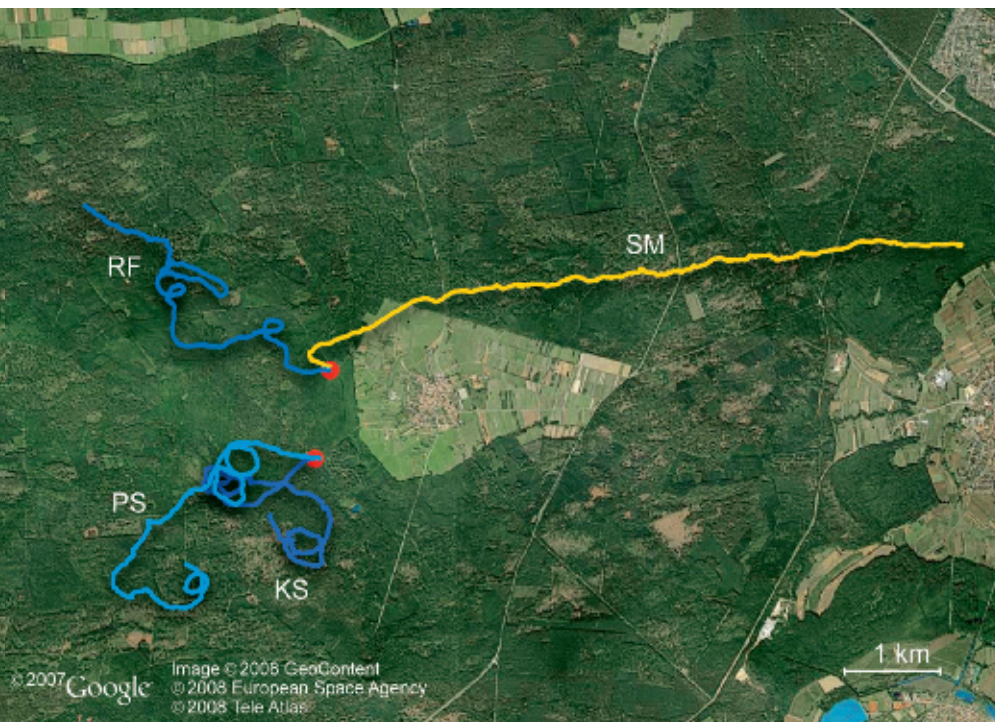
Searching for Orientation

Why We Walk in Circles when We Are Lost

It's a favorite theme in many Hollywood movies: after meeting with an accident in the desert or the jungle, the hero walks in a circle as he searches for a way out, and ends up right back where he started. Researchers from the Max Planck Institute for Biological Cybernetics have shown for the first time in an experiment that this idea is not just the product of filmmakers' imaginations.

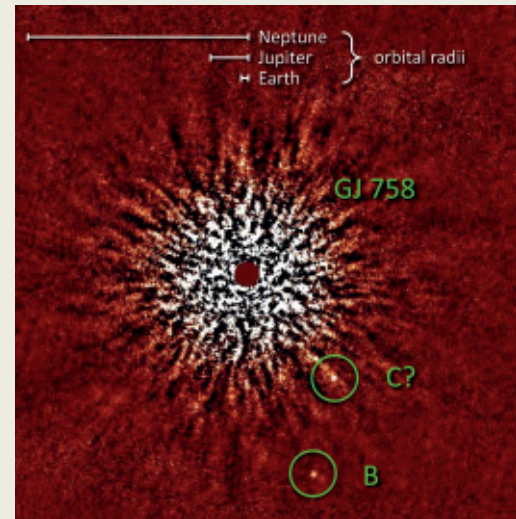
The Sahara in Tunisia and an extensive woodlands region in the Rhineland served as test areas. In these environments, which lacked any prominent orientation points, most of the test subjects stopped walking in a straight line soon after setting off. "It really is like in the movies – some of the subjects crossed their own paths several

times without noticing," relates Jan Souman from the MPI in Tübingen. The subjects managed to walk in a straight line only when the sky was cloudless, orienting themselves based on the position of the Sun. The scientists were surprised at how helpless people obviously are without any external orientation aids. On average, a blindfolded person moves no further than 100 meters from their starting point. It appears that inaccurate directional information from the eyes, ears and balance organs are the reason why hardly anyone can walk in a straight line for more than 20 meters – and not because their legs are of different lengths or varying strength, as is widely assumed. (CURRENT BIOLOGY, August 20, 2009)



Orientation experiment in the Rhineland: The red dots mark the starting points of the subjects, the colored lines their paths. While the subjects PS, KS and RF were not able to use the Sun's position for orientation, the Sun started to shine shortly after SM began the experiment.

Portrait of a Cool Planet



Seen in the light of its sun: Astronomers are able to create an image of GJ 758 B and its orbit and possibly another planet C only thanks to a technology that allows them to suppress the light of the central star GJ 758. For comparison: The distances between a few planets and our Sun.

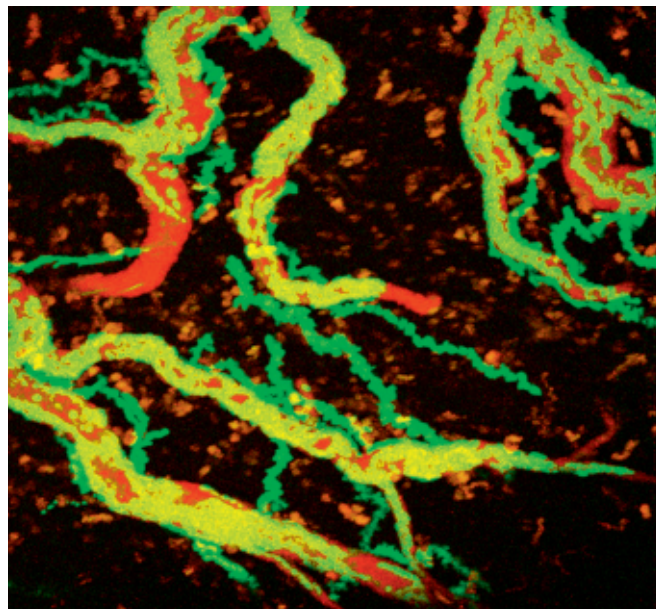
Direct hit in the hunt for a planet: Researchers from the Max Planck Institute for Astronomy in Heidelberg have discovered and imaged a faint object in the sky orbiting the star GJ 758. Its mass is estimated to be between 10 and 40 Jupiter masses. This indicates that the find is either a huge planet or a brown dwarf, that is, a failed sun. One thing is certain: At a temperature of around 330 degrees Celsius, GJ 758 B is the coldest companion of a sun-like star ever imaged. And it will probably get even colder. This is because GJ 758 B orbits its central star at a similar distance as Neptune, the outermost planet in our planetary system, orbits our Sun. Its surface must be similarly cold, namely around minus 200 degrees Celsius. This explains why the astronomers in Heidelberg assume that the newly discovered planet is still young and that its temperature will drop even further. (arXiv.org/abs/0911.1127)

Caught at the Border

Live observations reveal how immune cells infiltrate the brain in multiple sclerosis

Researchers at the Max Planck Institute for Neurobiology in Martinsried have caught immune cells in the act of penetrating brain tissue. Usually, the blood-brain barrier defends the central nervous system from the body's own defense cells. In some diseases, such as multiple sclerosis, however, aggressive immune cells disregard it and pass through the special blood vessel walls that are supposed to protect the brain. The scientists have now observed this in detail, which will help in the search for therapies used to treat such diseases as multiple sclerosis.

The researchers marked T-cells, a special component of the immune system, with green fluorescent protein and observed them under a light microscope. First, large numbers of the immune cells attach themselves to the blood vessel walls; then they even begin to crawl along them against the blood flow, as if they were looking for a gap. T-cells have not been known to behave in this way before. After a period of time ranging from a few minutes to a few hours, some of the immune cells squeeze through the blood vessel wall. Behind the blood-brain barrier, the invaders continue their search until they encounter phagocytes, the garbage collectors of the immune system. Once in contact with these, the T-cells excrete inflammatory messenger substances that attract other T-cells and start the attack on the nervous system.



Traces of an invasion: T-cells (green) crawl along the walls of the blood vessels (red). The image shows the distances they covered in 20 minutes. The green trails show that some of them are already moving through the surrounding brain tissue.

Photo: MPI for Neurobiology – Bartholomäus

Two Genes, Few Scales

The mirror carp saves cooks a lot of work – at least since medieval monks succeeded in breeding a variant with almost no scales. Scientists at the Max Planck Institute for Developmental Biology in Tübingen have now revealed that, ever since, it has actually had two copies of the gene that provided its covering of scales before the monks' intervention.



Photo: MPI for Developmental Biology – Miklós Bercsényi

However, one of the copies mutated and can thus no longer contribute to scale formation. If the fish did not have a reserve gene to fall back on, it would not be able to survive, since the gene is responsible for more than just the formation of its scales. It also holds the blueprint for a receptor without which the fish embryo cannot develop. For reasons not yet explained, this copy is switched off as soon as the gene has carried out its vital tasks and before the scales grow. It appears that duplicating a gene also affects its regulation. Reserve genes also play a role when organisms develop new characteristics. They take over the old functions of the genes, while a mutated copy produces new characteristics. (CURRENT BIOLOGY, October 13, 2009)

Tasty and almost scale-free: Thanks to a gene duplication, the mirror carp has only a sparse covering of scales.