


Do Chimpanzees Grieve for their Dead Children?

Ape mothers find it difficult to let go of their dead infants



Grief is a deeply human emotion. But what do animals feel when they are confronted with dead members of their species? Chimpanzees are apparently very bewildered and disturbed. Film captured by researchers from the Max Planck Institute for Psycholinguistics in Nijmegen (The Netherlands) seems to substantiate this interpretation. The moving scenes show how the chimpanzee Masya laid her infant, which had died two days previously, on the ground in a clearing. For an hour afterward, she repeatedly approached the corpse and touched it. Then she carried it to a group of other chimpanzees and watched as they inspected the lifeless body. She remained with the infant until the following day. Whether chimpanzees actually feel grief cannot objectively be judged on the basis of these images. However, the observer is a witness to a transitional phase in which the mother learns to fathom the death of her child. (AMERICAN JOURNAL OF PRIMATOLOGY, January 21, 2011, published online)

 www.youtube.com/user/MaxPlanckSociety#p/c/5/jzrige2nqqw

A chimpanzee mother with a young animal.

A Quantum Writer for Single Atoms

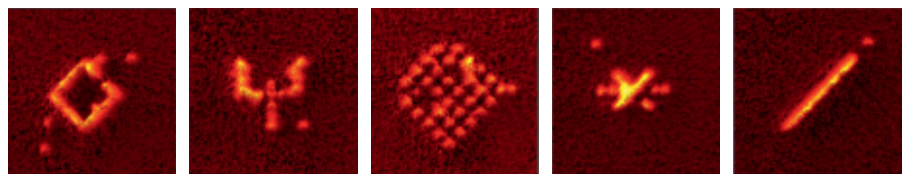
The spin of individual atoms in an optical crystal can be deliberately modified so that they can be used as quantum bits

It is now possible to write data in individual atoms. Physicists from the Max Planck Institute for Quantum Optics and the Ludwig Maximilian University of Munich have skillfully manipulated individual spins in a quantum gas made up of rubidium particles. Expressed in simple terms, the spin is the rotational direction of an atom. Researchers work-

ing with Stefan Kuhr and Immanuel Bloch used a microscope developed specifically for the purpose to address each individual particle in a collection of atoms that lie in overlapping laser waves, as if in an optical egg carton. The experiment achieves a prerequisite for processing information with atoms in an artificial light crystal, as has been pro-

posed for a quantum computer. Above all, however, the work has opened up completely new ways in which researchers can investigate quantum processes. For example, in the course of this study, they observed for the first time how individual massive particles, namely rubidium atoms, tunnel through potential walls. (NATURE, March 17, 2011)

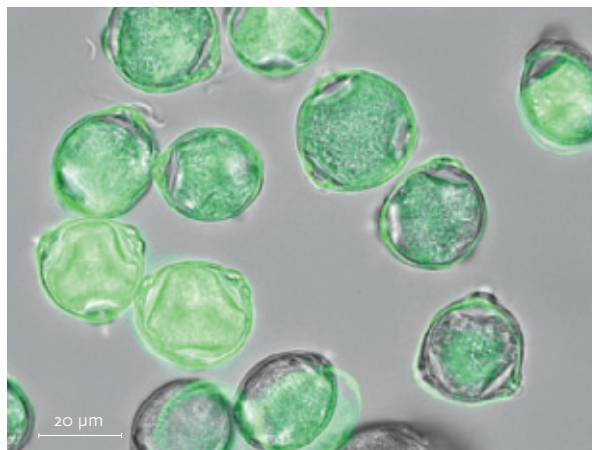
Patterns in a quantum gas: The fluorescence microscope images show the atoms that remain in the optical lattice after the researchers have manipulated the spins of other atoms and removed them.



Dangerous Oxygen

Long-lived reactive intermediate forms of oxygen that form on aerosol particles could be the reason why allergies are on the rise

Thanks to new findings by researchers from the Max Planck Institute for Chemistry and the Paul Scherrer Institute in Switzerland, it has now become clearer how toxic and allergenic substances are formed in the air we breathe. Scientists working with Ulrich Pöschl have, for the first time, shown that there are long-lived reactive intermediate forms of oxygen on aerosol particles, such



as soot and pollen. The oxygen forms are created when the particles react with ozone. They survive on the particles' surface for more than 100 seconds and, in this time, combine with other air pollutants, such as nitrous oxides. In chemical terms, the particles are oxidized and nitrated. This is what makes the soot particles more toxic and increases the potential of pollen to trigger allergies. As industrial and vehicle exhaust gases have increased the atmo-

Birch pollen with allergenic potential: The coloring of the fluorescence microscope image shows differences in the chemical composition of the pollen grains, which can contain allergy-triggering proteins in the cell and on the surface.

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 sphere's ozone content over the past few decades, this process could explain why the incidence of allergies has increased in recent years. (NATURE CHEMISTRY, February 20, 2011)

The Rights and Wrongs of Right and Left

When people are no longer able to move their dominant hand smoothly, their moral judgment changes

A glove can change someone's attitude. Daniel Casasanto at the Max Planck Institute for Psycholinguistics in Nijmegen in the Netherlands and Evangelia Chrysikou from the University of Pennsylvania asked naturally right- and left-handed individuals to set out domino tiles with their dominant hand in a clumsy glove to which, furthermore, the second glove was loosely attached. After just a few minutes, the subjects no longer associated this side with the "good side." The researchers also observed this situation

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 in those people who can no longer move their dominant hand smoothly after a brain injury. Normally, right-handed people consider the right side to be good, and left-handed people consider the left side to be good (see MAXPLANCKRESEARCH 4/2010, p. 44). For example, out of two applicants, they will unconsciously prefer the one whose photo is on the relevant side. This current study confirms that people associate positive things with their preferred hand, as they can move it more easily. (PSYCHOLOGICAL SCIENCE, March 9, 2011)

As Alike as Cat and Dog

Embryonic development reflects evolution

Embryos of different animal species are astonishingly alike. Researchers at the Max Planck Institute for Molecular Genetics in Dresden and at the Max Planck Institute for Evolutionary Biology in Plön have now shown in two studies that the oldest genes in phylogenetic terms are active during the phase when the similarity is at its greatest. Before and after the "phylotypical" period, in contrast, the species-specific genes dominate. Gene expression during embryonic development is thus similar to an hourglass with the phylotypical period as the indented section. The species of a phylum become more similar outwardly and genetically toward this point, and then become more different again. The studies show that, generally speaking, 19th century naturalists such as Charles Darwin and Ernst Haeckel were correct with their hypothesis that embryonic development mirrors phylogeny. (NATURE, December 9, 2010)



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 Ernst Haeckel's famous comparative analysis of vertebrate development shown with images of *drosophila* embryos that reflect gene expression over the course of embryonic development.

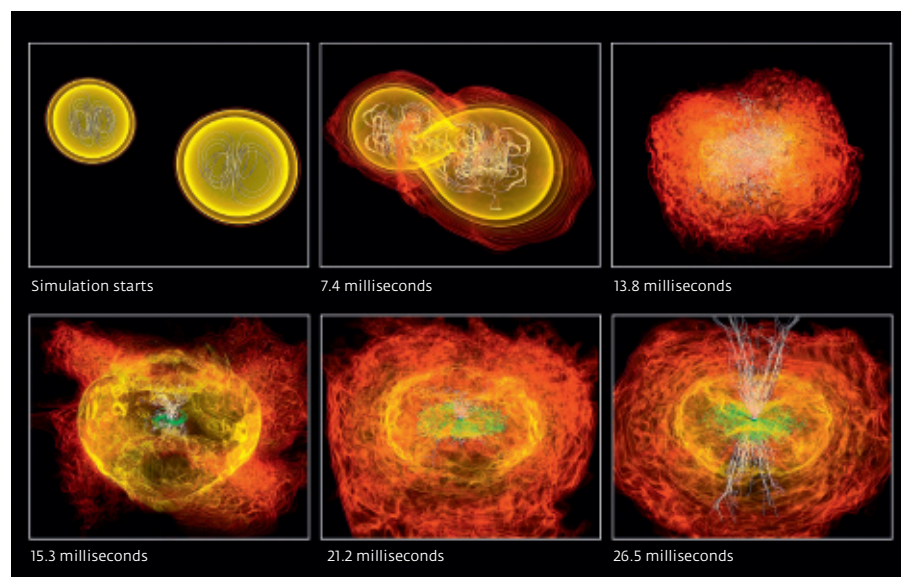
The Engine that Powers Short Gamma Rays

A simulation of colliding neutron stars explains cosmic bursts of radiation

They've puzzled scientists for years: short bursts of gamma rays that release more energy within fractions of a second than our galaxy, with its 200 billion stars, does in 12 months. What's

behind these outbursts? Researchers working with Luciano Rezzolla at the Max Planck Institute for Gravitational Physics have come one step closer to finding a solution. Using the institute's

Damiana supercomputer and a set of calculations lasting six weeks, they simulated the merging of two neutron stars to form a rapidly rotating black hole. This was initially surrounded by a ring of hot matter with a relatively weak and chaotic magnetic field. The rotation of this unstable system induced an extremely powerful and perpendicular magnetic field of 10 super-script 15 Gauss along the rotational axis, creating in turn a jet of ultra-heated matter that shot across space in two bundles of rays and briefly flared up in the gamma ray range. The researchers allowed the simulation to run twice as long as normal. (THE ASTROPHYSICAL JOURNAL LETTERS, April 7, 2011)



Two neutron stars merge within milliseconds to form a black hole. A strong magnetic field is generated along the rotational axis and creates a jet that hurls ultra-hot matter into space. Flashes of gamma light can occur in this jet.

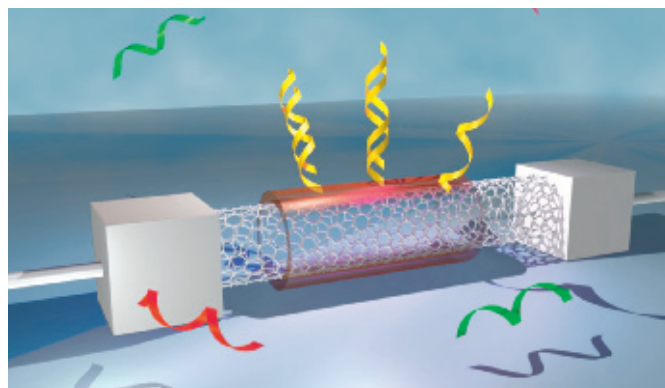
Nanosensor Sniffs Out Pathogens

Using tiny nanotubes on a chip, it is possible to detect even the smallest traces of genetic material quickly and reliably.

Researchers from the Max Planck Institute for Solid State Research in Stuttgart used sensors made of carbon nanotubes to detect tiny traces of DNA. Because the sensors respond to specific DNA sequences, they can be used to detect virus or microbe infections in blood samples. The nanosensors created by the scientists working with Kannan Balasubramanian are so sensitive that it is no longer necessary to concentrate or tag the DNA in a time-consuming process, which has been the case up to now. This means that they may be able to deliver diagnoses faster than traditional methods. Furthermore, the researchers have already developed a routine method for manufacturing their nanosensors that

makes rapid mass production possible. The end product could be a cell-phone-sized analysis device that can be used anywhere. (ANGEWANDTE CHEMIE int. ed., March 18, 2011)

DNA testing with a nanotube: Single strands of the DNA that is being tested for are attached to the carbon nanotube's surface. The matching DNA pieces (yellow) from the specimen settle on them and change the nanotube's conductivity.



Dark Matter not a Growth Factor

Galaxy bulges determine the mass of central black holes

At the center of most galaxies is a massive black hole. The heaviest are found in the largest galaxies, which, in turn, are surrounded by pronounced halos of dark matter. Scientists thus suspect that there could be a direct association between dark matter and black holes. A study by researchers from the Max Planck Institute for Extraterrestrial Physics, the University Observatory Munich and the University of Texas in



Named after its appearance: The Sombrero Galaxy (M104, NGC 4594) is an example of a galaxy system that is dominated by a large bulge. It contains a commensurately large black hole of around 1,000 million solar masses.

Austin contradicts this view: it is the bulge, the dense central area of a galactic system, that determines the mass of the central black hole. The team examined galaxies that

are embedded in massive halos of dark matter and therefore rotate at high speed, but have no or only small bulges. Their investigations showed that galaxies without a bulge contained – at best – black holes with very low mass, even if they were surrounded by massive halos. Therefore, it seems plausible that a black hole is fed by the bulge and thus grows. (NATURE, JANUARY 20, 2011)

Mussel Plastic

A polymer created in a laboratory has similar properties to a mussel protein, because it is cross-linked in the same way

Materials scientists like to be inspired by mussels: they copy mother-of-pearl, the adhesive that attaches the crustacean to the ground, the byssal fibers of their feet, and now the particularly tensile, strong and self-healing protein that surrounds the byssus as well. Scientists in the US have synthesized a polymer with similar structural properties to that which scientists working with Matt Harrington at the Max Planck Institute of Colloids and Interfaces discovered earlier.

Both the mussel protein and the artificial material are crosslinked with iron atoms, from which they derive their special properties. Synthetic polymers based on mussel protein could be suitable for use as new adhesives in underwater technology and in medicine. (PNAS EARLY EDITION, JANUARY 28, 2011)

I Spy with my Little Eye Something ... Green

Thyroid hormones regulate visual pigments in the eye throughout life

The thyroid gland uses hormones to determine how mice and rats see color. Thyroid hormones suppress the creation of UV/blue pigment in the color-sensitive cells in the retina and activate the production of green pigment. According to scientists at the Max Planck Institute for Brain Research in Frankfurt am Main, this is a lifelong effect. If the thyroid regulates the visual pigments in humans in a similar way, a low level of hormones caused by insufficient iodine in the diet or removal of the thyroid would affect the pigments in the cones and cause problems with color vision. As thyroid deficiency is usually treated before it can cause changes to vision, these dysfunctions have not been noticed before now. (JOURNAL OF NEUROSCIENCE, MARCH 30, 2011)

Hope for Arctic Sea Ice

According to new calculations, it is still possible to stop the retreat of the summer ice in the Arctic

The retreat of the summer ice that has been observed in the Arctic for some years could be halted. The rapid disap-

pearance of the summer ice had given rise to concerns that the ice sheet might be close to a tipping point, as

seawater absorbs substantially more heat without a cover of ice. Were it to go beyond the tipping point, the loss of the remaining sea ice would be unstoppable. However, the current results of research by a team working with Dirk Notz at the Max Planck Institute for Meteorology in Hamburg now indicate that there is no tipping point of this kind for the loss of summer ice in the Arctic. Instead, the ice cover reacts quite directly to the prevailing climate conditions. The progressive loss of the Arctic sea ice could thus be slowed down or even stopped – but only if there were a halt to global warming. (GEOPHYSICAL RESEARCH LETTERS, January 26, 2011)

The loss of sea ice in the Arctic summer can still be stopped, as there is no tipping point for its shrinking. However, in order to halt the retreat, we must succeed in slowing down global warming.

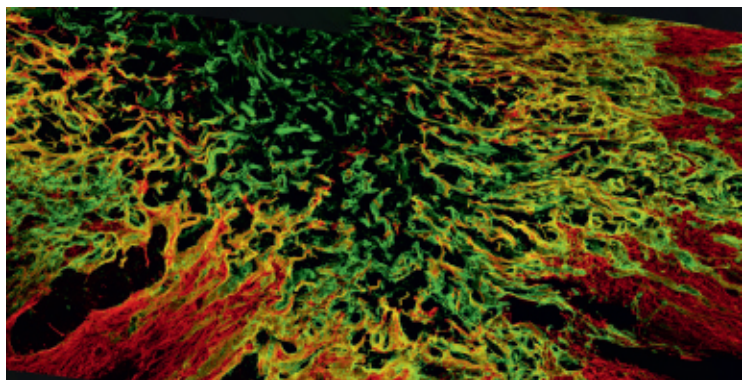


A Breakthrough in Scar Tissue

Cancer drug helps regeneration after spinal cord injury

When nerve bundles in the spinal cord are crushed or severed, the result is usually incurable paraplegia. Scientists at the Max Planck Institute for Neurobiology in Martinsried have made nerve cells in the spinal cord regrow with the cancer drug Taxol. The substance stabilizes the microtubuli, tube-shaped molecules in the cell skeleton, so that the axon of a damaged nerve cell can regenerate. Furthermore, Taxol prevents the formation of an inhibitor in the scar tissue. Rats with newly damaged nerve cells in their spinal cord can walk considerably better after a few weeks, thanks to Taxol. The scientists next want to examine whether Taxol is still effective when the injury lies some time in the past. The side effects and interaction of Taxol with other

drugs are well known, which makes clinical development much easier. It is, however, still unclear whether the substance will have the same effect on human nerve cells as on those of rodents. (SCIENCE, January 27, 2011, published online)



Scar tissue following damage to the spinal cord. It obstructs the regrowth of nerve cells.

Italian for Beginners

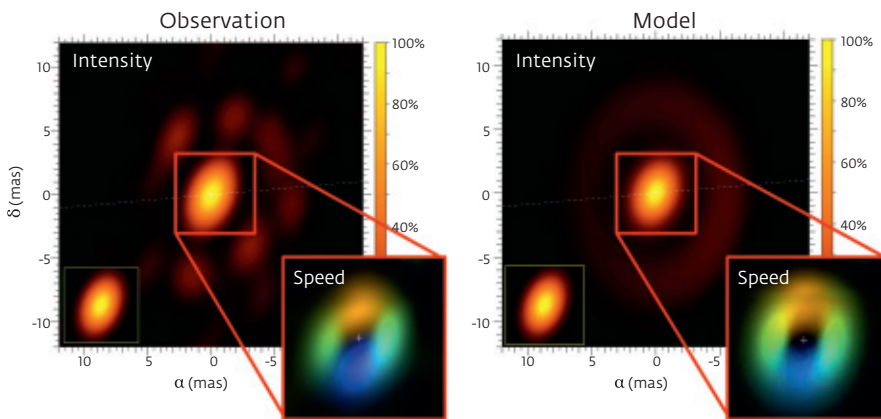
Babies recognize the rules of grammar in a foreign language earlier than previously thought

“Il fratello sta cantare” – the brother is sing. German babies as young as four months old hear that there is something wrong with this Italian sentence. When researchers from the Max Planck Institute for Human Cognitive and Brain Sciences played the correct and then the incorrect Italian sentences to the babies, they regis-

tered the differences after learning for just a quarter of an hour. At this age, content errors are not recognized, but babies recognize and generalize regularities in the sound sequences long before they have any understanding of the meaning. Interestingly, small children learn a foreign language in a completely different way than adults:



adults pay more attention to the associations of meaning in the sentence. (PLOS ONE, March 22, 2011)



A star in space and time: Images of HD 62623 taken with the VLT interferometer (left), compared with a model for a gas disc rotating around the star (right). The inserted images show the movement of the gas in 3D. The blue color shows gas that is moving toward the observer, while red shows gas that is moving away from the observer.

A Giant Star with a Thick Dust Disc

New 3D imaging technology reveals an invisible companion

A supergiant stands on the brink of death – yet it behaves like an infant. The old star is surrounded by a dust disc that one would otherwise expect to see only with a newborn. The strong particle wind that the bright sun HD 62623 blows into space would destroy a dust disc. A team working with Florentin Millour from the Observatoire de la Côte d’Azur and Anthony Meiland from the Max Planck Institute for Radioastronomy has made a detailed three-dimensional image of this star

and its immediate surroundings. It not only shows the structure of the material within the dust disc, but also its movement. It is likely that a close companion star is acting as a source by feeding the disc with its material. Because it is more than a thousand times less bright than HD 62623, the small partner remains invisible; its existence is revealed by a gap in the material between the disc and the central giant star. (ASTRONOMY & ASTROPHYSICS, JANUARY 26, 2011)

A New Phylum in the Animal Kingdom

They are tiny, with a mouth that is simultaneously an anus. And instead of a brain, they have a diffuse nervous system. Nevertheless, *Xenoturbella* and the so-called acoelomorph worms, both groups of simple marine worms, are more closely related to humans than, for example, the common earthworm. An international team of scientists including Albert Poustka from the Max Planck Institute for Molecular Genetics in Berlin discovered that both groups are more closely related to complex organisms from the *Deuterostomia* (“new mouth”) line than previously thought. In the *Deuterostomia*, the original mouth from the beginning of the embryonic development becomes the anus, and the mouth develops later. Previously, three *deuterostome* phyla were known: the chordates (e.g. vertebrates), the echinoderms (sea urchins, starfish, sea cucumbers) and acorn worms. *Xenoturbella* and the acoelomorph worms together now form the fourth phylum. These “Xenacoelomorpha” were not always as simply structured as they are today. The worms have simplified their construction plan, as that was clearly as advantageous or even more advantageous than a complicated body structure. (NATURE, FEBRUARY 10, 2011)