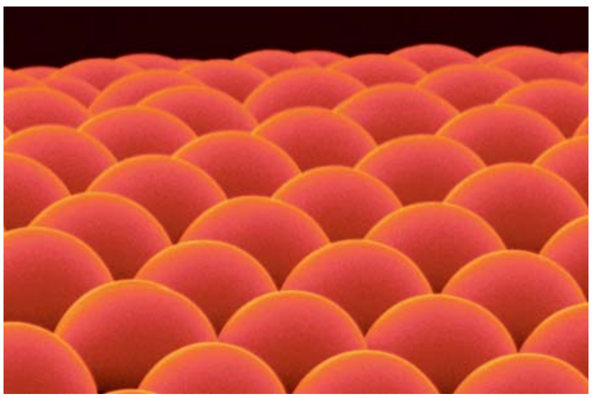
Microlenses – Formed Naturally

Materials scientists can sometimes learn from very simple organisms. Scientists at the Max Planck Institute of Colloids and Interfaces are manufacturing simple, inexpensive and top-quality microlenses from calcium carbonate. Their work is inspired by the brittlestar *Ophiocoma wendtii*, a relative of the starfish, whose skin is studded with such lenses. Like the brittlestar, the Max Planck researchers are using just one organic substance – in this case a surfactant – with which the tiny crystal lenses form on the surface of a calcium-saturated solution with the carbon dioxide in the air. Such microlenses are of technological interest in the processing of optical signals, for instance in telecommunications. Until now, it has been possible to manufacture these types of lenses only in very complex processes, for example using semiconductor technology. (Nature Communications, March 6, 2012)



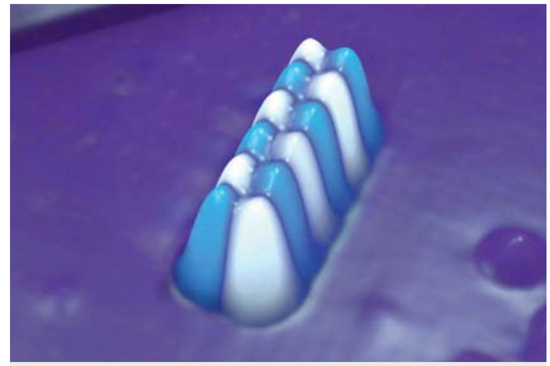
Microscopic lenses made from calcium carbonate: Regularly aligned hemispheres of calcium carbonate form an array of high-quality optical lenses.

Nasal Spray for Panic Attacks

Anxiety-reducing substance can reach the brain through the nose

Tablets that are intended to have an effect in the brain must overcome the blood-brain barrier. This can mean that a lot of the original active substance is lost. Using mice, Max Planck researchers have now demonstrated that the anti-anxiety substance neuropeptide S can also be absorbed through the nasal mucosa and deliver its effect in the brain. Scientists from the Max Planck Institute of Psychiatry in Munich succeeded in visualizing the path taken by the intra-nasally administered substance to special neurons in different regions of the brain. Neuropeptide S reached the brain just 30 minutes after administration through the nasal mucosa. The anxiolytic effect of the substance was achieved after four hours. Neuropeptide S clearly influences the transmission of signals between neurons in the hippocampus, an important brain structure for learning and memory. The substance will have to undergo a battery of tests before it can be used on humans. (Neuropsychopharmacology, January 25, 2012, published online)

Help in a little bottle: An anti-anxiety spray is still a long way off, but Max Planck scientists are working on it.



An atomic storage unit. Researchers from IBM and the Max Planck Society store one data bit in just 12 iron atoms on a copper nitride base. The alternating blue and white coloring illustrates the antiferromagnetic arrangement.

Smallest Data Storage Unit in the World

New opportunities in magnetic data storage are opening up to the IT industry. Scientists working in IBM's research division in San Jose, California, and a research group from the Max Planck Institute for Solid State Research at the Center for Free-Electron Laser Science in Hamburg developed an antiferromagnetic data storage unit. Conventional magnetic storage units use ferromagnetic storage points. In such units, the magnetic moments of all atoms, which can be visualized as tiny bar magnets, align themselves in the same direction. They thus generate a magnetic field and require a minimum distance between them. In antiferromagnets, the magnetic moments arrange themselves alternately in opposing directions and therefore don't generate a disruptive magnetic field. Prior to this, it was impossible to generate, in a controlled way, two states that could stand for the zero and the one in a data bit. The scientists have now succeeded in doing this in an extremely small storage point: the team accommodated one data bit in just 12 iron atoms that were positioned on a copper nitride surface. This means that information can be packed 100 times tighter than in current standard hard drives. (Science, January 13, 2012)

Photo: MPI for Solid State Research – Sebastian Loth (top), MPI of Colloids and Interfaces – Kyu-Bock Lee (middle), fotolia (bottom)