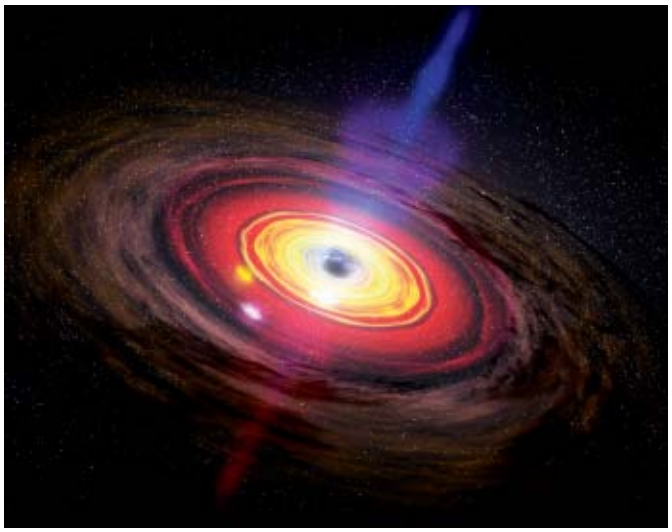
"Last Scream" from a Black Hole

Researchers create plasmas similar to those surrounding exotic objects

Black holes are voracious feeders: they devour neighboring gas clouds and stars in huge quantities. As the "food" is caught and spirals ever faster into the gullet, it becomes increasingly dense and heats up to millions of degrees Celsius. Before the material finally disappears, it emits an enormously intense X-ray into space. This "last scream" in the form of characteristic spectral lines comes from iron as it sheds electrons. Researchers at the Max Planck Institute for Nuclear Physics, working with colleagues at the Synchrotron X-ray source BESSY II in Berlin, have reproduced this process in the laboratory. They heated iron atoms to temperatures similar to those in the interior of the Sun – or those surrounding a black hole. The spectral lines they measured perfectly matched those detected at X-ray observatories. It emerged in the process that most theoretical computations do not reflect the line positions accurately enough. For example, scientists have long puzzled over the interpretations of the data from the active galactic nucleus NGC 3783. The researchers in Heidelberg, however, identified, among several model calculations, a theoretical procedure that makes the most accurate predictions – and thus created a new way to understand the physics of plasmas surrounding exotic objects. (Physical Review Letters, October 27, 2010)

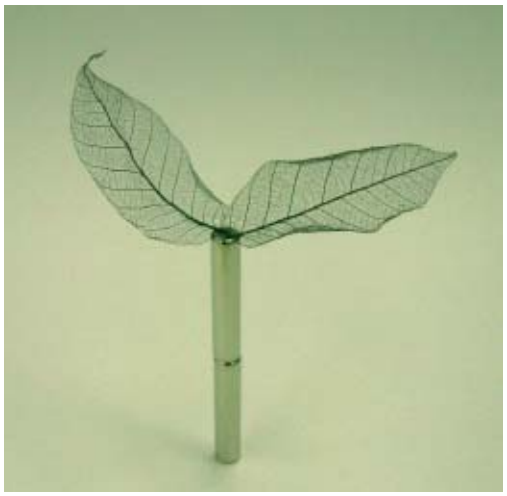


Exotic structure: Matter swirls turbulently around a black hole. What exactly is going on here?

Turning Over a New Leaf

A new technique allows filigree structures to be created in metal carbides

Chemists from the Max Planck Institute for Colloids and Interfaces have, quite literally, been copying nature. Using a new process, they transformed the skeleton of a leaf almost completely into magnetic iron carbide. To do this, the researchers treat the leaf with iron acetate, nitrogen and heat. The technique allows them to create metal carbides from every carbonaceous structure. But there are more benefits to this than just making attractively shaped objects. For example, the filigree biological structures could provide catalysts and electrodes with a large surface, thus making them particularly efficient.
(Angewandte Chemie, August 16, 2010)



A magnetic leaf: A simple chemical process transforms the leaf into iron carbide, which is magnetic and conducts electricity.

The Genes of Others

Every human being is unique and yet similar in many respects to other humans. This is also reflected in our genes. On the one hand, there are over 16 million variations in the human genome. At the same time, the genomes of all humans are 99.5 percent identical. In comparison, humans and chimpanzees share 96 percent of their DNA. Scientists working on the 1,000 Genome Project, a team that includes Hans Lehrach and Ralf Sudbrak from the Max Planck Institute for Molecular Genetics in Berlin, have analyzed the full genomes of 179 people, and the protein coding genes of 697 people "letter by letter." According to this study, each person has from 250 to 300 mutations that prevent the genes in question from functioning normally. Furthermore, each of them has from 50 to 100 gene variants that are associated with an inherited disease, and 60 new mutations that were not present in their parents. (Nature, October 28, 2010)

Image: MPI for Colloids and Interfaces (bottom), illustration: NASA/Dana Berry, SkyWorks Digital (top)