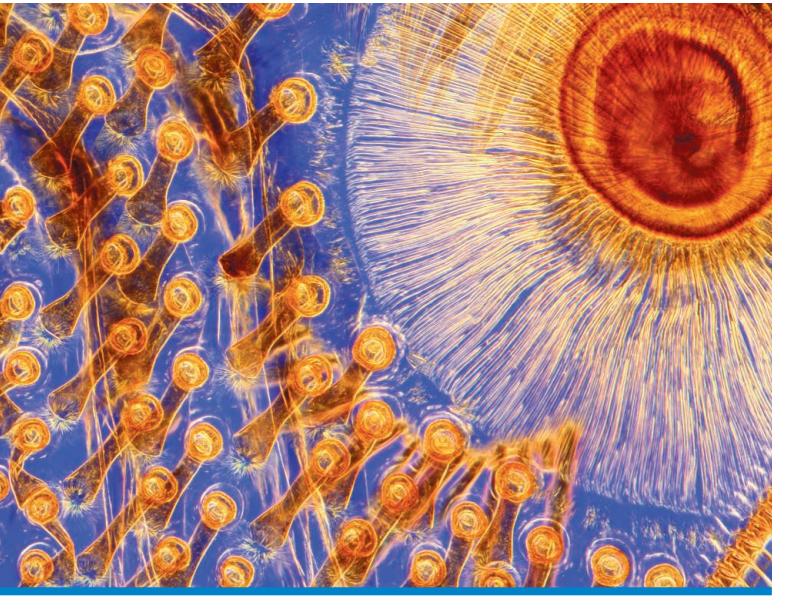
Science Snaps Win Prizes

From his home in Stafford, U.K., retired schoolteacher Spike Walker snapped four of the 20 images that won the 2010 Wellcome Image Awards, announced this week. The pictures, created by stacking as many as 44 different frames captured through a microscope, reveal surprising details about four different insects in vivid color. These include the hooks on a caterpillar's belly, a mosquito's feathery antennae, the hairs on a coiled ruby-tailed wasp, and the suckers on the foreleg of a great diving beetle, with which it grasps females during mating (pictured). "The beetle was one I found in a large collection of Victorian slides a friend was wanting to get rid of," Walker says. "The wasp just flew into the kitchen one day." His four photomicrographs, along with the 16 other winners, which included a scan of a patient's aneurysm and an image of a 3-day-old mouse blastocyst undergoing its first cell division, are on display at the Wellcome Collection in London.



>>FINDINGS

Rising Temperatures Bringing Bigger Floods

In October and November 2000, floods soaked large swaths of England and Wales, causing losses estimated to exceed $2 billion. Now new research suggests that human-caused climate change, brought about by past emissions of carbon dioxide, almost certainly boosted the risk of these floods.

Pardeep Pall of the University of Oxford in the United Kingdom and his colleagues ran thousands of climate simulations. In roughly half of them, they reduced atmospheric concentrations of carbon dioxide to levels measured in 1900, and they adjusted ocean temperatures and the amount of Arctic sea ice—which affects high-latitude weather patterns—accordingly. In the other simulations, they modeled modern conditions. Then they compared the rainfall amounts generated in both types of simulations. Finally, they fed the rainfall values into a model that assesses the potential for flooding.

In 90% of the simulations, results suggested that the flood risk in England and Wales in autumn 2000 was at least 20% higher than it would have been in 1900, the team reported online last week in *Nature*. In two-thirds of the cases, the flood risk was at least 90% higher.

http://scim.ag/more-floods

Cheers! Ancient Britons Made Skull Cups

Humans have been using skulls as cups for thousands of years to toast friends—or enemies. Now a team analyzing bones from Gough Cave in Somerset, United Kingdom, has found what it claims to be the earliest evidence for the practice.

Led by paleontologist Silvia Bello of the Natural History Museum in London, the team studied three skulls previously found in a cave layer radiocarbon dated to 14,700 years ago, during the Ice Age when the Magdalenian culture thrived there. The pattern of cutmarks and abrasions on the skulls suggests that the cranial vaults were carefully preserved while the rest of the faces were smashed off, the eyes gouged out, and the lower jaws carefully removed. Bello's team concluded online last week in *PLoS ONE* that the skulls were deliberately fashioned into cups or other containers, likely for a ceremony. Other bones from the cave show signs of cannibalism, and researchers suggest that the cups may even have been used to serve up the brains of an enemy. **http://scim.ag/skull-cups**

Longer Genes, Longer Flight

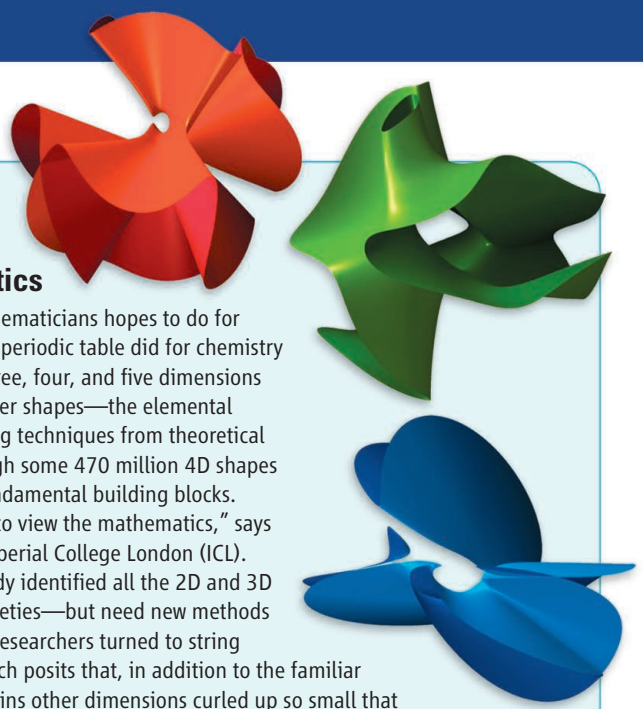
Every year, some 50 billion birds take to the air for their seasonal migrations. They may go 500 kilometers in a day and a few even travel from pole to pole. But how do they know when, where, and how far to fly? Now ornithologists have pinned down one of the genes that influences migratory behavior. And strange as it may sound, the length of that gene influences the length of the flights.

Jakob Mueller and Bart Kempenaers of the Max Planck Institute for Ornithology in Starnberg, Germany, along with Francisco Pulido, now at the Complutense University of Madrid in Spain, evaluated 14 populations of blackcaps (pictured) ranging from western Russia, through Europe, south to Africa. These populations vary in their inclinations to migrate. Blackcaps in Cape Verde, for example, never leave home, whereas those in Russia travel more than 3500 kilometers.

The researchers found that one gene, called *ADCYAP1* is correlated with the birds' typical premigratory behavior. They reported online in the *Proceedings of the Royal Society B* that groups that stayed put tended to have a shorter version of the gene, whereas long-distance migrants tended to have longer versions. The gene specifies a peptide in the brain that influences daily rhythms and affects energy use—increasing body temperature, metabolic rate, and fat usage. These sorts of changes occur as a bird gets ready to migrate. **http://scim.ag/long-flights**

Random Sample

Elementary Mathematics



An international group of mathematicians hopes to do for math what Dmitri Mendeleev's periodic table did for chemistry by identifying the shapes in three, four, and five dimensions that cannot be divided into other shapes—the elemental "atoms" of geometry. Borrowing techniques from theoretical physics, they plan to sift through some 470 million 4D shapes in search of a few thousand fundamental building blocks. "We're using physics as a lens to view the mathematics," says team leader Alessio Corti of Imperial College London (ICL).

Mathematicians have already identified all the 2D and 3D basic shapes—called Fano varieties—but need new methods for higher dimensions. So the researchers turned to string theory, a branch of physics which posits that, in addition to the familiar dimensions, the universe contains other dimensions curled up so small that their effects are hard to detect. Tools developed by string theorists to study such curled-up dimensions can tell the team whether higher-dimensional shapes, slices of which are shown here, are Fano varieties.

The researchers—who are from the United Kingdom, Russia, Japan, and Australia—communicate via a blog (http://scim.ag/fano-v) and Twitter, so anyone can see how they're getting on. Knowing the basic building blocks of geometry, they hope, will be useful for mathematicians, string theorists, and engineers. Team member Tom Coates of ICL says it should take roughly 3 years to work through the 4D shapes. And the 5D ones? "We simply don't know."

CREDITS (TOP TO BOTTOM): IMPERIAL COLLEGE LONDON; MIKE POPE; NATURAL HISTORY MUSEUM, LONDON

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