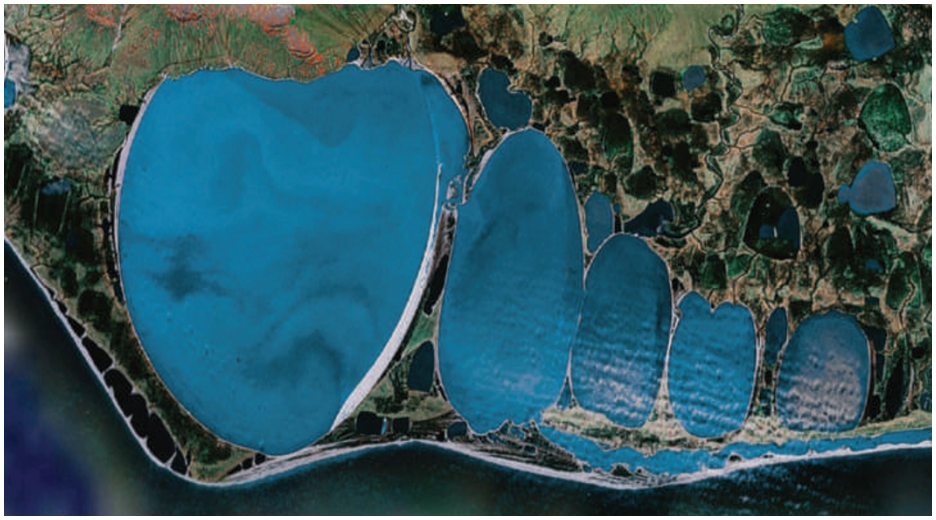
RESEARCH HIGHLIGHTS

On the cusp

Geology **37,** 187–190 (2009)

They might look like the footprints of giants or of alien visitors, but the quasi-geometric shapes adopted by some elongated lakes or ponds have a natural explanation.

The shores of such water bodies are washed by high-angle waves, which make them prone to instability caused by erosion and deposition of shoreline sand or gravel, say Andrew Ashton of the Woods Hole Oceanographic Institution in Massachusetts and his colleagues. Their simulations show that this process creates cusp-shaped capes and spits, and that the effect of these on wave patterns often leads to cusps on opposite shores 'attracting' one another. The cusps ultimately link up, forming bridges that divide the water body into a series of smaller, often oval, lakes.



NASA/DIGITALGLOBE/TERRAMETRICS/GOOGLE EARTH/A. ASHTON

ASSISTED COLONIZATION

Flitter further north

Conserv. Lett. **2,** 45–51 (2009)

Many species are edging northwards in response to climate change, among them the UK-resident butterflies marbled white (*Melanargia galathea*) and small skipper (*Thymelicus sylvestris*). In 1999 and 2000, Stephen Willis of Durham University, UK, and his colleagues collected several hundred adults of each species and moved them many kilometres north of their current ranges.

Both butterflies thrived in their new homes, suggesting that their ability to disperse northwards is slower than the rate at which suitable habitat is becoming available owing to climate change. The authors say that actively moving certain species may help them to survive climate change.

ECOLOGY

Perils of monoculture

Front. Ecol. Environ. doi:10.1890/080085 (2009)

A greater diversity of crops in a given area may reduce the amount of dissolved nitrogen compounds from fertilizers leaking into surrounding water bodies, where they wreak havoc with acquatic ecosystems.

Whitney Broussard, currently at the University of Louisiana at Lafayette, and Eugene Turner from Louisiana State University in Baton Rouge examined the relationship between various agricultural practices and levels of dissolved nitrogen compounds. They looked at data for 56 watersheds across the continental United States at both the beginning and the end of the twentieth century.

The duo discovered that about 45% of the difference seen in the concentration of nitrogen compounds in the watersheds between 1997 and 2002 was due to variation in the biodiversity of crops on agricultural land in those areas.

MICROMECHANICS

Bacterial spin doctors

Phys. Rev. Lett. **102,** 048104 (2009)

A micro-windmill driven by tumbling bacteria has been designed by Luca Angelani and his co-workers at the University of Rome La Sapienza.

Strikingly, the 'bacterial wind' isn't blowing in any particular direction — a cogwheel rotor converts the uncoordinated impacts of many bacterial cells into directional rotation by means of the asymmetrical, sawtooth shape of its teeth. This makes the 'bacterial motor' akin to Brownian motors, long familiar in physics and biology, in which random motions are converted to directional ones by asymmetry in the environment.

But the self-propelled nature of bacteria makes this device subtly different: in effect, it converts chemical energy into mechanical work.

EVOLUTION

All for self

Proc. Natl Acad. Sci. USA doi: 10.1073/pnas.0807679106 (2009)

Many plant species have accepted the trade-off between the benefits of greater self-reliance and the disadvantages inherent in inbreeding to switch from outcrossing to self-fertilization. However, little is known about the speed at which this happens, say Stephen Wright of the University of Toronto in Canada and his colleagues.

By sequencing 39 nuclear genes from specimens of the selfing *Capsella rubella* and its outcrossing progenitor *Capsella grandiflora*, they estimate that the move in this species happened within the past 20,000 years. This is consistent with it occurring since the last glacial maximum, after which agriculture spread across Europe, producing a situation favourable to plants more capable of colonization — one of the advantages of selfing. Natural selection for guaranteed reproduction can thus lead to major changes and speciation over short periods of time, the authors speculate.

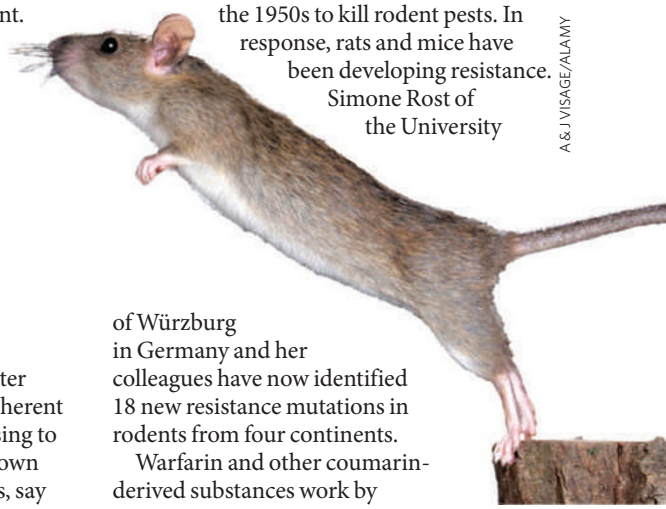
GENETICS

Rodent resistance

BMC Genet. doi:10.1186/1471-2156-10-4 (2009)

Pesticides derived from the compound coumarin have been used since the 1950s to kill rodent pests. In response, rats and mice have been developing resistance. Simone Rost of the University of Würzburg in Germany and her colleagues have now identified 18 new resistance mutations in rodents from four continents.

Warfarin and other coumarin-derived substances work by



A & J VISAGE/ALAMY