



## PLANETARY SCIENCE

## Martian moons formed *in situ*

The moons of Mars may have formed from a disk of debris kicked up by the impact of a giant meteorite on the planet.

Astronomers have struggled to explain the existence of Phobos (pictured) and Deimos, the small, irregularly shaped moons of the red planet. One view is that they were asteroids captured by Mars. But a team led by Pascal Rosenblatt at the Royal Observatory of Belgium in Brussels tested an alternative idea using computer simulations of how orbiting debris, created by a giant impact, might coalesce.

Relatively large moons form in the inner part of the disk thrown up by such a smash, and migrate outward, causing the outer part of the disk to coalesce into two bodies the sizes of Phobos and Deimos. The inner large moons are eventually dragged inward and fall back to Mars over 5 million years.

*Nature Geosci.* <http://dx.doi.org/10.1038/ngeo2742> (2016)

## CLIMATE SCIENCE

## Warming shifts plant sex ratio

Climate change seems to be skewing the sex ratios of an alpine herb towards male plants.

William Petry at the University of California, Irvine, and his colleagues analysed data on

populations of the herb valerian (*Valeriana edulis*) in the Rocky Mountains of Colorado as the region became warmer and drier over the past few decades. They found that in 2011, plants at the highest elevations were only 23% male, whereas at lower altitudes, where the climate is warmer and wetter, the plants were up to 50% male. Across 9 populations at a variety of elevations, there was an average of 6% more males in 2011 than in 1978.

A higher male-to-female ratio could result in increased pollination — and therefore seed production — which could help the plants to expand their range as they adapt to climate change, the authors suggest.

*Science* 353, 69–71 (2016)

## ROBOTICS

## Soft wheels make robots tough

Wheels built entirely from soft materials can help robots to roll over tricky terrain and resist damage.

Aaron Mazzeo and his co-workers at Rutgers University in Piscataway, New Jersey, built a squishy wheel inspired by the inching motions of soft creatures such as earthworms. A stretchable ring contains multiple internal chambers, groups of which can be inflated and deflated sequentially around the circle. The pressurized compartments exert torque on a second, outer ring, causing it to turn.

A soft robotic vehicle fitted with four of these wheels (pictured) travelled on a flat surface at 3.7 centimetres per second and kept moving after being dropped from eight times its height. The researchers also drove the



## SOCIAL SELECTION

## Fake article webpages draw fire

A debate is swirling around a tactic that academic publisher John Wiley & Sons uses to fight online piracy (see [go.nature.com/299xi1y](http://go.nature.com/299xi1y)). The company created a webpage, accessible by several URLs, that looked like an academic paper to automated downloading programs. But any users who accessed the URLs were then blocked from viewing other Wiley content. Wiley and other publishers use these 'trap' URLs —

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which are invisible to most human users — to detect and prevent unauthorized downloading and republishing of their content. But some users say that the tactic is too heavy-handed.

robot over a rocky landscape and underwater, and show that their concept can be modified to make winch rotors.

*Adv. Mater.* <http://doi.org/f3qjsh> (2016)

## CANCER BIOLOGY

## Leukaemia cells hide in fat tissue

Cancer-causing stem cells evade chemotherapy by surviving in fat deposits around gonads.

Fat tissue supports the growth of normal blood-forming stem cells. Craig Jordan of the University of Colorado Denver and his colleagues found that in a mouse model of one form of leukaemia, gonadal fat deposits contained numerous cancer stem cells, but subcutaneous fat had very few. Leukaemic cells induced the breakdown of gonadal fat, releasing nutrients that fuelled the growth of malignant cells in fat as well as other tissues. The cancer stem cells also expressed CD36, a cellular marker that boosts fat metabolism, helping to protect the cells from many chemotherapy drugs.

Targeting fat metabolism could help to eradicate leukaemia stem cells, the authors suggest.

*Cell Stem Cell* <http://doi.org/bkqj> (2016)

## CLIMATE CHANGE

## Negative carbon emissions needed

Countries' existing promises regarding emissions reductions are unlikely to prevent global warming exceeding 2°C above pre-industrial temperatures by the end of the century, meaning that large amounts of carbon may need to be removed from the atmosphere.

Benjamin Sanderson and his co-workers at the US National Center for Atmospheric Research in Boulder, Colorado, explored the odds of staying below 2°C of warming for a range of emissions pathways. They also analysed whether 'negative emissions' — the removal of carbon from the atmosphere — will be necessary.

To avoid crossing the 2-degree threshold during this century, net global emissions must drop to zero by 2085, the authors find. Depending on the level of near-term reductions, between 1.5 billion and 5 billion tonnes of CO<sub>2</sub> per year will need to be captured and removed from the atmosphere thereafter.

*Geophys. Res. Lett.* <http://doi.org/bkqh> (2016)

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