

ASTRONOMY

Carbon monoxide in large-star disks

Stars twice as massive as the Sun can feature carbon-monoxide-rich gas disks around them, contrary to the expectation that ultraviolet radiation would have stripped away the gas.

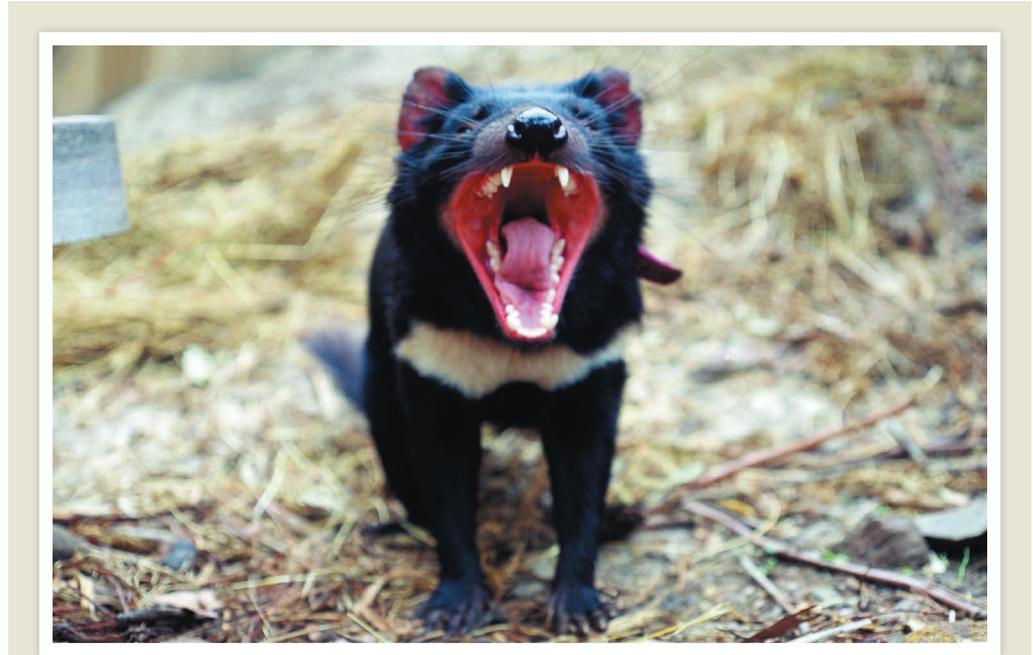
Meredith Hughes at Wesleyan University in Middletown, Connecticut, and her colleagues used the Atacama Large Millimeter/submillimeter Array in northern Chile to probe the regions around 24 young star systems, only about 5 million to 10 million years old. They chose stars surrounded by a disk of dust debris — resembling a scaled-up version of the Solar System's Kuiper belt. This leftover material could form new planets, including gas giants. Surprisingly, three of the larger stars in the sample had strong carbon monoxide emissions. *Astrophys. J.* 828, 25 (2016)

CANCER

'Perfect storm' of cancer risk

The ability of an organ's stem cells to generate new tissue over time — the cells' generative capacity — determines how prone that organ is to cancer.

Scientists have debated the relative importance of factors that contribute to an organ's cancer risk, including 'intrinsic' factors such as the number of stem-cell divisions and 'extrinsic' factors that cause tissue and DNA damage. To compare these factors, Richard Gilbertson at the CRUK Cambridge Institute, UK, Arzu Onar-Thomas at St Jude Children's Research Hospital in Memphis, Tennessee, and their colleagues studied stem



MENNA JONES

DISEASE ECOLOGY

Rapid evolution of cancer resistance

Tasmanian devils have developed a degree of genetic resistance to a virulent contagious facial cancer in just four to six generations.

Andrew Storfer at Washington State University in Pullman and his colleagues sequenced about one-sixth of the genome for 294 devils (*Sarcophilus harrisii*) from 3 wild populations. The authors used samples collected both before and after the groups first

encountered the facial cancer.

The team found five genes spread across two regions of the genome that showed strong signs of selection, including a large number of single-DNA-base changes, throughout the devil populations. Two of the genes, *CD146* and *THY1*, are known to help the immune system to recognize foreign cells in other animals. *Nature Commun.* 7, 12684 (2016)

cells called Prom1⁺ cells with varying levels of generative capacity in different organs in mice of various ages. The authors introduced key cancer-causing mutations into the cells, then looked for tumour growth in the organs.

The team found that cancer risk correlated closely with the generative capacity of the Prom1⁺ cells. In liver tissue, cancer mutations alone did not cause cancer — tissue injury significantly increased cancer susceptibility. The authors propose that several factors contribute to a 'perfect storm' of tumour growth: mutated

stem cells and extrinsic factors that trigger cell proliferation. *Cell* <http://doi.org/bp73> (2016)

CLIMATE-CHANGE ECOLOGY

Trees flourish on the happy edge

As the climate warms, sugar maples expanding their populations uphill could outrun their insect predators and flourish on the 'happy edge' of their range.

Morgane Urli and her colleagues at the University of Sherbrooke in Quebec, Canada, transplanted

two-year-old sugar maples (*Acer saccharum*) uphill to sites just at, and beyond, their current elevation range limit. Some were given protection from herbivores. Of seedlings without protection, more than 75% at the range edge and beyond survived, compared with just 30% at the centre of the current range. The difference narrowed markedly in protected plants, suggesting that the increased survival was largely due to 'enemy release' at and beyond the current range.

Previously, the team showed that seed predation beyond elevation range limits is very

high. However, those few seeds that do escape can look forward to a healthy future.

Ecology <http://doi.org/bp5t> (2016)

CONSERVATION BIOLOGY

Lazy bustards live longer

Migration in great bustards seems to be on the decline because many of those that do migrate die in collisions with power lines.

Carlos Palacín at the National Museum of Natural Sciences in Madrid and his colleagues captured and radio-tagged 180 male great bustards (*Otis tarda*) across 29 breeding groups, covering most of the species' range in Iberia. Only some birds migrated north in summer. Of those that did, 21.3% died in crashes with power lines, whereas just 6.3% in the sedentary group died in this way.

The authors found a steady increase in the proportion of non-migratory males over the study period, from 17% in 1997 to 45% in 2012. They propose that males decide whether to migrate by observing other males. Thus, as the number of migrators declines, the behaviour may die out. *Conserv. Biol.* <http://doi.org/bp53> (2016)

PALAEOLOGY

Tiny pterosaurs' tenure extended

The discovery of a surprisingly small fossilized pterosaur (pictured with domestic cat for scale) in rock some 77 million years old challenges the accepted history of the winged reptiles. Scientists had thought that, by around 100 million years ago, small pterosaurs had been replaced by larger species.

Elizabeth Martin-Silverstone at the University of Southampton, UK, and her colleagues uncovered a wing bone and vertebrae from a pterosaur in 80-million- to 72-million-year-old rock formations in British

Columbia, Canada. Although the creature's 1.5-metre wingspan was tiny compared with that of the 10-metre giants known from this period, bone analysis revealed that it was almost fully grown.

Fossilized juveniles of larger pterosaur species from this period are also rare, suggesting that the record may be biased against small pterosaurs. *R. Soc. Open Sci.* 3, 160333 (2016)

STEM CELLS

Bone cells on demand

Researchers have come up with a simple recipe for making bone from stem cells.

Embryonic stem cells can form every type of tissue in the body, but methods for forcing these and other pluripotent stem cells to differentiate into a specific type can be inefficient and costly. A team led by Shyni Varghese at the University of California, San Diego, added a chemical called adenosine — which occurs naturally in the body — to human stem-cell cultures and produced bone-making cells called osteoblasts in under three weeks. The cultured osteoblasts generated calcified bone, and scaffolds that had been coated with the osteoblasts and implanted into mice repaired skull defects. *Sci. Adv.* 2, e1600691 (2016)

GENETICS

Synthetic DNA overreacts to light

Synthetic DNA bases created in 2014 to expand the genetic code are light-sensitive and produce reactive oxygen species (ROS) when exposed to certain wavelengths.

Ultraviolet light can



damage natural DNA bases, but cells have in-built repair mechanisms to fix this. Carlos Crespo-Hernández of Case Western Reserve University in Cleveland, Ohio, and his co-workers found that two lab-made DNA bases — d5SICS and dNaM, which have been used to design semi-synthetic bacteria — generate up to 100 times more reactive species than the most reactive natural base, thymidine, when exposed to near-visible wavelengths of light. In response to light exposure, a carcinoma cell line grown with d5SICS had higher levels of ROS, and cell proliferation was reduced.

Synthetic DNA bases may accelerate photochemical damage to cells, the authors say. *J. Am. Chem. Soc.* <http://doi.org/bp55> (2016)

CLIMATE CHANGE

Melting ice opens Arctic to shipping

Thanks to melting Arctic sea ice, ships with moderate ice strengthening (lighter than currently required, pictured) may be able to travel northern waters all year round by the century's end.

Nathanael Melia and his colleagues at the University of Reading, UK, used several global climate models to simulate the fastest shipping routes through the Arctic, depending on future greenhouse-gas emissions. In their most extreme scenario, the route from Yokohama in Japan to Rotterdam in the Netherlands becomes 13 days shorter than

alternative routes by 2100.

Even ordinary vessels could see the period during which they can navigate Arctic waters double by mid-century. *Geophys. Res. Lett.* <http://doi.org/bp5x> (2016)

STAR FORMATION

Star-rich early galaxy clusters

Galaxy clusters in the early Universe produced more stars than their more modern counterparts.

When a galaxy becomes part of a cluster — a group of galaxies bound together by gravity — its crowded surroundings often cause it to stop producing stars, an effect called environmental quenching. Using the Keck Observatory in Hawaii and the Very Large Telescope in Chile, a team led by Julie Nantais at the Andres Bello University in Santiago observed four galaxy clusters nearly 10 billion years old. They found that, in these early clusters, only about 30% more of the galaxies had stopped producing stars than had the surrounding galaxies, compared with a difference of about 50% in newer clusters.

Knowing how quenching changes over the history of the Universe may help scientists to determine why the cluster environment causes the phenomenon.

Astron. Astrophys. 592, A161 (2016)

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