

RESEARCH HIGHLIGHTS

Selections from the scientific literature

MEDICINE

Drug manufacture on demand

A fridge-sized machine can produce multiple pharmacy-quality medicines on demand in hours, and could make drug supply chains more resistant to disruption.

Klavs Jensen at the Massachusetts Institute of Technology in Cambridge and his colleagues developed a machine that can synthesize hundreds to thousands of doses of four common drugs: diazepam, diphenhydramine, fluoxetine and lidocaine. Their 'plug-and-play' system can conduct multiple-step synthesis from commercial starting materials, and can also purify and crystallize the resulting compounds into a useable product.

Such a machine could one day allow on-demand production of medicines for hospitals, humanitarian operations and pharmaceutical research. *Science* 352, 61–67 (2016)

VIROLOGY

Virus adaptation to mosquitoes

Insect-borne viruses can lose some of their vigour during their time in mosquitoes before transmission to a vertebrate host.

Gregory Ebel at Colorado State University in Fort Collins and his colleagues infected four mosquito species (including *Aedes aegypti*,



pictured) with West Nile virus, which jumps back and forth between mosquitoes and birds.

Fourteen days later, they isolated the virus from the insects' saliva and organs and sequenced its RNA. They found that viruses from different mosquito species had acquired different sets of mutations. When they put the virus into avian cells, they found that these mutations made it more difficult for the virus to survive, suggesting that it had adapted to living in the mosquito. The findings may help to understand how insect-borne viruses are

spread, the researchers say. *Cell Host Microbe* <http://doi.org/bdxr> (2016)

ASTRONOMY

White dwarf's weird atmosphere

Astronomers have discovered a white dwarf star that has an atmosphere made almost entirely of oxygen — the first of its kind to be discovered.

White dwarfs are the dense cores that get left behind when a relatively small star's nuclear fuel runs out and it sheds some of its outer layers. Usually their atmospheres

are made of hydrogen or helium, because these light elements float to the surface. By analysing light gathered by the Sloan Digital Sky Survey telescope, Kepler de Souza Oliveira Filho at the Federal University of Rio Grande do Sul in Porto Alegre, Brazil, and his colleagues identified a white dwarf that has been stripped of its light elements. This has left it with an atmosphere containing mostly oxygen, with traces of neon and magnesium.

A violent pulse of burning carbon from inside the star or a fiery merger with a companion white dwarf could



MONTY RAKUSEN/GETTY

ECOLOGY

A path to better fisheries

Better-managed fisheries could yield billions of extra dollars in profit and extract millions more tonnes of fish from the oceans.

Many fish stocks are overexploited and poorly managed. Christopher Costello at the University of California, Santa Barbara, and his colleagues modelled the trajectories of 4,713 fisheries under various management systems.

Compared to a 'business-as-usual' trajectory, improved management centred on fishing rights that boost the economic value of fish could

increase fish numbers, the researchers estimate, and yield 16 million tonnes more fish by 2050. It would generate US\$53 billion in profit and there would be 619 million tonnes more biomass in the oceans as a result. The average overfished stock would recover in 10 years, and 98% of stocks would recover by 2050. Better management could improve food security, conservation and profits in nations that currently manage their fisheries poorly, say the authors.

Proc. Natl Acad. Sci. USA <http://doi.org/bdtd> (2016)