NEURODEGENERATION

Hunting for the effects of huntingtin

Huntington's disease (HD) is associated with a mutant form of the protein huntingtin (Htt). HD-associated symptoms are alleviated by inhibition of the kinase mTOR, which activates protein synthesis when amino acids are plentiful. In mouse striatal neurons, Pryor *et al.* found that wild-type Htt stimulated amino acid–induced mTOR signaling by enhancing its interaction with an activating protein. Mutant Htt promoted this interaction even when amino acid availability was not increased. In a mouse model of HD, activating mTOR in striatal neurons accelerated the onset of symptoms. — LKF

Sci. Signal. **7**, ra103 (2014).

PLANT GENETICS

Y male plants affect female development

Although most plants have both male and female organs within a single flower, some produce separate male and female plants. In some cases, such as persimmons, males are determined by a Y chromosome. Akagi *et al.* examined the gene transcript differences between male and female persimmons. A gene on the Y chromosome regulated a non–sex chromosome–linked small RNA that suppresses female organ development. This small RNA was localized to male flowers and could affect female development in other plant species. The evolutionary history of these genes suggests that they are tied to the origin of the separation of sexes in the persimmon family. — LMZ

Science, this issue p. 646

Persimmons separate the sexes

CREDITS: (LEFT TO RIGHT) © TOPIC PHOTO AGENCY/CORBIS; C. BICKEL/*SCIENCE*

BEHAVIORAL ECONOMICS

How to increase charitable donations

Charities could raise more money from more people if they were to announce that a startup grant had been used to defray overhead expenses. Gneezy *et al.* told 40,000 potential donors that an initial donation (half of the target amount) would be used as seed money, as a source of matching funds, or for covering administrative and fundraising costs. When the money was assigned to cover administration, twice as many people made donations. — GJC

Science, this issue p. 632

NANOMEDICINE

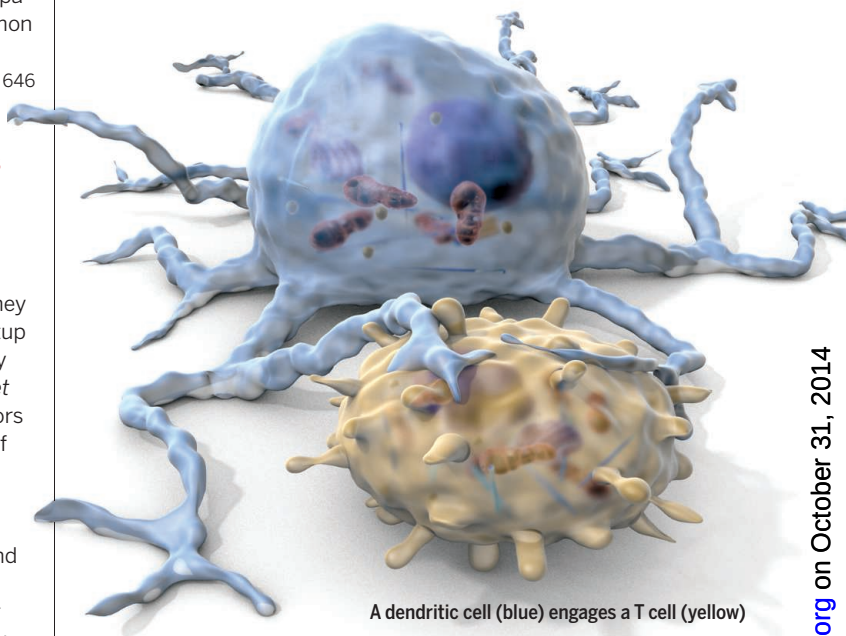
Nanoparticles for molecular cancer imaging

Tiny particles can be coated with antibodies or peptides to target a molecule specific to cancer, improving diagnostic accuracy and patient stratification. Yet these decorated nanoparticles have been slow in making it to clinical trials. Now, Phillips *et al.* describe the translation of ultrasmall (<10 nm) inorganic nanoparticles, called "C dots," from animals to patients. The nanoparticles were not toxic in a small group of five patients with metastatic melanoma and were excreted intact via the kidneys and bladder. In contrast, larger or uncoated particles often get lodged in the liver. Many more studies in patients will be needed to confirm lack of toxicity and to optimize tumor targeting, but now that such ultrasmall nanoparticles can be tested in people, a new era of molecular cancer imaging has begun. — MLF

Sci. Transl. Med. **6**, 260ra149 (2014).

IN OTHER JOURNALS

Edited by **Kristen Mueller** *and* **Jesse Smith**



A dendritic cell (blue) engages a T cell (yellow)

CANCER IMMUNOLOGY

A dendritic cell target for immunotherapy

Cancer immunotherapies work by activating T cells to kill tumors. Antigen-presenting cells (APCs), such as dendritic cells and macrophages, activate T cells by engaging protein receptors on the T cell surface. This then tells the T cells to attack the tumors. But T cells typically cannot attack tumors because the immunosuppressive microenvironment of tumors keeps APCs from turning these signals on. Broz *et al.* now report, however, that low numbers of dendritic cells capable of activating T cells exist in tumors in mice. T cell–mediated clearance of tumors depended on these cells. In humans, an increased genetic signature of these cells correlated with better outcomes in a variety of tumor types. — KLM

Can. Cell 10.1016/j.ccell.2014.09.007 (2014).

GEOCHEMISTRY

Monitoring the mineral-water interface

At a microscopic level, mineral-water interfaces are vast, ever-changing landscapes. Individually, these interfaces have a trivial influence on the environment, but on a global scale they help drive important geochemical reactions such as the uptake of CO_2 from the atmosphere during chemical weathering. Siebecker *et al.* used fast-resolved x-ray absorption spectroscopy to monitor real-time mineral growth and dissolution on Al-rich pyrophyllite clay in a flowing Ni-rich solution. Not only did precipitation of mixed Ni-Al layered hydroxides occur on extremely fast time scales, but it occurred as a consequence of the rapid release of Al from the simultaneously dissolving pyrophyllite. — NW

Nat. Comm. 10.1038/ncomms6003 (2014).

Downloaded from www.sciencemag.org on October 31, 2014

Published by AAAS

The Colosseum in February 2012, during a cold wave that swept across Europe.

CLIMATE SCIENCE

Sea-ice loss behind Eurasia's chills

Severe winters, such as the deadly cold wave from January to February 2012 that blanketed Europe with snow, are becoming more frequent across Eurasia. Some scientists contend that Arctic sea-ice loss is responsible, but modelers haven't pinpointed a climate link. Mori *et al*. identified two circulation patterns that drove winter temperatures in Eurasia from 1979 to 2013: the Arctic Oscillation (which confines colder air to the polar latitudes) and a pattern dubbed "Warm Arctic and Cold Eurasia" (WACE), which correlated both to sea-ice loss in the Barents-Kara Sea and to particularly cold winters; its impact has more than doubled the probability of severe winters in central Eurasia. But by the end of the century, the Arctic Oscillation could overpower WACE's cooling effect, bringing temperatures back up. — CG

Nat. Geosci., 10.1038/ngeo2277 (2014).

QUANTUM PHYSICS

Making a measure of quantum coherence

The notion that particles have properties of waves lies at the heart of quantum mechanics. When quantum systems interact, their interaction can be described in terms of interfering waves, whose coherence is of utmost importance in working out how these waves ultimately interfere. Determining how much coherence there is in a system or how much is required for a particular process is difficult to quantify, though. Baumgratz *et al.* present a rigorous mathematical framework for the quantification of coherence and identify intuitive and easily computable measures that can be used to compute it. They argue that having such a quantifiable metric will have important implications for describing energy transfer processes or transferring quantum information between quantum elements. — ISO

Phys. Rev. Lett. 10.1103/PhysRevLett.113.140401 (2014).

AGING

A drug fights off ravages of aging in mice

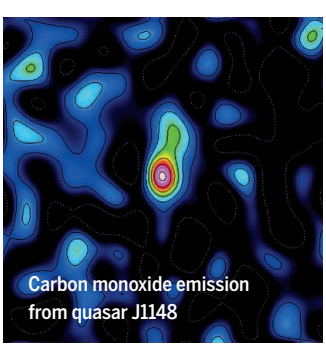
Interested in a pill to extend life span and delay the onset of age-related diseases? The answer may lie in targeting the enzyme NAD-dependent deactylase sirtuin 1 (SIRT1): Animals with enhanced activity of SIRT1 show some of these effects. To study the effects of long-term SIRT1 activity, Mercken *et al*. fed mice a synthetic activator of SIRT1 from 6 months of age for the rest of their (~3-year) life span. The treated mice had 5% and 10% increases in maximum and mean life span, respectively. They also resisted many problems associated with human aging. The mice had more stable blood glucose levels, better muscle endurance and balance, less fat, and suppressed inflammatory responses. — LBR

Aging Cell 10.1111/acel.12220 (2014).

ASTRONOMY

A surprise window to the early universe

Less than a billion years after the Big Bang, black holes at the cores of distant quasars had already reached millions of times the Sun's mass, implying a puzzlingly rapid growth rate. To understand the process, astronomers look for their predecessors at even greater distances, but such objects may be cloaked in dust and gas that thwart optical and x-ray detection. Gallerani *et al.* recently detected a millimeter emission line (J = 17 to 16) of the molecule CO in one luminous quasar (J1148) that cuts through dust unabated. If the earliest ancestors of supermassive black holes indeed exist in such thick cocoons, long-wavelength emission lines may offer a way to look at sources that would otherwise lie invisible. — MMM



Carbon monoxide emission from quasar J1148

Mon. Not. R. Astron. Soc. 10.1093/mnras/stu2031 (2014).

CANCER GENOMICS

Cancer's deadly mutational tug of war

As cancers grow, they mutate, which allows their continued growth and metastasis. Mutations are either driver mutations—required for tumors to progress—or passenger mutations—additional random mutations that result from such rapid adaptation. How do passenger mutations affect tumors? McFarland *et al*. found that passenger mutations are 100 times more common than driver mutations and have smaller effects on tumors, but the effects are often deleterious. Thus driver and passenger mutations are in a "tug of war" that determines whether a tumor will progress. A better understanding of how passenger mutations accumulate could explain the success of current treatments or provide additional avenues to explore for therapeutic benefit. — LMZ

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1404341111 (2014).

GENOME EDITING

Dissecting an RNA that dissects genomes

By adapting the immune defense system found in many species of bacteria, scientists can now edit the genome of any organism at will. In this system (called type II CRISPR Cas), a small RNA—the single guide RNA (sgRNA)—guides the enzyme Cas9 to DNA complementary sequences, which Cas9 then cleaves. Looking for how the sgRNA targets Cas9 to DNA, Briner *et al*. identified several structural modules in the sgRNA that determine Cas9 targeting. Some of these motifs also determined which species variant of Cas9 would be targeted. These results may inform the design of more compact and versatile genome editing systems. — GR

Mol. Cell 10.1016/j.molcel.2014.09.019 (2014).

CREDITS: (TOP TO BOTTOM) EPA/GUIDO MONTANI/NEWSCOM; S. GALLERANI *ET AL.*, *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY* (19 OCTOBER 2014) © OXFORD UNIVERSITY PRESS

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