MATERIALS CHEMISTRY

## Soldering semiconductor nanoparticles

The optical and electronic properties of semiconductor nanoparticles can be tuned through changes in their size and composition. However, poor contact between interfaces can degrade nanoparticle performance in devices. Dolzhnikov *et al*. report the synthesis of a gel-like "solder" for metal chalcogenide nanoparticles, such as cadmium selenide and lead telluride, by cross-linking molecular wires of these materials. — PDS

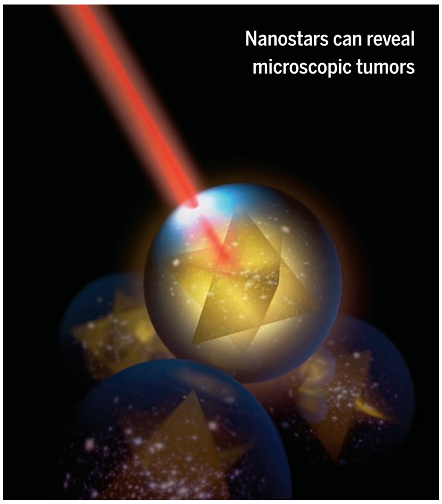
*Science*, this issue p. 425

CANCER IMAGING

## Seeing nanostars

Microscopic tumors may be invisible to the naked eye, but they are no match for nanosized imaging agents that penetrate cancer tissue and signal the presence of disease. Harmsen *et al.* created a new generation of cancer-imaging agents called "nanostars"—star-shaped gold cores and Raman reporter molecules wrapped in silica—that can be visualized by Raman scattering. A new feature that puts the nanostars in resonance with the near-infrared window lets them outshine any previous nanoparticles. With these surface-enhanced resonance Raman scattering nanostars, the authors visualized microscopic lesions in animal models of pancreatic, breast, and prostate cancer, as well as sarcomas. — MLF

*Sci. Transl. Med.* **7**, 271ra7 (2015).



Nanostars can reveal microscopic tumors

PROTEASOMES

## A detailed look at proteasomes in situ

The 26*S* proteasome is a protein machine that degrades intracellular proteins in the cytosol. The proteasome is critical for protein quality control and for the regulation of numerous cellular processes in eukaryotic cells. The structure of isolated proteasomes is well established, but how intact proteasomes look within the cell is less clear. Asano *et al*. used an improved approach to electron cryotomography to look at proteasomes in intact hippocampal neurons. Their analysis suggests that these cells only use about 20% of their proteasomes in an unstressed state, which leaves significant spare capacity to deal with proteotoxic stress. — SMH

*Science*, this issue p. 439

CELL BIOLOGY

## A binding partner for an orphan receptor

Anaplastic lymphoma kinase (ALK) is a receptor tyrosine kinase that is important during the development of the nervous system. ALK can also be aberrantly activated in certain types of cancers, including neuroblastoma and lung adenocarcinoma. Until now, ALK was an "orphan" receptor because its ligand was not known. Now, Murray *et al.* show that heparin binds directly to ALK and stimulates its activity (see the Focus by Lemke). An antibody that blocked the binding prevented heparin from activating this receptor tyrosine kinase, providing a potential avenue for therapeutic intervention. — JDB

*Sci. Signal.* **8**, ra6; see also fs2 (2015).

# IN OTHER JOURNALS

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

SIGNAL TRANSDUCTION

## How a mouse's nose feels the cold

Guanylyl cyclases (GC) are a family of transmembrane proteins that regulate physiological processes as diverse as blood pressure and our sense of smell. Neurons in the Grueneberg ganglion, a sensory organ in the mouse nose involved in detecting cold temperatures, express a subtype of GCs called GC-Gs, but scientists do not fully understand what activates these proteins. Chao *et al*. now show that cool temperatures can directly activate GC-Gs, probably by driving GC-G proteins to oligomerize (group together). Mouse pups exposed to cool temperatures normally make ultrasonic cries that encourage maternal care, but pups engineered to lack GC-G proteins could not. — VV

*EMBO J.* 10.15252/embj.201489652 (2014).

Guanylyl cyclase proteins in the mouse nose sense cold

OPTICS

## A one-two approach to air-lasing

Standoff spectroscopy involves the excitation and detection of chemical species at a distance. From security screening to environmental monitoring, there is a need to obtain accurate readings, which usually entails getting as much of a signal back as possible. Powerful laser pulses can excite pockets of air at great distances, allowing the remote sensing of the surrounding atmosphere, but their utility is limited by the small amount of light that gets back to the detector. Laurain *et al.* provide a solution to this problem, in the form of a two-color sequence of intense laser pulses. The first pulse, at infrared wavelengths, efficiently dissociates the air molecules; it is followed by a second ultraviolet pulse that excites the dissociated molecules and induces lasing. The induced laser light is emitted directionally, providing the possibility of greatly enhanced detection efficiency. — ISO

*Phys. Rev. Lett.* **113**, 253901 (2014).

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Livestock, such as cattle, cause strife among the Nyangatom people of East Africa

ANTHROPOLOGY

## The evolutionary benefits of warfare

Many human societies engage in warfare, but given the mortal risks involved, many evolutionary anthropologists have wondered why. Is there an evolutionary benefit to warfare? Glowacki and Wrangham tackled this question by studying the Nyangatom, a nomadic society in East Africa. Nyangatom men carry out livestock raids to pay for the right to marry. Men who were active cattle raiders had more wives and children than men who were not. But they had to wait for this benefit. Young raiders give stolen livestock as gifts to paternal relatives. They only benefitted later in life by inheriting the larger herds they helped to build. — GR

*Proc. Natl. Acad. Sci. U.S.A.* 10.1073/pnas.1412287112 (2014).

MINERAL PHYSICS

## A lower-mantle water cycle component

Water has a dramatic impact on mantle dynamics and chemistry. Despite speculation about water in Earth's lower mantle, a mechanism for supplying water to this remote region has been elusive. Pamato *et al.* suggest that a hydrous mineral called "phase D" may fill that role. Aluminum-rich hydrous phase D was found to be stable at the right temperature-pressure conditions and should be present in rocks with compositions that make up subducted ocean crust. Subducted slabs could therefore introduce water-rich patches into an otherwise dry lower mantle, providing an alternative explanation for some seismic and geochemical anomalies. — BG

*Nat. Geosci.* 10.1038/ngeo2306 (2015).

ENVIRONMENTAL SCIENCE

## Droughts and dead zones on the rise

Nutrient-rich agricultural runoff or wastewater discharge can lead to the formation of harmful algal blooms or oxygen-depleted (hypoxic) "dead zones" in surface waters. But now, Zhou *et al.* show that low tributary river discharge was the largest contributor to a record-breaking hypoxic event in Lake Erie in 2012. Drought conditions across much of North America that year decreased water flow into the lake, exacerbating the effects of persistent nutrient runoff. Because drought and other extreme climate events are expected to increase with climate change, management strategies need to consider all factors that may degrade future water quality. — NW

*Environ. Sci. Technol.* 10.1021/es503981n (2014).

PLANT GENOMICS

## Probing plant evolution by GC content

Scientists use GC content (that is, the percentage of guanine or cytosine residues in a genome) as a proxy to measure many elements relating to gene evolution. Within the major group of flowering plants called monocots, which includes many agriculturally important species, the GC content of the genomes of grasses decreases from the 5' to 3' end of the gene. In order to better understand how the distribution of GC content evolved in monocots, Clément *et al*. examined orthologous genes across 10 monocot species. They found that the specific pattern of GC distribution seen in grasses is in fact not grass-specific—it is ancestral to the monocots. — LMZ

*Genome Biol. Evol.* 10.1093/gbe/evu278 (2014).

Lake Erie as seen from space

HIV ERADICATION

## A cure from which there is no escape

One way to cure HIV-1 would be to pharmacologically drive virus production in latently infected cells and then to get $CD8^+$ T cells to kill these virus-spewing cells. But HIV-1 mutates to escape $CD8^+$ T cell responses, so is this strategy even possible? To find out, Deng *et al*. tested whether people chronically infected with HIV-1 harbor $CD8^+$ T cells that can recognize unmutated portions of latent HIV-1. They found that indeed, they do, and that stimulating these cells led them to kill cells infected with HIV-1 derived from latently infected cells, both in culture and in mice engineered to have a human immune system. — KLM

*Nature* 10.1038/nature14053 (2015).

PHOTOS: (TOP TO BOTTOM) RANDY OLSON/NATIONAL GEOGRAPHIC CREATIVE; NASA/JEFF SCHMALTZ, LANCE/EOSDIS MODIS RAPID RESPONSE