from open to closed states with changes in salt concentration or temperature. — PDS

Science, this issue p. 1446; see also p. 1417

NUCLEAR PHYSICS

Weighing the neutron against the proton

Elementary science textbooks often state that protons have the same mass as neutrons. This is not far from the truth—the neutron is about 0.14% heavier (and less stable) than the proton. The precise value is important, because if the mass difference were bigger or smaller, the world as we know it would likely not exist. Borsanyi *et al.* calculated the mass difference to high precision using a sophisticated approach that took into account the various forces that exist within a nucleon. The calculations reveal how finely tuned our universe needs to be. — JS

Science, this issue p. 1452

BONE BIOLOGY

Rebuilding bone in osteoporosis

The skeleton undergoes continuous turnover because osteoblast cells build bone and osteoclasts break it down. Too much turnover can cause osteoporosis. The receptor tyrosine kinase DDR2 tilts the balance in favor of bone formation. Zhang *et al.* found that DDR2 both enhanced the development of osteoblasts and prevented osteoclasts from fully developing and breaking down bone. Viral delivery of DDR2 increased bone density in a mouse model of osteoporosis. Thus, increasing DDR2 levels in both types of bone cells may benefit osteoporosis patients. — LKF

Sci. Signal. 8, ra31 (2015).

NEURODEVELOPMENT

Build the builders before the brain

Humans are much smarter than mice—key to this is the relative thickness of the human brain's neocortex. Florio *et al.* combed through genes expressed in the progenitor cells that build the neocortex and zeroed in on one gene found in humans but not in mice. The gene, which seems to differentiate humans from chimpanzees, drives proliferation of the key progenitor cells. Mice expressing this human gene during development built more elaborate brains. — PJH

Science, this issue p. 1465

SNARE PROTEINS

An explosive way to fuse membranes

The molecular machine that promotes membrane fusion during intracellular transport involves a number of so-called SNARE proteins. Ryu *et al.* describe the molecular mechanism by which two proteins —NSF and α-SNAP—disassemble SNARE complexes. A combination of single-molecule techniques resolved intermediate steps of the reaction. Surprisingly, unlike previously assumed, NSF did not unwind SNARE complexes processively. Instead, built-up tension was released in a single burst to "tear" the SNARE complex apart in a one-step global unfolding reaction. — SMH

Science, this issue p. 1485

1D NANOSTRUCTURES

Crafting organic-inorganic shish-kebabs

Functionalized inorganic nanocrystals can be assembled on polymeric chains like shish-kebabs. Xu *et al.* developed a clever and unconventional route for the synthesis of one-dimensional (1D) nanostructures. They capitalized on rationally designed amphiphilic wormlike precursors as nanoreactors. The approach opens the door for the design of intriguing hybrid materials with yet to be discovered properties. – ZHK

Science Advances 10.1126/sciadv.1500025 (2015).

IN OTHER JOURNALS

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

Weaning enhances the regenerative potential of pancreatic beta cells

CELL REGENERATION

Weaning means more than no more milk

Nursing mothers provide much needed nutrition to offspring, but the full effects of weaning on offspring's physiology is unknown. Stolovich-Rain *et al.* now show that in mice, weaning affects the function of insulin-producing beta cells in the pancreas. The ability of beta cells to regenerate after injury or to modulate their insulin secretion decreases with age. However, beta cells also regenerated poorly in response to injury in very young mice and only gained this function upon weaning. These results suggest that at least for mouse beta cells, weaning jump-starts the cell cycle and modulates insulin production in response to glucose. — BAP

Curr. Biol. **24**, 2733 (2014).

CANCER BIOLOGY

A CRISPR view of tumor metastasis

Large tumors metastasize more often than small tumors. Is this simply because large tumors release a greater number of malignant cells into the circulation? Or is it because the genetic changes in tumor cells that drive them to proliferate rapidly are the same as those that promote their metastatic behavior? To explore this question, Chen *et al.* designed a screen based on a genome-editing technology called CRISPR-Cas9 to identify genes that, when inactivated, enhance tumor growth, lung metastasis, or both in mice. The small set of inactivated genes found in metastatic lesions largely overlapped with the set found in late-stage primary tumors, implying that functional loss of these genes drives both growth and metastasis. — PAK

Cell 10.1016/j.cell.2015.02.038 (2015).

CELL BIOLOGY

Fatty acid trafficking in starvation

Starving cells switch their metabolism from glucose-based to mitochondrial oxidation of fatty acids (FAs). This requires FAs to move from lipid droplets, their home during times of ample nutrition, to the mitochondria. Because free FAs in the cytoplasm are toxic to cells, cells stringently control their trafficking and metabolism. To better

PHOTO: TOM MCHUGH/SCIENCE SOURCE

CONSERVATION

The hazards of isolation

Climate change affects animals in many ways, including shrinking and shifting their range. On continents, shifts may facilitate adaptation, but many highly threatened species live in regions where geography limits how far their range can shift. One region facing this challenge is Madagascar, where most species are endemic. Brown and Yoder used a suite of spatial modeling approaches to predict how warming might affect Madagascar's iconic lemur species. They found that 60% of lemur species face range contractions due to climate change. They highlight regions of highest conservation concern and conclude that long-term persistence of lemurs will require maintaining dispersal corridors and reducing habitat loss. — SNV

Curr. Biol. **24**, 2733 (2014).

Climate change threatens lemurs in Madagascar.

understand how cells coordinate these processes during starvation, Rambold *et al.* tracked fluorescently labeled FAs in live mouse cells. Enzymes called lipases freed FAs from lipid droplets, allowing their transfer to highly fused mitochondria located nearby. Autophagy, an intracellular degradation process, replenished FAs to lipid droplets. Such careful coordination allows cells to generate substrates for mitochondrial energy production while preventing free FAs–related toxicity. — MSM

Dev. Cell 10.1016/j.devcel.2015.01.029 (2015).

ORGANIC CHEMISTRY

Ionic liquids can ring in carbon dioxide

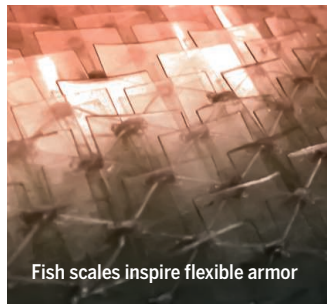
The growing risks of atmospheric carbon dioxide (CO_2) emissions are prompting chemists to explore more productive uses for the gas. Hu *et al.* present a simple means of coaxing carbon dioxide into small, ring-shaped molecules called oxazolidinones, which are of interest in medicinal chemistry research. Specifically, they found that certain ionic liquids can act as both solvent and catalyst to couple CO_2 with propargylic amines. This environmentally benign approach avoids the need to add metals to accelerate the reaction. The solvent showed consistent performance over five cycles of recovery and reuse. — JSY

Angew. Chem. Int. Ed. 10.1002/anie.201411969 (2015).

MATERIALS SCIENCE

Something fishy about synthetic armor

Many fish are covered in rigid scales attached to a flexible dermis layer, an arrangement that is compliant, resistant to penetration, and lightweight—in other words, an efficient coat of armor. Fink *et al.* use this as inspiration for a synthetic protective material based on a stretchable mesh that supports a set of hard



Fish scales inspire flexible armor

plastic tiles. The mesh, made from periodically repeating, sinusoidal polypropylene fibers, provides in-plane elasticity and holds the scales, made from cellulose acetate butyrate, in place as the material is deformed. It also provides a mechanism for scales to rotate and interact with adjacent scales. The mechanical response during in-plane deformation, flexure, and indentation showed many of the advantageous attributes of its biological counterpart. — MSL

ACS Appl. Mater. Interfaces 10.1021/acsami.5b00258 (2015).

EDUCATION

A CURE for promoting undergraduate research

In a perfect world, all undergraduate students would participate in a Course-based Undergraduate Research Experience (CURE). Students participating in CUREs report gains similar to those of students participating in research internships, promoting CUREs as a scalable alternative. What, exactly, do we know about the causal mechanisms underlying the efficacy of CUREs? Using a systems approach, Corwin *et al.* reviewed literature on CUREs and research internships, generated a comprehensive set of outcomes, and connected these outcomes to what students actually do while enrolled in a CURE. These individual outcome models were then combined into an overarching model depicting the relationships among student activities and outcomes. These models are presented with the hope that the CURE community will test and revise them. — MM

CBE Life Sci. Educ. 10.1187/cbe.14-10-0167 (2014).

PHOTOS FROM LEFT: FRANS LANTING/MINT IMAGES/SCIENCE SOURCE; ATASHA FUNK, MARK STOYKOVICH AND FRANCK J. VERNEREY