

In this roundup, Elsa Youngsteadt summarizes notable recent items about scientific research, selected from news reports compiled in *Sigma Xi's free electronic newsletters Science in the News Daily and Science in the News Weekly*. Online: <http://sitn.sigmaxi.org> and <http://americanscientist.org/sitnweekly>

### Leaping Labidocera!



When threatened by fish, some marine plankton leap through the air to safety. Researchers studied this previously undocumented behavior in two species of copepods (tiny crustaceans) that swim near the ocean's surface. Video of 89 *Anomalocera ornata* individuals, recorded in the field, showed that a single leap typically carried the animals more than 40 times their own 3-millimeter body length. Upon landing, only one individual was attacked by its original pursuer. Using high-speed video of a related species, *Labidocera aestiva*, the researchers calculated that jumping plankton lost more than half their kinetic energy to water drag and to breaking the surface tension—but that loss was rewarded by low air resistance: One jump carried them at least 10 times farther through the air than it would through the water. (Illustration not to scale, courtesy of Brad Gemmill.)

Gemmill, B. J., et al. *Plankton reach new heights in effort to avoid predators*. *Proceedings of the Royal Society B* (published online March 21)

### Efficient Quantum Lights

Quantum dots are on their way to becoming the next big thing in visual displays for televisions and gadgets. When exposed to electric current, these nanometer-scale semiconductor crystals emit light in narrow wavelength bands defined by dot size and chemistry. In electronic displays, they are sandwiched between electrodes in quantum-dot light-emitting diodes (QLEDs). But QLED efficiency has so far been poor: They convert only about 2 percent of their energy supply into light. By

tinkering with the electrodes—modifying the usual indium tin oxide anode material and using it for the cathode—engineers boosted efficiency of red and green QLEDs to 7.3 and 5.8 percent, respectively. Those values compete with current technologies and what's more, the green device was the brightest QLED yet reported.

Kwak, J., et al. *Bright and efficient full-color colloidal quantum dot light-emitting diodes using an inverted device structure*. *Nano Letters* 12:2362–2366 (May)

### The Orderly Brain

Underlying the brain's inscrutable complexity is a relatively tidy circuit board of nerve fibers. The cell bodies in the brain's gray matter are connected by axons—long nerve fibers that make up the interior white matter. To see whether the axons form a tangled spaghetti-like mass or a tidy grid, researchers looked into the brains of living humans and dead specimens of four other primate species using diffusion magnetic resonance imaging. The method detects three-dimensional diffusion of water molecules in the brain to infer the physical structure of axon bundles. (Each line in the image below, of an owl monkey's brain, represents thousands of cells.) The team was surprised to find gently curved sheets of fibers in parallel and perpendicular arrangements, with few diagonals or squiggles. The grid-like structure hints at simple developmental rules that could give rise to the final complex structure. (Image courtesy of Van Wedeen.)



Wedeen, V. J., et al. *The geometric structure of the brain fiber pathways*. *Science* 335:1628–1634 (March 30)

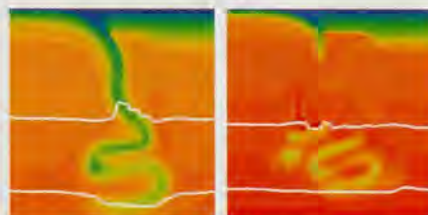
### Prehistoric Fisheries Success

How to eat fish without wiping them out is an ongoing problem for conservation and governance. Prehistoric Hawaiians may have had it figured out, according

to an analysis of more than 700 years of coral-reef fishing. Researchers reviewed archaeological, anthropological and historical records to estimate the Hawaiian catch from 1250 onward. They found that for the 400 years before European contact, Hawaiians caught at least 12 to 17 metric tons of fish per square kilometer of reef per year. Today, most reefs show signs of depletion with only half that much fishing. The authors attribute the Hawaiian success to strict regulations about who could fish, what they could catch and when they could do so. Rules were locally made and ruthlessly enforced. The authors suggest that, even without adopting such harsh punishments, enforcement of modern fishing regulations could be improved.

McClenachan, L., and J. N. Kittinger. *Multi-century trends and the sustainability of coral reef fisheries in Hawai'i and Florida*. *Fish and Fisheries* (published online March 20)

### Tectonic Baby Steps



Today, Earth's tectonic plates are in constant motion. In subduction zones, as illustrated in the left side of the figure above, the Earth's solid surface (green) dives hundreds of kilometers into the mantle (orange) without interruption. But it wasn't always so. Conditions on the young Earth may have made the process go in fits and starts. When researchers modeled subduction as it would have happened some 3 billion years ago, when the mantle was 200 degrees Celsius hotter than it is today, they got the result on the right side of the figure: Tectonic plates began to subduct but quickly broke off, stalling further movement for millions of years. The result could help explain why the oldest chemical signatures of subduction are found in relatively thin layers of rock that accumulated for just a few million years at a time. (Image courtesy of Jeroen van Hunen.)

Moyen, J.-F., and J. van Hunen. *Short-term episodicity of Archaean plate tectonics*. *Geology* 40:451–454 (May)

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