

edited by Gilbert Chin

MATERIALS SCIENCE

Yarn Spinning

In a typical electrospinning process, a charged polymer melt of solution is extruded toward a grounded collector plate. At sufficiently high electric fields, the polymer stream is whipped about, leading to the formation of a nonwoven mat of submicrometer-diameter fibers.

Li *et al.* modified the basic setup by using a split collector plate composed of two parallel conducting strips, separated by a gap of variable width. The

electric field that was generated led to the formation of large area arrays of oriented parallel fibers, which were easily transferred to a substrate for further processing. The authors were able to create fibers of a variety of polymers, TiO₂/polymer composites, Sb-doped SnO₂, and a number of other ceramics.

Ko *et al.* electrospun solutions of either polylactic acid (PLA) or polyacrylonitrile (PAN), which had been mixed with single-walled carbon nanotubes (SWNTs), to produce composite fibers and yarns. In

the PLA fibers, the SWNTs formed spherical agglomerates, but in the PAN fibers, the SWNTs were uniformly distributed and were oriented parallel to the fiber direction after spinning. The fiber mats showed improved mechanical properties, and it is believed that they can be heat-treated to form a carbon/SWNT composite. — MSL

Nano Lett. 10.1021/nl0344256 (2003);
Adv. Mater. 15, 1161 (2003).

CELL BIOLOGY

Making Membrane

Peroxisomes have been thought to represent autonomous intracellular organelles that metabolize lipids and drugs in oxidative reactions; the reactions generate H₂O₂ (which is disarmed by catalase), hence the appellation. Isolated peroxisomes can import peroxisomal proteins when added to cellular homogenates, and peroxisomes can proliferate when cells are challenged with a variety of inducers. However, it has not been altogether clear whether other intracellular organelles, such as the endoplasmic reticulum (ER), play a role in peroxisome biogenesis.

Geuze *et al.* used electron microscopy combined with immunocytochemistry and electron tomography to reconstruct three-dimensional images of peroxisomes in mouse dendritic cells. They found that several peroxisomal membrane proteins were present in specialized subdomains of the ER. The subdomain membranes were continuous with those of a peroxisomal reticulum—presumed to be the source of mature peroxisomes. Thus, although some peroxisomal proteins can be imported directly, per-

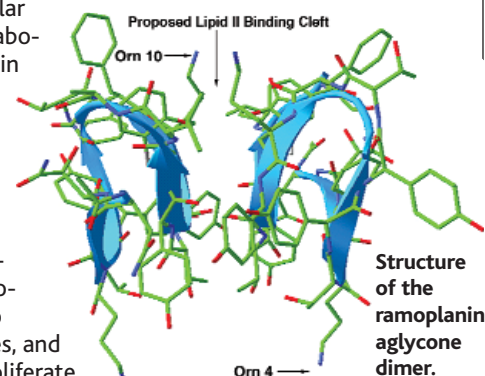
oxisomal membrane components may in large part be derived from the ER. — SMH

Mol. Biol. Cell 14, 2900 (2003).

BIOCHEMISTRY

A Lipid II Sandwich

In their endless struggle to survive, microorganisms have developed a versatile armory of molecular weaponry. Many of these compounds act by inhibiting essential enzymatic reactions, such as ribosomal protein synthesis, but others, of which the most widely useful and used is vancomycin, bind to building blocks of the peptidoglycan,



the cross-linked foundation of the bacterial cell wall. The emergence of bacteria resistant to vancomycin has motivated a search for new antibiotics; one such candidate is ramoplanin, a cyclic peptide made of 17 amino acids and 2 saccharides. Hu *et al.* have shown by enzyme kinetics that it binds to lipid II, which carries a pentapeptide-disaccharide intermediate from the cytoplasm to the cell wall assembly site, and that it does so with a 2:1 stoichiometry of ramoplanin:lipid II. One of the critical interactions involves the distal amino group of ornithine-10, which sits at the mouth of a proposed binding cleft for lipid II. — GJC

J. Am. Chem. Soc. 125, 8736 (2003).

GEOLOGY

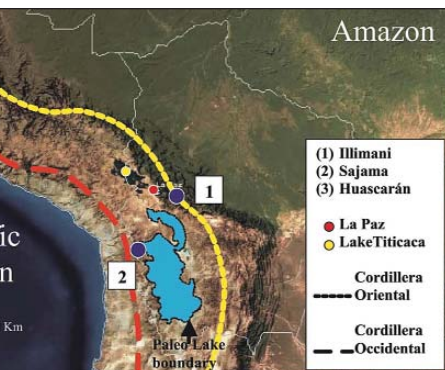
Not As Dry As Dust

Two long ice cores were drilled into glaciers in the high Andes during the 1990s, at Huascarán in Peru and farther south at Sajama in Bolivia. These cores provide climate records that extend backward into glacial periods in the tropics. Such long and continuous records are scarce and have been particularly important for assessing the role of the tropics in climate change and for evaluating how early civilizations in the region were affected by and coped with climate change. Both of these cores record the overall warming of the region at the end of the Ice Age, as marked most prominently by a change in the oxygen isotope composition of the ice. One interpretation is that this primarily reflects regional warming, perhaps by as much as 5° to 12°C during deglaciation, but some of the isotopic signal could reflect a shift in moisture sources. There are also several differences between the cores that may be due to

local conditions, and understanding these differences is critical for deciphering the deglaciation history of the tropics.

Ramirez *et al.* have obtained and analyzed a third ice core from Nevado Illimani in the high Andes of Bolivia, north of Sajama. It too extends back to the Ice Age and agrees more closely with the Huascarán core, rather than the proximal Sajama core. Comparisons of these three cores and other records from tropical South America imply that glacial times in this region were particularly cold and wet, that some of the isotopic signal may reflect this additional moisture, and that parts of the Holocene record of Sajama may have been affected by local conditions. — BH

Earth Planet. Sci. Lett. 212, 337 (2003).



Andean locations of the three ice cores.

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Earth Planet. Sci. Lett. 212, 337 (2003).

ECOLOGY/EVOLUTION

The Effects of Overeating

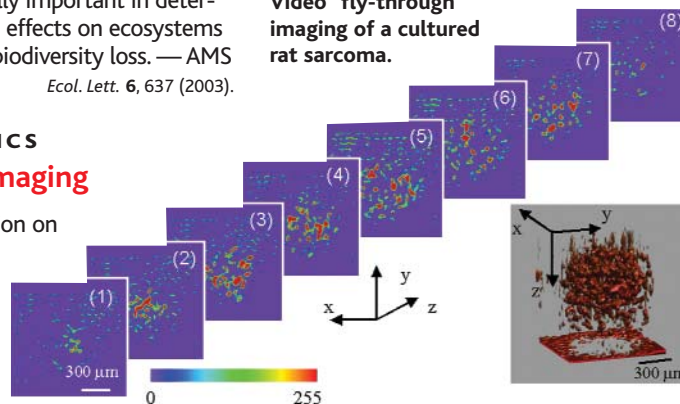
The relationship between biodiversity and ecosystem properties and functioning has been under the spotlight in ecology for several years. Most of the experimental work in this area has involved manipulating the number of plant species in a system and examining the consequences in terms of parameters such as biomass and productivity. Duffy *et al.* add a new layer of complexity and realism by adding the effects of herbivore diversity. Increasing the diversity of grazing organisms in a seagrass ecosystem led to reductions in the diversity and biomass of plants. These results suggest that there is a counteractive effect on increased diversity by consumers, as opposed to producers, and that food web interactions may be critically important in determining the ultimate effects on ecosystems of human-induced biodiversity loss. — AMS

Ecol. Lett. 6, 637 (2003).

it has recently been found that light at far-infrared wavelengths, whose low energy avoids the harmful effects of ionizing x-rays, can also penetrate biological tissue without being appreciably absorbed. Collecting and analyzing this scattered light is the basis of optical coherence tomography. Using photorefractive quantum wells, which essentially work as a dynamic holographic image plate for the storage of the scattered light interference pattern, Yu *et al.* demonstrate the ability to take three-dimensional non-invasive slices of tumour spheroids. Without the need for post-processing, this nondestructive imaging technique may prove a useful window through which to visualize the dynamical internal working of living biological tissue. — ISO

Appl. Phys. Lett. 83, 575 (2003).

Video "fly-through" imaging of a cultured rat sarcoma.



APPLIED PHYSICS

Dynamic 3D Imaging

Obtaining information on the internal make-up of living tissue has generally been the domain of x-ray imaging techniques. However,

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Counteracting Hypertension

Angiotensin II (Ang II), the product of sequential degradation of angiotensinogen by renin- and angiotensin-converting enzyme, has long been considered the primary effector of the renin-angiotensin system, which plays a key role in regulating blood pressure and thus is important in the pathogenesis of cardiovascular disease. Recent research, however, suggests that the peptide angiotensin-(1-7) [Ang-(1-7)], which is produced through an alternative pathway and has cardiovascular effects antagonistic to those of Ang II, may be a physiologically relevant effector, too.

Santos *et al.* propose the orphan guanine nucleotide-binding protein (G protein)-coupled receptor (GPCR) Mas as the functional receptor for Ang-(1-7). The authors used autoradiographic analysis to compare Ang II and Ang-(1-7) binding in kidney slices from wild-type and Mas-deficient mice. Specific Ang-(1-7) binding was not detected in the mutant mice, whereas specific Ang II binding was still present. Furthermore, Ang-(1-7) elicited arachidonic acid release from two cultured cell lines transfected with Mas and showed specific binding to Mas-transfected cells. Finally, Mas knockout mice lost the wild-type antidiuretic response to Ang-(1-7) after water loading, and aortic rings from the mutant mice lacked Ang-(1-7)-dependent relaxation. These data implicate Mas as a physiologically active receptor for Ang-(1-7) and a potential target in the treatment of cardiovascular disease. — EA

Proc. Natl. Acad. Sci. U.S.A. 100, 8258 (2003).