EDITORS' CHOICE

edited by Gilbert Chin

PLANT SCIENCE

Augmenting an Appealing Aroma

Our response to the odors of an excellent dinner reminds us that the enjoyment of food encompasses its aroma as well as its taste, texture, and appearance. Efforts to improve the tomato have focused on flavor and fruit stability, sometimes to the detriment of its aroma. Lewinsohn *et al.* have used metabolic engineering to augment the panoply of endogenous volatiles, comprising many organics, often present only in trace quantities. The monoterpene linalool is present in edible fruits (guava, peach, and plum) and also contributes to the aroma of several herbs (coriander and sweet basil).

Clarkia breweri.

Working with two lines of commercially available tomatoes, both of which lack linalool, the authors produced transgenic lines by adding a linalool synthase gene taken from the flowering plant *Clarkia breweri*. The tomato promoter selected to regulate the exogenous gene was one normally activated during ripening, hence the amount of linalool increased as the tomatoes changed from green to red. The altered profile of organics in the transgenic tomatoes was detectable by human noses, but the results of the taste test are not yet in. — PJH

Plant Physiol. **127**, 1256 (2001).

BIOMEDICINE

Genetic Tales of Gain and Loss

Bone tissue in adults is continuously degraded and rebuilt. As we age, this delicate balance becomes tipped in favor of degradation, which can render bones brittle and prone to fracture—a common and debilitating condition known as osteoporosis. By studying rare inherited disorders that affect bone mass early in life, researchers hope to learn more about the molecular mechanisms that regulate bone remodeling and ultimately to apply that information to the design of drugs for osteoporosis and other common bone diseases.

This strategy has led to the discovery of a gene critical to the bone remodeling process, different alleles of which can cause loss or gain of bone mass. Studying families with osteoporosis-pseudoglioma syndrome (OPPG), a recessively inherited disorder in which children exhibit low bone mass, Gong *et al.* identified causative mutations in *LPR5*, a gene encoding a protein related to the low-density lipoprotein receptor. The LPR5 protein regulates the growth and/or differentiation of osteoblasts (the cells that rebuild bone) through the Wnt signaling pathway, and the mutations in the OPPG patients appear to cause loss of protein function. In complementary work, Little *et al.* found that a family with exceptionally high bone mass, a trait inherited in a dominant fashion, carries a missense mutation in the same gene. The resulting amino acid change is predicted to alter interactions of LPR5 with other proteins, leading to a gain of protein function. The fact that sequence alterations in LPR5 can produce a spectrum of bone phenotypes indicates that this protein and the Wnt pathway through which it acts may be exciting targets for the development of new therapeutics. — PAK

Cell **107**, 513 (2001); *Am. J. Hum. Genet.*, in press.

MICROBIOLOGY

A Fumigating Fungal Fragrance

Within the twigs of the cinnamon tree lurks an intriguing fungus, *Muscodor albus*, which produces volatile compounds that are toxic for a wide range of plant and animal pathogenic bacteria and fungi. Many fungi produce bad smells, and many of the odors are species specific. Strobel *et al.* now show that the natural mixture of volatiles exuded by *M. albus* is lethal to many organisms, including *Staphylococcus aureus* and *Pythium ultimum*, whereas closely related fungal species are relatively spared. *M. albus* worked very well as a fumigant in glasshouse experiments, preventing the growth of the smut fungus *Ustilago hordei* on barley seedlings for 15 weeks. From other rainforest plants, these authors have isolated other endophyte fungal species that produce different suites of lethal gases. — CA

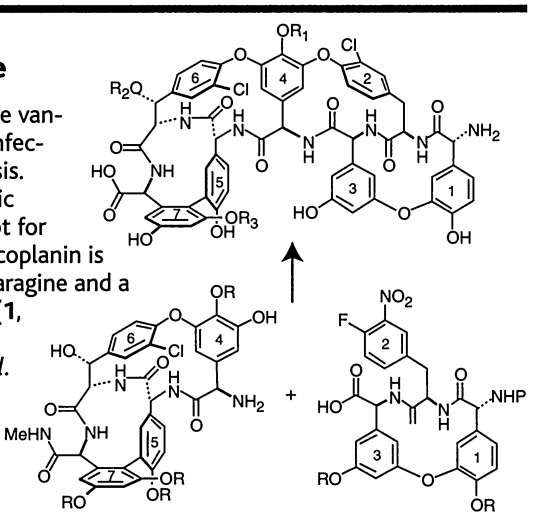
Microbiology **147**, 2943 (2001).

CHEMISTRY

Synthesizing the Teicoplanin Core

The glycopeptide teicoplanin is used clinically, like vancomycin, to combat methicillin-resistant staph infections and is an important target for total synthesis. Teicoplanin shares with vancomycin a macrocyclic tetrapeptide subunit (**4**-**7**) that is invariant except for the extent of chlorination of ring 6. However, teicoplanin is more complex than vancomycin, because an asparagine and a leucine are replaced by two arylglycine residues (**1**, **3**) that are more susceptible to racemization and are cross-linked to form a diaryl ether. Evans *et al.* now report the total synthesis of the tetracyclic teicoplanin core (without the three carbohydrate chains R_1, R_2, and R_3), using a Cu(II)-promoted phenolic arylation reaction to avoid epimerization of the arylglycine residues during macrocycle synthesis. — PDS

J. Am. Chem. Soc., 10.1021/ja011943e.



Coupling peptidic subunits (residues 1-3 and 4-7) to make the teicoplanin aglycon.

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SOURCE: (PHOTO, LEFT) D. W. TAYLOR/UNIVERSITY OF CALIFORNIA, BERKELEY; (RIGHT) EVANS *ET AL.*, *J. AM. CHEM. SOC.*, 10.1021/JA011943E

geologic data indicate that the seaway had retreated by the time of the Chicxulub impact event at the end of the Cretaceous.

Terry *et al.* have discovered disrupted sedimentary rock layers in the Badlands region of South Dakota. The disrupted beds contain large-scale slump-roll structures consistent with the movement of seaway shelf edge deposits caused by shock waves from the impact event. Above these layers is a thin bed of spherules that might be impact ejecta, and these deposits are overlain by a thicker sequence of shallow marine sediments. This newly discovered distal signal of the impact indicates that the Western Interior Seaway may have been present from the Late Cretaceous into the Early Tertiary, given the continuous sequence of marine sediments found in the Badlands. — LR

Geology **29**, 1055 (2001).

ECOLOGY

Rescued from the Living Dead

Fragmentation of natural habitats by human activities disrupts many ecological interactions. For instance, plants that depend on animals for pollination suffer reproductive decline if their pollinator populations are unable to reach individuals in isolated habitat fragments. Dick has documented a case where the reverse is true: The reproductive success of the Amazon forest tree *Dinizia excelsa* actually increases when the forest is fragmented. Under these circumstances, the native insect pollinators of *D. excelsa* are replaced by the recently arrived African honeybee, which is able to transfer pollen between individuals up to 3 kilometers apart, in some cases leading to a threefold increase in seed output. The seeds are viable in the disturbed habitat. The African honeybee, generally considered a problematic pest, appears to be an important agent in perpetuating the tree population in remnant forest patches. — AMS

Proc. R. Soc. London Ser. B **268**, 2391 (2001).

ASTROPHYSICS

Neutrino Bursts

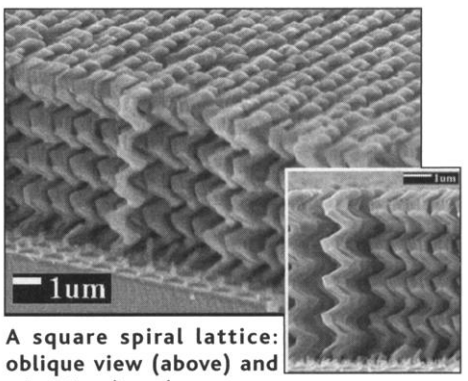
Many gamma ray bursts (GRBs) are modeled as relativistic fireballs from the collapse of the core of a massive star. For these GRBs, the fireball can be collimated into jets that burst through the stellar envelope and produce gamma rays. Mészáros and Waxman have taken this model and investigated the possibility that a neutrino burst is produced before the GRB. They show that a relativistic jet can be altered by internal shock waves as it makes its way to the edge of the stellar envelope. The shock waves can accelerate protons that interact with x-ray photons to produce teraelectronvolt electron and muon neutrinos. In addition to predicting a neutrino burst before an observable GRB, their model suggests that a neutrino burst may be produced from a "dark" GRB (in which the jets generated from the collapse do not break through the stellar envelope). Thus, if astronomers could observe the neutrino burst, they would be able to detect and count both dark and bright GRBs, providing a rate of star collapse at cosmological distances in the universe. Of course, neutrino detection is difficult, but the authors predict that either type of GRB, occurring as far away as a redshift of one, will produce a characteristic neutrino signal that should register on a 1-cubic-kilometer detector, such as the AMANDA experiment that is currently being constructed. — LR

Phys. Rev. Lett. **87**, 171102 (2001).

APPLIED PHYSICS

GLAD to be Photonic

Functional photonic crystals are artificial structures whose spatial periodicity of dielectric constant is of the same length scale as the wavelength of light to be manipulated. One of the main problems in constructing a three-dimensional photonic crystal is the complexity of its preparation. Methods used to date have involved several steps of lithographic and microelectronic processing. Kennedy *et al.* present results using a glancing angle deposition (GLAD) technique in which a large array of square lattice spirals can be prepared in a one-step process. Theoretical analysis predicts favorable photonic properties for this structure. — ISO



A square spiral lattice: oblique view (above) and edge view (inset).

Nano Lett., 10.1021/nl015635q.

CREDITS: KENNEDY *ET AL.*, *NANO LETT.*, 10.1021/NL015635Q