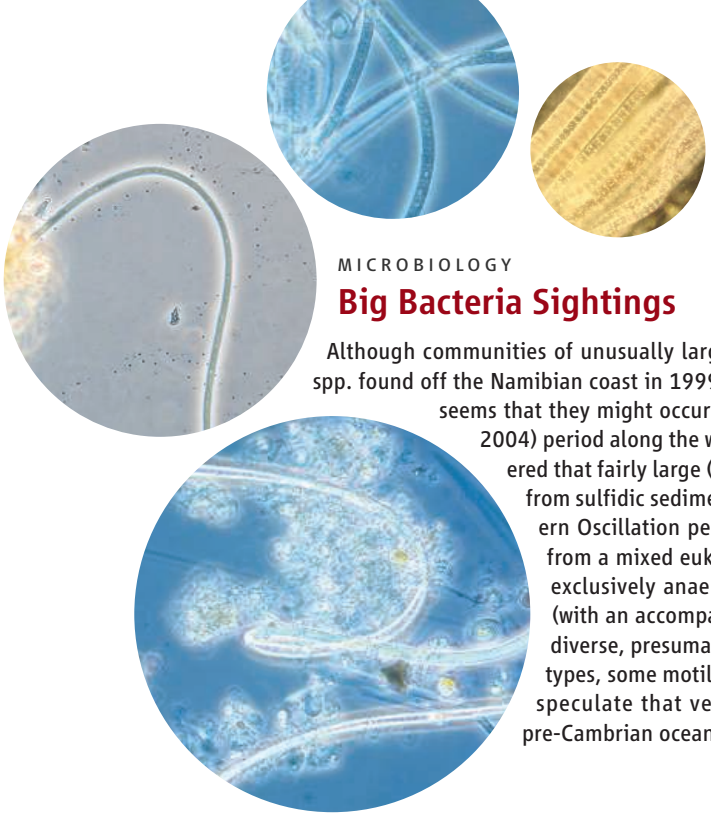


MICROBIOLOGY

Big Bacteria Sightings

Although communities of unusually large bacteria, like the gigantic 1-mm-diameter *Thiomargarita* spp. found off the Namibian coast in 1999, have only recently been discovered in marine sediments, it seems that they might occur widely in the benthos. During a long inter–El Niño (1998 to 2004) period along the western coast of South America, Gallardo and Espinoza discovered that fairly large (roughly 1 x 100 mm) filamentous bacteria could be recovered from sulfidic sediments overlain by oxygen-deficient water. As the El Niño–Southern Oscillation persisted, repeat sampling showed that the community shifted from a mixed eukaryote plus megabacteria (*Thioploca* spp.) composition to an exclusively anaerobic complex of the newly discovered filamentous bacteria (with an accompanying loss of megafauna). These macrobacteria appear to be diverse, presumably representing many ecotypes, and there are several phenotypes, some motile and some containing refractive sulfur granules. The authors speculate that very similar assemblages may have been present in anoxic pre-Cambrian oceans. — CA

Int. Microbiol. **10**, 97 (2007).

CREDITS (TOP TO BOTTOM): GALLARDO AND ESPINOZA, *INT. MICROBIOL.* **10**, 97 (2007); U.S. FISH AND WILDLIFE SERVICE PHOTO

PHYSIOLOGY

Ensuring Milk Quality

In discussions of diet and health, fat generally gets a bad rap. One notable exception is the case of newborn babies, who require substantial quantities of milk lipids for normal growth and development. Indeed, to meet this need, the mammary glands of new mothers secrete nearly 6 kg of fat during a typical 6-month lactation period.

In a study of genetically manipulated mice, Wan *et al*. show that the quality of fat in milk is as important to neonatal health as the quantity, and they begin to dissect the mechanism by which quality control is achieved. The authors noticed that nursing pups of female mice that were genetically deficient in the transcription factor PPAR-γ (peroxisome proliferator–activated receptor–γ) exhibited growth delays and hair loss. These abnormalities were not related to the genotypes of the fathers or the pups, nor were they related to maternal parenting behaviors. Instead, they could be traced to a nutritional defect in the milk produced by the mutant mothers—namely, the presence of proinflammatory lipids, which were the products of aberrantly overexpressed lipid oxidation enzymes in the maternal mammary glands. One confirmatory piece of evidence that hair loss in the pup was a consequence of inflammatory responses was that treatment with aspirin effectively prevented the alopecia. Thus, maternal PPAR-γ appears to protect nursing newborns by suppressing the production of "toxic" fats in milk. Interestingly, the source of the PPAR-γ mediating this protective effect is not the mammary epithelium but appears to be hematopoietic or endothelial cells. — PAK

Genes Dev. **21**, 10.1101/gad.1567207 (2007).

ENVIRONMENTAL SCIENCE

Silver and Its Surroundings

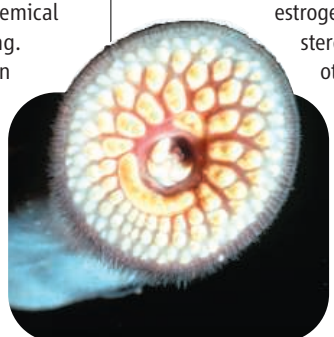
Silver has been prized throughout human history for its sheen and more recently for its exceptional electrical conductivity and its chemical applicability to photographic processing. Although its toxicity is only moderate in comparison with that of other heavy metals, its antimicrobial properties point to the utility of a more thorough understanding of its environmental impact, particularly in light of the steadily increasing stream of electronics waste. In this vein, Eckelman and Graedel have analyzed the worldwide anthropogenic release of silver to air, land, and water. Their analysis spanned 64 countries for the year 1997 and compared releases from the mining stage through manufacturing and waste disposal (they note that more than half of processed silver is recycled). The plurality of the 13 million kg of discarded silver (~44%) went to landfills, with the next highest category (~30%) being composed of tailings released during mining. Regional toxicological impact was estimated based on a previously established hazard ranking of various silver compounds. — JSY

Environ. Sci. Technol. **41**, 10.1021/es062970d (2007).

EVOLUTION

An Early Use of Androstenedione

Sex hormones such as estrogen, progesterone, and androgen exert their physiological effects by binding to proteins of the steroid hormone receptor family. Studies with basal vertebrates have mapped out the evolution of these signaling pathways, which are important in regulating reproduction. Prior work has suggested that the estrogen receptor was the first steroid receptor and that other steroid receptors arose later, probably through gene duplication. Although androgens are generally traced back to gnathostomes, Bryan *et al.* now identify an androgen receptor in the sea lamprey *Petromyzon marinus*, a jawless vertebrate. The specific androgen, androstenedione, is a precursor of testosterone, and when androstenedione was implanted into male lampreys, the development of the testis and secondary male characteristics was accelerated. Hence, by showing that a functional androgenic hormone and its receptor are present in jawless vertebrates, this work argues against the claim that androgen receptors evolved after agnathan-gnathostome divergence. — BAP



***Petromyzon marinus*.**

Biol. Reprod. **77**, 10.1095/biolreprod.107.061093 (2007).

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ASTROPHYSICS

The Red and the Blue

All galaxies can be built up from two major components: a central spherical bulge and a surrounding flattened disk of stars. The relative size of each has been widely used to classify galaxies, so that a variety of types can be identified with disks of varying size, and when there is no disk, the galaxy is classified as elliptical. Complementing this picture, galaxies tend to favor one of two colors, either red or blue. Ellipticals are mostly red and spirals blue, leading to suggestions that this color preference is simply due to the relative contributions of stars in the bulge and disk to the galaxy's overall light.

Drory and Fisher have found that this simple view is inadequate, however. Decomposing the shapes of tens of galaxies selected from the Sloan Digital Sky Survey using images taken by the Hubble Space Telescope, they find that some particular galaxies do not follow the expected relationship between color and brightness expected from their bulge-to-disk ratio. The galaxies in question instead have

so-called "pseudobulges," or central puffed-up concentrations of stars whose properties are more similar to those in the disks than in ellipticals or normal bulges. Such differences imply that it is the type of central bulge that is important, not its size, in characterizing a galaxy. Also, the characteristics ultimately depend on the environment in which the galaxy first formed, so that pseudobulges are indicative of later, less violent formation in comparison with the conditions that give rise to normal bulges. — JB

Astrophys. J. **664**, 640 (2007).

CREDIT: DRORY AND FISHER, *ASTROPHYS. J.* **664**, 640 (2007)

CHEMISTRY

Strong Solvent Imprint

The optical rotation of polarized light caused by chiral molecules dissolved in solution is usually attributed to the interaction of the light field with the electronic distribution of the solute. However, the solvent shell around the molecule can also exert strong effects; for example, the sign of the optical rotation of (*S*)-methyloxirane switches from positive to negative when the solvent is changed from water to benzene. Previous theoretical work has shown that the interaction of (*S*)-methyloxirane with water accounts for most of the optical rotary dispersion (ORD) in aqueous media. Mukhopadhyay *et al*. now present time-dependent density functional theory calculations of ORD for Monte Carlo simulations of (*S*)- and (*R*)-methyloxirane solvated with benzene. They show that for an explicit solvent model, the dissymmetric benzene solvent shell, rather than the solute itself, dominates the ORD. This effect was not seen with implicit solvent molecules or with an achiral solute (ethylene oxide). — PDS

Angew. Chem. Int. Ed. **46**, 10.1002/anie.200702273 (2007).

CELL BIOLOGY

A Needle in a Haystack

Primary cilia are composed of a stereotypical arrangement of microtubules that are anchored to a basal body and extend within a membrane sheath from many animal cells. Primary cilia act as microscopic sensory organs in sampling the extracellular environment and play a role during development in morphogen sensing, as well as contributing to sight and smell and other functions in multiple organs. Defects in primary cilium formation are associated with several diseases, such as retinal degeneration and neural tube defects. Primary cilium induction and function require the coordination of both membrane trafficking and microtubule assembly pathways.

Yoshimura *et al*. wanted to define the mechanisms involved in primary cilium formation and undertook a systematic approach to identify which members of the multitudinous Rab GTPase family of membrane traffic regulators were important. Only one of them, Rab8a, localized to the primary cilum; it interacted specifically with cenexin, a microtubule- and basal body–binding protein known to be involved in primary cilium production. Two other family members, Rab17 and Rab23, and their partnered GTPase activators also participated in primary cilium generation, whereas other Rabs and their activators were not required. This study paves the way for an understanding of the requirements for the specific recruitment of membrane trafficking and microtubule assembly machineries during primary cilium biogenesis, and how deficiencies lead inexorably to disease. — SMH

J. Cell Biol. **178**, 363 (2007).

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Strong Solvent Imprint

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