

BIOCHEMISTRY

Peptides to Sway Iron Levels

Ferritin proteins are best known for storing iron within their cores, but ferritins also release iron when it is needed, such as during hemoglobin synthesis or when iron is lost through hemorrhage. Although the release process is driven by the reduction of Fe^{3+} and uptake by Fe^{2+} chelators or chaperones, changes in the gated pore of the protein, such as mutations of conserved pore residues, affect the rate of iron release, and in vitro, millimolar concentrations of urea can unfold pore helices and increase the release rate. Liu *et al.* searched a combinatorial peptide library of ferritin-binding peptides and identified a single heptamer that accelerated iron release threefold, and when combined with Desferal, an iron chelator in therapeutic use, led to an eightfold increase. Another heptapeptide was identified that decreased iron release, possibly by binding across the pore. Potential applications include treatment of iron overload or limiting unwanted effects of iron release, such as consumption of cellular reductants. — PDS

J. Biol. Chem. **282**, 10.1074/jbc.C700153200 (2007).

APPLIED PHYSICS

Sending Plasmons Round a Bend

The orders-of-magnitude size difference between optical fibers and nanometer-scale electronic circuitry presents a substantial compatibility gap between the fast long-distance optical signal communications offered by photonics and the convenience of small-scale integrated microelectronics. Surface plasmons are hybrid excitations of light and packets of electrons confined to the interfacial region of a metal and a dielectric, and they offer the potential to fill that gap. However, plasmons are dispersive and tend to leak away because of scattering and radiation losses, giving rise to the general problem of efficiently guiding the plasmons around the two-dimensional plane to desired sites. Steinberger *et al.* have fabricated surface plasmon waveguides by lithographically patterning tracks of silicon dioxide deposited on a gold film. They demonstrate the ability to guide plasmons around a 90° bend, showing that there is a tradeoff between bend radius and propagation length for the optimal transmission of the plasmons through the waveguide. The results should help shrink the incompatibility gap yet further. — ISO

Appl. Phys. Lett. **91**, 81111 (2007).

BIOCHEMISTRY

Mobile Electron Carriers

Microbes that have not yet been cultured under laboratory conditions are, not surprisingly, rather more difficult to work with than those that

have, such as the perennial workhorses *Escherichia* and *Saccharomyces*. Nevertheless, recent forays into soil and marine communities have hinted at a wealth of untapped pharmaceutical and biochemical expertise, and technological advances in extracting and sequencing genomic DNA of unpurified (and in many cases, unseen) organisms have begun to bring those microbial skills within reach.

MuBmann *et al.* have analyzed a single *Beggiatoa* filament (roughly $30\ \mu\text{m}$ wide and 1 cm long) of almost 1000 cells by whole-genome amplification and pyro(phosphate) sequencing. They have been able to assemble enough sequence to cover approximately $\frac{3}{4}$ of the 11-Mb genome as estimated by the recovery of single-copy marker genes and aminoacyl tRNA synthetases. The collection of sulfur-, nitrogen-, and oxygen-metabolizing enzymes, albeit still incomplete, provides genetic evidence for the elevatorlike lifestyle of this bacterium, which cycles vertically as it harvests energy from the oxidation of sulfidic deposits. At the relatively oxygen-rich surface of marine sediments, electrons from elemental sulfur are donated to oxygen, yielding sulfate; in deeper, anoxic regions of the sediment, nitrate is recruited as the acceptor of electrons from hydrogen sulfide. *Beggiatoa* are energetic hoard-

ers of nitrate, accumulating it in vacuoles in concentrations as high as 0.5 M to the dismay of competing denitrifying bacteria. — GJC

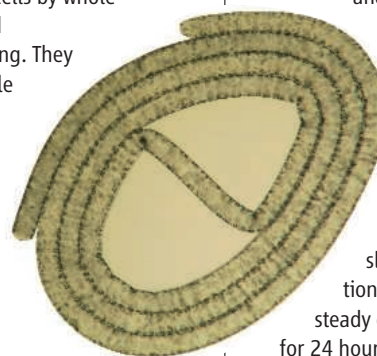
PLoS Biol. **5**, e230 (2007).

MATERIALS SCIENCE

Oxygen on Demand

In the design of artificial tissues or repair of large wounds, one critical limiting factor is the availability of the oxygen necessary for vascularization and healing to occur. To skirt slow oxygen diffusion, Harrison *et al.* have explored the possibility of creating a material that can generate oxygen in situ. Sodium percarbonate was mixed with poly(D,L-lactide-co-glycolide) (PLGA) in solution, and films were solution-cast and slowly dried to prevent the formation of voids. In a moist environment, steady oxygen production was observed for 24 hours and then gradually slowed and ended after 70 hours in total. PLGA films were placed under dorsal skin flaps in mice and then observed over a period of 1 week. Those containing sodium percarbonate exhibited a significant decrease in flap necrosis over the first 3 days, along with less visible tissue damage and greater mechanical strength. However, there was no benefit after a week in comparison with untreated PLGA films. The authors are seeking to extend the oxygen release time, either through encapsula-

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Beggiatoa filament.

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tion of the sodium percarbonate or through the use of different oxygen-generating chemical components. — MSL

Biomaterials **28**, 4628 (2007).

CHEMISTRY

Breaking Two Rings

Polyesters have traditionally been prepared by condensation of monomers bearing acid or ester groups: The chain grows by formation of O-C bonds with concomitant loss of water or alcohol. Choosing a cyclic monomer can eliminate formation of these small-molecule by-products, as chain growth proceeds by ring-opening, but this approach offers limited functional diversity along the polymer backbone. Jeske *et al.* have developed a zinc catalyst that links epoxides to cyclic anhydrides through alternating ring-opening steps and thereby introduces backbone substituents ranging from methyl and cyclohexyl to vinyl moieties by appending them to the strained three-membered rings. A cyano group on the diiminate ligand coordinated to zinc proved key to catalyst stability under the reaction conditions. The system achieved number-average molecular weights exceeding 10^4 and low polydispersities (1.1 to 1.5). — JSY

J. Am. Chem. Soc. **129**, 10.1021/ja0737568 (2007).

PSYCHOLOGY

Pressure From Above

A recent interdisciplinary trend is the use of economic transactions, which yield a quantitative expression of preferences, in experimental studies of human social behavior. In the anonymous one-shot dictator game, a person is allotted the task of taking any part or all of a sum of money, with the remainder given to a second person who is neither seen nor encountered again. Shariff and Norenzayan engaged 75 residents (ages 17 to 82) of Vancouver and offered them the opportunity of playing this game after having completed one of three possible scrambled sentence tests. Across the three groups, the modal choice was to take either the entire amount or only half of it. Within each of the two groups who had been implicitly primed with concepts of religion or of civic justice, 11 out of 25 people ceded half of the money, as compared to 10 of 25 absconding with everything in the neutral prime condition. Furthermore, both types of pro-social priming evoked significantly greater expressions of generosity (than the neutral prime) by theists. Linking institutional systems of morality to other-regarding behavior by individuals lends support to the proposal that the development of social norms enabled the increase of group size in our human ancestors. — GJC

Psychol. Sci. **18**, 803 (2007).



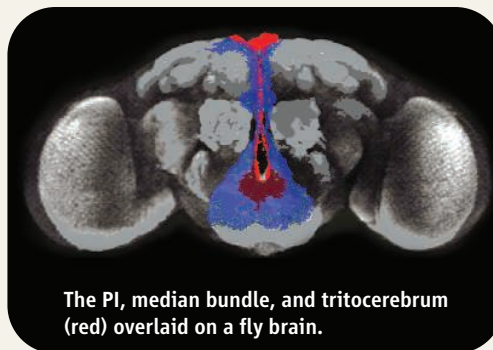
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<< Knitting a Ravelled Sleeve

For an activity in which we spend a third of our lives, much about sleep remains enigmatic. Foltenyi *et al.* investigated the role of epidermal growth factor receptor (EGFR) signaling in regulating sleep in *Drosophila*. In the fly, the activation of EGFR ligands such as Spitz depends on the transmembrane protein Star and on Rhomboid family

(Rho) proteases. Using flies in which Rho and Star expression could be conditionally induced, they showed that overexpression led to a transient increase in both the duration and number of sleep episodes, which was followed by a decrease and then a return to normal. The overexpression of Rho and Star also led to an increase in phosphorylation of extracellular signal-regulated kinase (ERK, a target of EGFR signaling) that paralleled the temporal pattern of increased sleep, and the increase in ERK phosphorylation was greatest in the tritocerebrum. Moreover, several lines of flies in which Rho activity in neurons projecting from the pars intercerebralis (PI, a region analogous to the vertebrate hypothalamus) to the tritocerebrum was inhibited with RNA interference showed decreased sleep. This decrease involved brief sleep episodes in conjunction with an increase in the number of times that sleep was attempted—potentially a fly model of insomnia. The authors propose that the production of EGFR ligand by PI neurons leads to ERK activation in tritocerebrum neurons, thereby promoting sleep. — EMA

Nat. Neurosci. **10**, 1160 (2007).



The PI, median bundle, and tritocerebrum (red) overlaid on a fly brain.