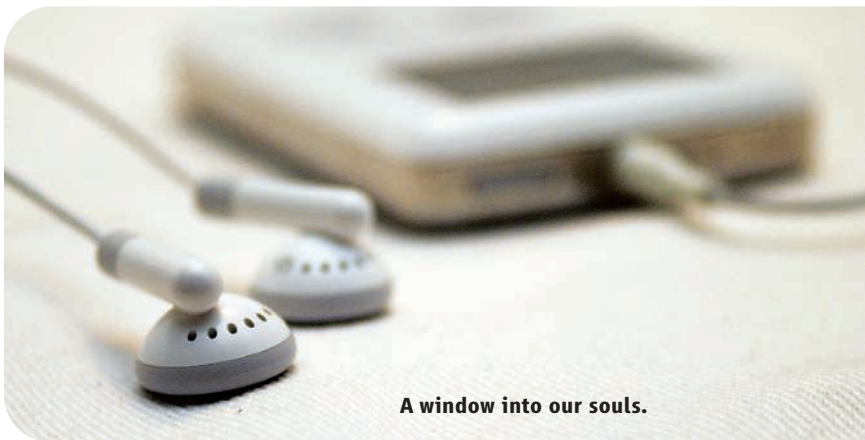
HIGHLIGHTS OF THE RECENT LITERATURE

PSYCHOLOGY

Unintentional Music Sharing



A window into our souls.

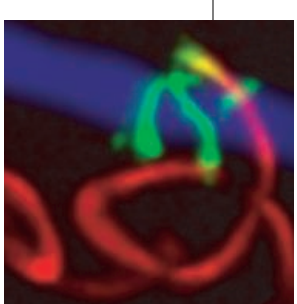
Might our selves be revealed by our choices in music? Rentfrow and Gosling explored this question by asking 74 college students to provide individual top-10 lists of their favorite songs, which were then recorded onto CDs. The students were also asked to provide self-report ratings on personality measures, such as extraversion and conscientiousness; terminal and instrumental values, such as a comfortable life and ambition; and affect and self-esteem. Eight listeners were then asked to rate the students on the same criteria, solely on the basis of hearing their music selections. The measures for which listener judgments correlated most strongly with the self-report data were the personality trait of openness to experience and the instrumental value of imagination. Furthermore, three other listeners had previously coded the songs for 25 experimentally tested musical attributes (for instance, the amount of singing), and these characteristics also displayed correlations with openness and imagination (along with several other traits and values). The results show a differentiating and consistent linkage between our musical tastes and the impressions of us that strangers form purely from learning which songs we like. — GJC

Psychol. Sci. **17**, 236 (2006).

MICROBIOLOGY

Secret Life Exposed

The parasites that cause malaria, *Plasmodium* spp., have been caught on video during a previously hidden portion of their life cycle. Amino *et al.* used epifluorescence time-lapse microscopy to track parasites engineered to express green fluorescent protein as they wended their way through hairless mice. The parasites were injected into mouse skin as sporozoites by a mosquito, and although many traced a path into blood vessels, a significant proportion either actively invaded lymph vessels or remained in the skin. Sporozoites in the lymph system were previously thought to drain into the blood, but in this study, most were shown to be captured in proximal lymph glands. Interestingly, sporozoites injected by syringe instead of mosquito proved 20 times less likely to invade the lymph ducts. The parasites in the lymph node partially transformed into exoerythrocytic forms (EEFs) within the host's dendritic cells and subsequently appeared to degrade completely. Simultaneously, their sister sporozoites that reached the liver through the blood developed normally. Presumably, the degrading EEFs in the dendritic cells deliver EEF-stage antigens, which may induce tolerance in the host, an important consideration for vaccination strategies that use attenuated sporozoites. — CA



Time-lapse image (red to green to yellow) of the sporozoite invading a blood vessel (blue).

CREDITS (TOP TO BOTTOM): J. MOGLIA/*SCIENCE*; AMINO *ET AL.*, *NAT. MED.* **12**, 220 (2006)

Nat. Med. **12**, 220 (2006).

ECOLOGY/EVOLUTION

Eggs on the Rise

A bird's clutch size—the quantity of eggs laid during a nesting period—is a central feature of a bird's life history, but has presented an evolutionary conundrum. Although studies of bird species have predicted the existence of positive selection for increasing clutch size over time, such increases have failed to materialize during long-term observation, perhaps because of constraints imposed by correlated environmental factors that also affect fitness.

In a 25-year study of mute swans, Charmantier *et al.* observed not only the expected directional selection for increasing clutch size, but also an actual increase, of 0.35 standard deviations, across the population. Reduced predation and increased food supply over the course of the study may have fostered the increase. Because the authors kept track of the pedigrees of all of the individuals in the study, they garnered strong evidence that these changes were genetic rather than phenotypic, and hence that a clear microevolutionary change took place over the course of a quarter century. — AMS

Am. Nat. **167,** 10.1086/499378 (2006).

CELL BIOLOGY

Perfect Packaging

Endothelial cells that line the blood vessels are packed with cigar-shaped organelles termed Weibel-Palade bodies. These secretory storage granules are filled with a protein known as von Willebrand's factor (VWF), which, when released from the cell, plays a key role in reestablishing the integrity of damaged blood vessels by recruiting platelets to the site of injury. Michaux *et al.* found that low pH within the storage granule is important to generate and maintain the tubular folding of the VWF, which in turn defines the morphology of the granule. Thus, the folding of VWF into tubules generates the unique architecture of the Weibel-Palade bodies.

The authors further sought to learn if this well-defined geometry has a functional significance beyond packaging and storage. They found that the tubular packaging is important during secretion to allow the VWF to unfold rapidly and efficiently into very long fibrils—up to 100 times the

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length of the packaged protein tubules—in order to trap circulating platelets. If folding is aberrant, or if a rise in granule pH interferes with packaging, VWF fails to unfold fully—presumably due to premature unraveling and tangling of the polypeptide before secretion—and platelet capture is severely compromised. — SMH

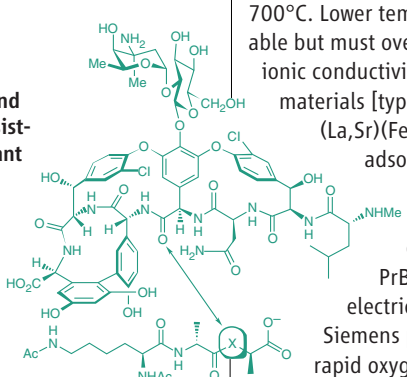
Dev. Cell **10**, 223 (2006).

CHEMISTRY

Restored Affinity

Vancomycin is a powerful antibiotic, which functions by binding to a pair of alanine residues and thereby disrupting the formation of bacterial cell walls. However, several strains of bacteria can evolve to resist vancomycin through replacement of the terminal alanine with lactate. This structural substitution of an O atom for an N-H group reduces vancomycin binding affinity by a factor of 1000.

In a preliminary effort to combat this resistance pathway, Crowley and Boger have modified the vancomycin structure. Their prior modeling studies attributed the reduced affinity to lone pair repulsion between the lactate oxygen and a carbonyl oxygen in the vancomycin framework. They therefore prepared a synthetic derivative with a methylene group replacing the offending carbonyl. This backbone substitution was deemed too fundamental a change to attempt by modifying intact vancomycin. Instead, the authors were able to adapt their prior total synthesis of the native compound by introducing the methylene group at the outset and protecting the adjacent nitrogen as a carbamate. The resulting compound showed a 40-fold improvement in activity against cultures of resistant bacteria, with only a 37-fold loss in affinity toward the Ala-Ala motif present in nonresistant strains. — JSY



Vancomycin structure and binding motif in nonresistant (X = NH) and resistant (X = O) bacteria.

J. Am. Chem. Soc. 10.1021/ja0572912 (2006).

ASTRONOMY

Seeking Planets in the Dust

To understand planet formation in our solar system and beyond, astronomers search for dusty debris disks around stars like the Sun. Kalas *et al.* have spotted light scattered by low-mass disks around two stars that are close to a billion years old. In order to make these observations, the authors used the sensitive Advanced Camera for Surveys on board the Hubble Space Telescope; an inserted coronagraph mask permitted a clear field of view by blocking the stars' central glare.

The two disks have different shapes, due to distinct inclination and intrinsically different architectures. One appears as a narrow belt of dust, concentrated 83 astronomical units (AU) from the star, with an outer edge truncated abruptly at 109 AU. In contrast, the other star's disk extends out to 110 AU without significant narrowing, despite the old age of the star.

On the basis of these characteristics and those observed in similar studies, the authors propose two limiting classes of disk morphology: narrow belts and wide disks. The former could arise from early stochastic dynamical events that expel material and heat the disk, with nascent planets sweeping up the dust at certain radii, perhaps mirroring the early stages of our own solar system. The absence of these features in the wide disk morphology suggests that planet formation may not be ubiquitous in dust clouds. — JB

Astrophys. J. **637**, L57 (2006).

MATERIALS SCIENCE

Cooler Running

Current solid-oxide fuel cells run at 500° to 700°C. Lower temperature operation is desirable but must overcome low electronic and ionic conductivity in the ceramic cathode materials [typically $(La,Sr)MnO_3$ or $(La,Sr)(Fe,Co)O_3$] where oxygen is adsorbed and reduced to oxide. Kim *et al.* have found that the oxygen-deficient double-perovskite material $PrBaCo_2O_{5+\delta}$ (PBCO) has high electrical conductivity (~100 Siemens per square centimeter) and rapid oxygen transport kinetics at 300° to 500°C. Prior screening for improved cathodes has generally assessed candidate materials in porous bulk morphologies. To achieve a more precisely ordered microstructure, the authors prepared the PBCO as an epitaxial thin film, which was grown on strontium titanate by pulsed laser deposition. They speculate that the increase in oxygen surface exchange rate relative to that of disordered perovskites may arise from the alignment of the PBCO *c* axis in the film plane, which raises the concentration of vacancies into which oxide can diffuse. — PDS

Appl. Phys. Lett. **88**, 024103 (2006).

CREDIT: CROWLEY AND BOGER, *J. AM. CHEM. SOC.* 10.1021/JA0572912 (2006)