Molecular rulers measure self-assembling capsules

Molecular capsules such as resorcinarenes can self-assemble and surround smaller guest molecules of an appropriate size, shape, and chemical surface. This host–guest complex is stabilized by noncovalent forces such as hydrogen bonding and Van der Waals forces. The host’s cavity, a cage of fixed aromatic molecules, magnetically shields guest molecules, and measuring the experimental values of the magnetic environment can provide steric and electronic maps of these molecular capsules. Dariush Ajami et al. synthesized a series of terminal acetylenes, the narrowest of organic structures, to probe the environment inside a cylindrical resorcinarene capsule with tapered ends. This series of guest acetylenes acted like molecular rulers: as the guest molecule lengthened, the terminal acetylene was forced deeper into the capsule and experienced less magnetic shielding, reflected in downfield NMR shifts. Because self-assembling molecular capsules have diverse uses, the ability to intricately map these structures could aid in the development of applications ranging from nonlinear optics to biomolecular sensors. — F.A.

“Experimental and computational probes of the space in a self-assembled capsule” by Dariush Ajami, Tetsuo Iwasawa, and Julius Rebek, Jr. (see pages 8934–8936)

Cardiac stem cells find a niche

Stem cells were recently identified in cardiac tissue, challenging the long-held belief that the heart functioned throughout an organism’s life with the same cells that existed at birth. Konrad Urbanek et al. describe the characteristics of cardiac stem cell niches, the tissue microenvironments that house and support the stem cells, providing functional evidence that the heart is an organ replenished by stem cells. Using radiolabeling to mark proliferating cells, the researchers identified continually dividing cells in the interstitial space between myocytes in mice. In these niches, stem cells clustered together with more mature (lineage-committed) cells, suggesting that the resident stem cells divide to replenish the heart’s stock of primitive stem cells and produce cells capable of forming new adult heart cells. The findings provide functional evidence that the heart is replenished by stem cells throughout an organism’s lifetime and suggest that stem cell therapies may hold potential for cardiac repair. — M.M.

“Stem cell niches in the adult mouse heart” by Konrad Urbanek, Daniela Cesselli, Marcello Rota, Angelo Nascimbene, Antonella De Angelis, Toru Hosoda, Claudia Bearzi, Alessandro Boni, Roberto Bolli, Jan Kajstura, Piero Anversa, and Annarosa Leri (see pages 9226–9231)

Mammary tumors arrested in mice by deleting Notch

The Notch signaling pathway, which controls cell fates through interactions among neighboring cells, is involved in the development of a variety of cancers, including mammary tumors. By using a combination of genetic and molecular analyses, Apostolos Klinakis et al. have elucidated a pathway by which Notch1, a member of the mammalian Notch protein family, causes such tumors in mice. The authors found that Notch1 activates the Myc transcription factor, a well studied oncogene. A similar set of genes was found to be up-regulated in Myc- and Notch1-induced mammary adenocarcinomas. When Myc was ablated in a
mouse model of Notch1-driven breast cancer, a decrease in the incidence and latency of mammary tumors was observed. In 90% of human breast carcinomas with high Myc expression, Notch1 was also highly expressed. Reporter constructs localized the sites responsible for Notch1-dependent activation in both mouse and human Myc genes and, together with other biochemical results, provided evidence that Myc is a direct transcriptional target of Notch1. The unraveling of the Notch1/Myc relationship is expected to stimulate further investigation into the involvement of the Notch signaling pathway in human breast cancer. — F.A.

“Myc is a Notch1 transcriptional target and a requisite for Notch1-induced mammary tumorigenesis in mice” by Apostolos Klinakis, Matthias Szabolcs, Katerina Politi, Hippokratis Kiaris, Spyros Artavanis-Tsakonas, and Argiris Efstratiadis (see pages 9262–9267)

**MICROBIOLOGY**

*Lactobacillus* genome reveals evolution in progress

*Lactobacillus delbrueckii* ssp. *bulgaricus* has been used worldwide in yogurt fermentation since as early as 3,200 B.C. and is one of the most industrially important bacteria. Maarten van de Guchte *et al.* have now sequenced the complete 1.8-million-bp genome of *L. bulgaricus* to provide a detailed picture of this important member of the acidophilus family. The sequence reveals that this bacterium is currently in the midst of rapid evolutionary specialization from a natural plant-associated habitat to the manmade habitat of fermented milk. *L. bulgaricus* has an \(\approx 50\%\) higher-than-average amount of tRNA and rRNA genes for its genome size, as well as 270 nonfunctioning pseudogenes, demonstrating a historical and ongoing reduction in genome size as superfluous functions are removed. A higher GC content in the genome, especially at the third codon position, and the presence of a rare inverted repeat in the replication termination region, also suggest a transient evolutionary stage. Van de Guchte *et al.* note that several of *L. bulgaricus*’s deficient pathways can be complemented by *Streptococcus thermophilus*, the other bacterium involved in yogurt fermentation, showing that protocooperation has also influenced *L. bulgaricus* evolution. — N.Z.


**PSYCHOLOGY**

**Fluent stock names and performance**

Financial stocks with easy-to-pronounce names or symbols perform better than their unpronounceable counterparts, over the short term, Adam Alter and Daniel Oppenheimer report. This finding reinforces the hypothesis that people prefer easily digestible, fluent information and shows that simple cognitive models can sometimes outperform complex ones. Alter and Oppenheimer studied how names affect the short-term fluctuations of stocks in real and simulated markets. The authors compared the performance of stocks with fluent names and ticker codes (e.g., “Coach Incorporated” and “CAB”) to stocks with disfluent names and ticker codes (e.g., “Valassis Communications Incorporated” and “WDN”). On the basis of a ranking exercise, the experiment showed that people expected stocks with fluent names to outperform those with disfluent names. In a similar analysis of real market data, stocks with fluent names significantly outperformed stocks with disfluent names over the short term. Fluency has been shown to guide people’s choices in many areas, but these findings demonstrate that name fluency may influence the behavior of financial markets. Alter and Oppenheimer suggest that behavioral principles like fluency may be more helpful in understanding stock market fluctuation than complex economic models. — P.D.

“Predicting short-term stock fluctuations by using processing fluency” by Adam L. Alter and Daniel M. Oppenheimer (see pages 9369–9372)