

edited by Gilbert Chin

GEOPHYSICS

Experimenting in the Kitchen

The surfaces of basaltic lavas commonly exhibit two kinds of textures: Pāhoehoe flows form a ropy and relatively smooth surface, and 'a'ā flows look like jumbled, sharp, angular blocks. It is generally thought that these types reflect an interaction between the viscosity of the lava, which varies as it cools and crystals form, and the shear rate of the flow. Many flows change their morphology from pāhoehoe to 'a'ā, and a few change back.

To investigate this transition, Soule and Cashman carried out a series of laboratory experiments using corn syrup (diluted to the viscosity of hot basaltic magma) and rice (which has the same density as the diluted syrup and represents the lava crystals). They observed four different regimes: With increasing amounts of rice (corresponding to



Pāhoehoe (above) and 'a'ā (left) lavas.



increasing viscosity), flow is laminar; the rice grains aggregate into clumps; shear zones form between the clumps; and finally, a thin film of rice-free syrup appears along the flow boundary, perhaps by cavitation, and the main flow is thus detached. This evolution and the abrupt transitions between these regimes are consistent with field measurements of the pāhoehoe-to-'a'ā transition. — BH

Geology 33, 361 (2005).

tionalize alkanes under mild conditions. For poly(2-butene), which can be thought of as polyethylene with a methyl branch at every third carbon, grafting occurred at the tertiary carbons. For random copolymers of ethylene and 1-octene, grafting occurred primarily at the secondary carbons and was controlled by the ratio of polymer to graft monomer. The authors also showed that they could also functionalize polypropylene, primarily at the secondary carbons, without any of the chain scission problems that plague the traditional radical-initiated methods. — MSL

Macromolecules 10.1021/ma050626f (2005).

PSYCHOLOGY

A Sliding Scale

How hiring decisions are made is, not surprisingly, a topic of broad and continuing interest in view of their impact on people, individually in everyday life and collectively in societal debates about opportunity and outcome. Uhlmann and Cohen describe a trio of experiments showing how shifting standards might contribute to discrimination. In a pair of roughly mirror-image situations, male and female subjects were asked to assess male and female applicants for high-ranking stereotypically male- and female-dominated jobs (police chief and women's studies professor). Contrasting sets of skills (physical fitness versus media savvy) and achievements (publications versus advocacy) were evenly distributed among the applicants, and subjects did in fact evaluate applicant strength on the basis of credentials and not as a function of applicant gender. Male subjects, however, rated media savvy as being a more

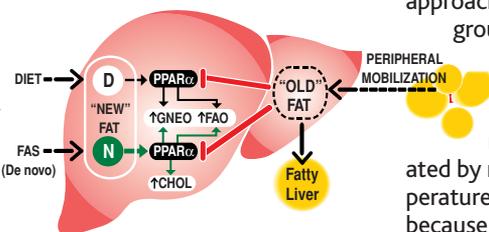
BIOMEDICINE

New Fat, Old Fat

Pursuing good health may mean including enough fat in your diet. Fat that is either consumed or synthesized de novo in cells is considered new, whereas old fat is stored in adipose tissue, waiting to be used. According to Chakravarthy *et al.*, the liver discriminates between these sources as it coordinates nutrient and energy homeostasis.

Fatty acids serve as the natural ligands for PPAR α , a hepatocyte nuclear receptor that regulates genes involved in the metabolism of glucose, fatty acids, and cholesterol. When fed a diet with no fat, mice lacking fatty acid synthase (FAS) developed hypoglycemia due to a failure in activating target genes of PPAR α that control gluconeogenesis (GNEO). Paradoxically, the livers in these mice became fat-laden because of the mobilization of peripheral fat and the inability of the liv-

ers to express PPAR α target genes involved in fatty acid oxidation (FAO). Adding dietary fat or an agonist of PPAR α reversed these symptoms. Mice lacking FAS also had low serum and liver cholesterol levels due to decreased hepatic cholesterol synthesis (CHOL). The authors propose that new fat may activate a distinct pool of PPAR α in the liver to maintain



Model for PPAR α pathways in the liver.

normal levels of glucose, fat and cholesterol. Metabolic abnormalities associated with obesity and diabetes might be treated by pharmacologically activating these distinct receptor pools. — LDC

Cell Metab. 1, 309 (2005).

CHEMISTRY

Better Grafting

Polyolefins, such as polyethylene and polypropylene, have many uses, including shopping bags and hip replacements. To improve the solvent resistance or to make them more adhesive to polar surfaces, it is advantageous to graft polar groups onto the polymer backbone. However, current approaches to adding polar groups are either much slower than commercial polyolefin polymerization methods or are initiated by radicals at high temperatures and pressures because they are not compatible with the use of metal catalysts. Ideally, one would like to add side groups in a controlled secondary process, something that is easy to do for polymers with unsaturated bonds in the backbone, but is much more challenging for polyolefins. Díaz-Requejo *et al.* examined a copper-based catalytic system, which they had used to func-

important criterion for success as a police chief when ranking male applicants who had that skill; similarly, female subjects emphasized advocacy as being crucial when considering female applicants who had been activists for the professorship. These differences then translated into hiring choices, where men favored men in the first competition and women favored women in the second. The simple manipulation of committing to hiring criteria before evaluating the applicants largely mitigated gender bias in the outcomes. — GJC

Psychol. Sci. 16, 474 (2005).

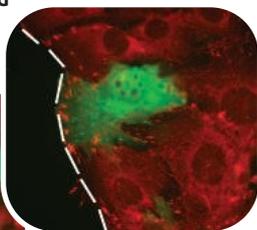
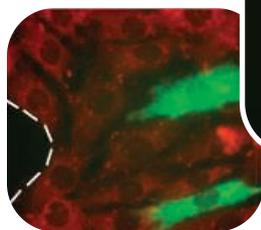
CELL BIOLOGY

Defocusing with Dynamin

In mammalian cells, actin-rich focal adhesions form at places where the cell membrane protein integrin interacts with the extracellular matrix. When adherent cells move across a surface, they lay down focal adhesions at the front of the cell and disassemble adhesions at the back. Much is known about focal adhesion assembly, but less about disassembly.

Ezratty *et al.* targeted molecules specifically involved in focal adhesion disassembly by adding a drug that induced microtubule disassembly and then removing the drug to allow microtubules to regrow, during which time focal adhesions disassembled in a

An inactive form of dynamin (green, left) interferes with migration toward a wound (dashed line) as compared with cells with wild-type dynamin (right).



synchronous fashion. They found that adhesion disassembly required focal adhesion kinase and dynamin, which localized to the adhesions, and inhibiting dynamin activity prevented cell migration. Thus, the disassembly of focal adhesions involves a pair of molecular entities, microtubules and dynamin, neither of which are used in the assembly process. — SMH

Nat. Cell Biol. 10.1038/ncb1262 (2005).

IMMUNOLOGY

A Regulatory Effect of Tax

Regulatory T (T-reg) cells are central moderators of the immune system, restraining overexuberant T cells and those that have a tendency to react against the body's own components. Consequently, perturbing the function of T-reg cells could have deleterious effects on the health of an individual.

Yamano *et al.* have extended previous observations that T-reg cells represent a preferential reservoir for the human T cell lymphotropic virus (HTLV-1) in infected individuals. These patients develop an immunity-based neurologic disease, in which large numbers of virus-specific CD8⁺ cytotoxic T cells invade the central nervous system. Virus-infected T-reg cells were severely diminished in their ability to suppress T cell responses and in the expression of the transcription factor Foxp3. These deficits were traced to the expression of a viral transcriptional repressor, Tax, and could be recapitulated by transfecting the *tax* gene into uninfected T-reg cells.

Although some autoimmune effects have been reported in this group of HTLV-1 patients, it is interesting that such a profound T-reg cell defect does not appear to result in a broader impairment of normal immune function. — SJS

J. Clin. Invest. 115, 1361 (2005).

APPLIED PHYSICS

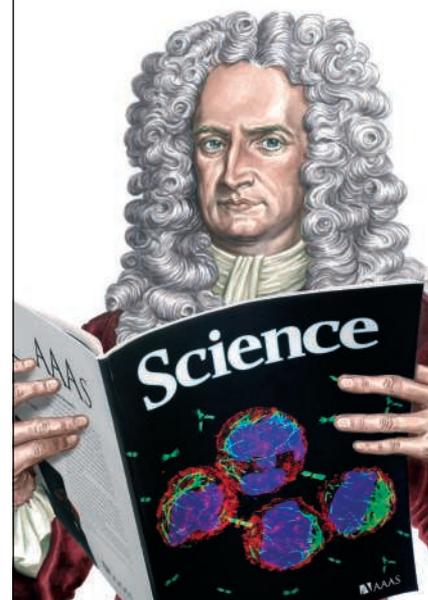
Quantum Networking

The ability to send single photons down optical fibers offers the possibility of secure communications over existing fiber networks. One challenge has been to find single-photon sources that emit at the telecom wavelengths of 1300 nm. The emission wavelength of quantum dots can be tuned by controlling their size, making them ideal candidates for further study. On the other hand, infrared communication wavelengths would require the dots to be relatively large; under typical growth conditions, this would require a longer growth time, resulting in a high density of dots on the surface and a large number of single-photon sources. By carefully adjusting the growth conditions, Ward *et al.* show that they can whittle down and isolate the number of emitters to just one, thereby providing a practical source of single photons for quantum communication over fiber-optic networks. — ISO

Appl. Phys. Lett. 86, 201111 (2005).

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