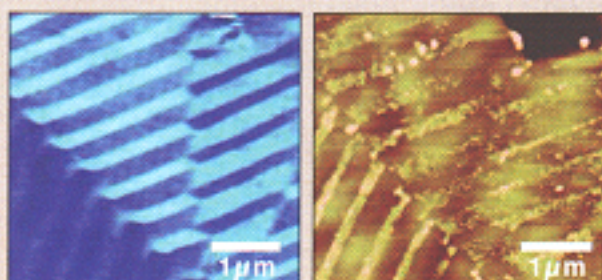


edited by Stella Hurtley

APPLIED PHYSICS

Ferroelectric Lithography

Much like a pen on a piece of paper or a stick dragged through sand on a beach, probe microscopy methods have been used to pattern substrates, either through the deposition of molecules or by scratching the substrate. Arrays of probes can pattern with more than one "ink," but there are limits to the complexity of the patterns that can be formed. By combining a ferroelectric substrate with redox chemical reactions, Kalinin *et al.* show that they can sequentially fabricate complex metal patterns. Using either barium titanate or lead zirconate titanate as their substrates, through the application of a local electric field, domains were produced with different orientations of the ferroelectric polarization. When subject to light above the bandgap wavelength, electron-hole pairs form according to the local ferroelectric polarization, and thus when immersed in a solution containing metal ions, they will be preferentially deposited on the positively oriented domains. Ag, Rh, Pd, Pt, and Au were successfully applied, and structures using many metals and functional organics could be built through a series of patterning and photoreduction cycles. — MSL



Domain polarizations (left) and regions of silver deposition (right).

Adv. Mater. 16, 795 (2004).

BIOMEDICINE

Healthy Appetite

Since its discovery 5 years ago, the stomach-derived peptide ghrelin has been the subject of intense research. Dubbed the "hunger hormone," ghrelin stimulates food intake and body weight gain when administered to rodents, possibly through direct action on the brain. These observations prompted speculation that pharmacological inhibitors of ghrelin production would be valuable drugs for the treatment of obesity.

To study the physiological role of ghrelin, Wortley *et al.* generated ghrelin-deficient mice. Surprisingly, the mutant mice showed normal food intake, basal metabolic rate, and body weight. In contrast to wild-type mice, however, ghrelin-deficient mice on a high-fat diet burned more fat than carbohydrate, suggesting that ghrelin may play a role in regulating the metabolic substrates used for the maintenance of energy balance. In a complementary study, Sun *et al.* found that mice deficient in the receptor for ghrelin also showed no major abnormalities in food intake or body composition. Together, the studies indicate that ghrelin is not an essential

regulator of appetite, and its role in body weight regulation may be more complex than previously envisaged. — PAK

Proc. Natl. Acad. Sci. U.S.A. 101, 8227; 4679 (2004)

PALEONTOLOGY

Snakeheads: Coming Down the Mountains

Snakeheads (Channidae) are air-breathing freshwater fish that can walk on the land and jump in the water. These large fish (0.3 to 1.8 m long) have



Channa striata.

heavy bones and sharp teeth. Unfortunately, they are predatory and have become a problem in North America, where they have been introduced accidentally and could decimate native species.

An excellent fossil record of this robust fish indicates an

origin in Pakistan at least 50 million years ago (Ma). Böhme tracked their migration into western Eurasia about 17 Ma and into Africa and eastern Asia about 8 Ma. In nature, extant snakeheads are restricted to African and Asian regions of high precipitation with temperatures greater than 20°C. Using these climatic restrictions, the author inferred that their migration about 17 Ma fits with a northward shift of the Intertropical Convergence Zone, and their migration about 8 Ma fits with the development of the Asian monsoon—two climatic shifts related to the uplift of the Alps, Pyrenees, and Himalayas. Thus, the mobility of the snakeheads traces paleoclimate and past tectonics. — LR

Geology 32, 393 (2004).

IMMUNOLOGY

The Long and the Short of It

Over a human lifetime, the immune system becomes dominated by an aging lymphocyte population, with the source of new cells diminishing and the existing pool being preserved to fight infection. As with any cell, the normal life span of a lymphocyte is marked by the gradual

shortening of its telomeres, eventually resulting in replicative senescence of the cell. However, it is likely that this process is differentially regulated in T lymphocytes, depending on whether they are slowly dividing naive T cells, short-lived highly proliferating effectors, or long-lived memory cells.

Reed *et al.* looked at memory cell differentiation in humans who had previously been vaccinated with BCG. After injection of a second antigen, T cells responded vigorously at the site of challenge in the skin, acquiring an activated memory phenotype as they proliferated. Compared with other circulating T cells in these people, the responding cells displayed as much as eight times the level of telomere reduction 3 weeks after vaccination—the amount that would normally be seen in a resting cell over 1 year. Type 1 interferons present at the site of the response were largely responsible for the elevated telomere erosion, apparently through inhibition of the enzyme telomerase, which normally maintains telomere ends. — SJS

J. Exp. Med. 199, 1433 (2004).

CONTINUED ON PAGE 1417