

EDITORS' CHOICE

edited by Stella Hurltley

ASTROPHYSICS

Buried Active Galactic Nucleus

Ultraluminous infrared galaxies (ULIRGs) are some of the brightest objects that have formed in the past few billion years, and older objects observed in the submillimeter background emission appear to be similar to ULIRGs. The high luminosity and other characteristics suggest that ULIRGs are starburst galaxies with high rates of star formation, but recent work has indicated that some ULIRGs may get their energy from a central source engine, namely an active galactic nucleus (AGN) that is buried within a shroud of dust.

Imanishi *et al.* obtained infrared spectra of the galaxy UGC 5101 and found a weak polycyclic aromatic hydrocarbon emission coupled with a strong 3.4-micrometer carbonaceous dust absorption. The weak emission cannot account for the object's luminosity, suggesting that an AGN is needed and that the strong absorption is due to the AGN being buried in a sphere of dust. Thus, not all ULIRGs may be starburst galaxies, and this may alter estimates of star formation rates in the early universe and the present. — LR

Astrophys. J. **558**, astro-ph0108156v2.

APPLIED PHYSICS

Single-Electron Shuttle

The ability to transport single electrons in electronic circuits addresses not only energy dissipation issues as the electronics industry looks to fabricate smaller devices, but also presents potential for precision measurement and metrology. Most approaches for fabricating single-electron devices have involved the patterning between source and drain contacts of a small metallic island

on which electrons can be added and transported one at a time. However, as the patterned device is fixed, the rate at which the single electrons can be transported is limited.

Now Erbe *et al.* have added a further degree of freedom combining nanomechanics and electronics to attach the small metallic island to the end of an oscillating clapper. As the clapper oscillates, single electrons can be ferried between the source and drain electrodes. The advantage of this setup is that the frequency of the clapper can be controlled. The device allows transport of single electrons at rates up to 100 MHz. — ISO

Phys. Rev. Lett. **87**, 096106 (2001).

ATMOSPHERE & OCEANS

Indian Smoke Signals

Recently, high concentrations of anthropogenic pollution from south and southeast Asia have been found over large regions of the northern Indian Ocean. This has raised the question as to whether the region's cloud properties have been influenced by increasing aerosols. Results from models indicate that solar absorption by soot aerosols can decrease daytime cloud cover.

Norris has tested whether this effect may be important over the Indian Ocean, by examining changes in cloudiness between 1952 and 1996, a period during which there have been large increases in Asian air pollution. Cloud cover actually increased over the period, as did cloud cover in the relatively clean air over the southern Indian Ocean. The similarity of these trends suggests that changes in cloudiness in the northern Indian Ocean are not the result of increased soot pollution and that other factors, such as variations in sea surface temperatures, must be responsible. — HJS

Geophys. Res. Lett. **28**, 3271 (2001).

DEVELOPMENT

Misguided and Misunderstood

Eggs have an internal polarity that is important in defining the polarity of the developing embryo. The establishment of polarity is a key factor in controlling normal development. Now Guillemain *et al.* have discovered an unanticipated role for the nuclear lamins in defining polarity. The nuclear lamin proteins are related to inter-

Image not available for online use.

Wild-type (left) and *misguided* (middle and right) oocytes. Mutant oocytes show nuclear envelope and lamin disruption (red) and aberrant DNA organization (green).

mediate filaments and line the nuclear envelope. In mutant *Drosophila* lacking functional versions of one of the main nuclear lamins, the dorsal-ventral polarity of oocytes was disrupted. In addition, directed outgrowth of cytoplasmic extensions from terminal cells of the trachea was disrupted—which was how the original mutant, *misguided*, was identified. How disruption of the nuclear envelope and the associated DNA translates into cytoplasmic defects is unclear. However, this role of the lamins in cytoplasmic, as well as nuclear, organization may well help in understanding the pathology of human diseases caused by mutations in the nuclear lamins. — SMH

Nature Cell Biol. **3**, 848 (2001).

EVOLUTIONARY GENETICS

Your Place Or Mine?

Patterns of genetic diversity in humans (and other species) are heavily dependent on patterns of population movements and migrations. Oota *et al.* show how sex-biased patterns of migration influence genetic variation both in mitochondrial DNA (mtDNA), which is inherited through the maternal line, and in the Y chromosome, which is inherited through the male line. In the hill tribes of northern Thailand, some societies are matrilineal, which means that women stay in their birthplace, whereas men move to marry; others are patrilineal and the women move—a pattern more common in human societies. In

patrilineal groups, mtDNA haplotype diversity was much higher than in the matrilineal groups, whereas the reverse was true of Y haplotypes. Thus, at a fine scale, social structure can determine genetic diversity in humans. — AMS

Nature Genet. **10**, 1038/ng711.

BIOMEDICINE

Tailored Cancer Therapy

Prompted by the discovery that tumors derived from a given tissue type can have distinct molecular features, it may now be possible to develop "tailored" cancer therapy. The basic idea is to classify tumors according to the specific growth signaling pathways that are aberrantly activated in the tu-

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mor cells and to apply therapies that selectively target those pathways.

The potential benefit of tailored cancer therapy is illustrated by the preclinical work of Neshat *et al.* and Podsypanina *et al.*, who studied tumors genetically deficient in PTEN phosphatase, the product of a tumor suppressor gene that is commonly mutated in human endometrial, prostate, and brain cancers. Noting that PTEN-deficient tumors show elevated activity of the mTOR/S6 kinase signaling pathway, the authors tested the anticancer activity of a drug (CCI-779) known to inhibit this pathway. Treatment with the drug retarded the growth of PTEN-deficient tumor cells in culture and PTEN-deficient tumors in mice, but was much less effective against tumors showing normal expression of PTEN. Thus, PTEN-deficient human tumors may be especially sensitive to the antiproliferative effects of CCI-779 and the related drug rapamycin, which is already in clinical use as an immunosuppressant. — PAK

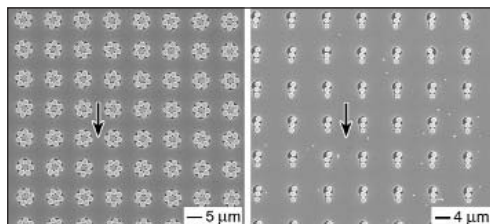
Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.171076798;
10.1073/pnas.171060098.

MATERIALS SCIENCE

Template-Assisted Self-Assembly

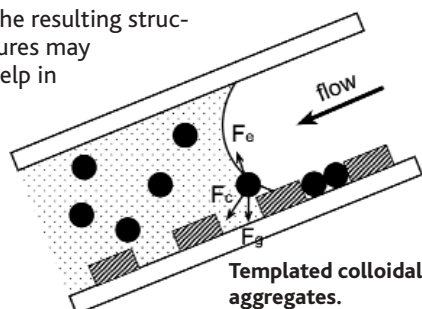
Colloidal particles are used in applications from paints and toners to cosmetics and photographic film. Use of spherical particles has dominated because their properties can be controlled relatively easily. However, for advanced applications, e.g., in optical materials, non-spherical particles may be more advantageous because they can form a wider range of crystal structures.

Now Yin *et al.* have developed an approach that allows the assembly of spherical colloids into complex-shaped aggregates. Photolithography is used to pattern a surface with geometric templates. When a dispersion containing colloidal polymer particles flows over the surface,



the particles are trapped in the templates as the liquid drains away. Depending on the size and shape of the template, different assemblies may form, round, elongated, triangular, or hybrid-shaped particles. When the assemblies are thermally annealed, they remain stable after the template has been dissolved.

The resulting structures may help in



understanding the properties of non-spherical colloids and may also form building blocks to assemble mesostructured systems. — JU

J. Am. Chem. Soc. 10.1021/ja011048v.

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Addicted to Growth Factors?

Growth factors appear to limit apoptosis (programmed cell death) by changing the abundance or activity of proteins that control the apoptotic process. Now, Vander Heiden *et al.* propose another role for growth factors that can also influence apoptosis: control of nutrient uptake and bioenergetic homeostasis. In a mouse cell line that requires interleukin 3 (IL-3) for survival, after growth factor removal it was the level of reduction in glycolysis, not IL-3 concentration, that determined whether cells died. Cells used to high concentrations of IL-3, with higher glycolytic rates, were more susceptible to cell death due to growth factor withdrawal. When glucose was limited, mitochondria released cytochrome c and the cells underwent apoptosis. Sensitivity to decreases in nutrient availability was also greater in cells "addicted" to high levels of growth factor. Furthermore, overexpression of the glucose transporter Glut1, which would supply the cell with more nutrients, delayed apoptosis. Thus the effects of growth factors on the metabolic status of the cell are likely to be key factors determining whether it undergoes mitochondrial malfunction leading to apoptosis. — LBR

Mol. Cell. Biol. 21, 5899 (2001).