

edited by Gilbert Chin

IMMUNOLOGY

A Weapon of Mass Distraction

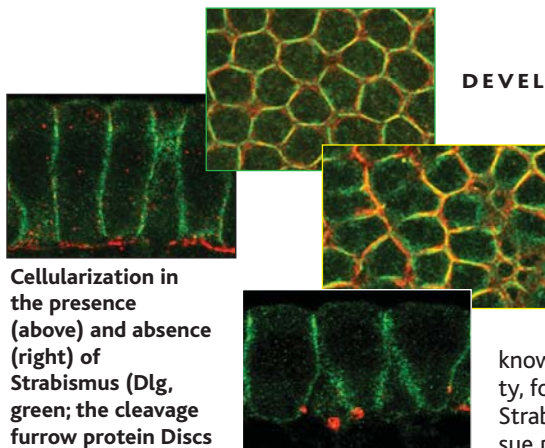
Tumors can be slippery customers when it comes to their recognition and destruction by the immune system. Often this is because the similarity of tumor cells to their healthy counterparts makes detection by tumor-reactive T cells difficult. Uyttenhove *et al.* uncover a further means by which tumors may actively thwart the efforts of T cells. In a large panel of human tumors, many expressed the tryptophan-catabolizing enzyme indoleamine 2,3-dioxygenase (IDO). T cells are particularly sensitive to tryptophan availability, meaning that IDO is able to inhibit both mouse and human T cell proliferation. In a mouse model, where T cell immunity normally leads to a rapid rejection of tumors, rejection did not occur when tumor cells were engineered to express IDO, and an IDO inhibitor partially restored tumor rejection. Thus, by depleting the local tryptophan pool, tumors may divert, en masse, the unwanted attention of T cells. — SJS

Nature Med. 9, 1269 (2003).

CHEMISTRY

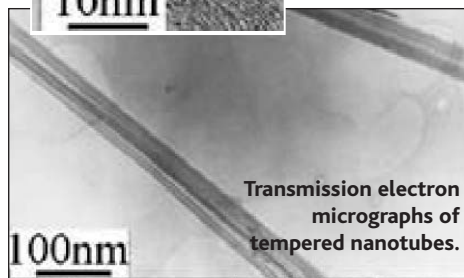
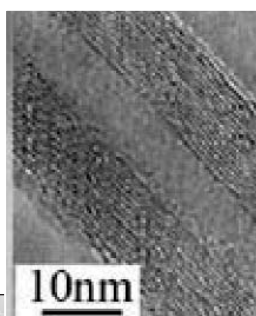
Hot Rods

A number of methods have been developed for the synthesis of single- and multiwalled carbon nanotubes. However, these methods typically require high temperatures and complex procedures, or they use metallic catalyst particles that need to be retrieved in a second stage. Kang *et al.* show that it is possible



Cellularization in the presence (above) and absence (right) of Strabismus (Dlg, green; the cleavage furrow protein Discs Lost, red).

to make multiwalled tubes directly from graphite rods. They heated the rods in air until they were red hot (above 800°C) and then plunged them into freezing water. After a "slight explosion," the water became turbid, and after repeating this cycle many times, they obtained a yield of about 40%. The authors suggest that the rapid quenching and the thermal gradient across the graphite layers causes them to curve and crimp, allowing the edges to bond to each other. The nanotubes have an inner diameter between 5 and 10



Transmission electron micrographs of tempered nanotubes.

nm, and an outer diameter between 30 and 50 nm, and appear to be straight and free of defects. — MSL

J. Am. Chem. Soc.
10.1021/ja037399m (2003).

DEVELOPMENT

Building Cells

In the early stages of fly embryo development, nuclei divide but remain within a single compartment. Subsequently, these 6000 syncytial nuclei are individually packaged into newly constructed cell membranes. Lee *et al.* show that the tumor suppressor Discs-Large (Dlg), which is known to be involved in the genesis of cell polarity, forms a complex with the membrane protein Strabismus (Stbm), which is involved in planar tissue polarity. In mutant larvae lacking either of these proteins, plasma membrane formation was severely compromised; when either protein was overexpressed, excessive amounts of plasma membranes were induced. The Dlg-Stbm complex appears to recruit intracellular post-Golgi membranes to the cell surface in order to support the growth of new plasma membrane. — SMH

Nature Cell Biol. 10.1038/ncb1055 (2003).

ATMOSPHERIC SCIENCE

Icy Complications

Satellite measurements of lower tropospheric microwave emissions have been used to estimate tropospheric temperatures. These data have been interpreted as showing little or no warming there since 1978, in apparent contradiction to surface temperature analyses, which show a strong temperature increase over the same period. It is thought that these temperature series should agree. Two possible explanations exist: either one or both of the temperature records is wrong, or the records are correct and there is an unknown physical basis for the difference. Some suspect that the problem lies with the tropospheric temperature estimates, because calculating accurate atmospheric temperatures from the microwave data is an extremely complicated and difficult operation.

Swanson examined the satellite data in conjunction with tropospheric temperature measurements made with radiosondes lofted from Antarctica and found that the records differ significantly. On the basis of anomalous temperature reversals contained in

the microwave-based temperature reconstructions, and observations of sea ice, he suggests that the lower troposphere temperatures inferred for latitudes above 60° are inaccurate because of the influence of the annual sea ice cycle. — HJS

Geophys. Res. Lett. 30,
10.1029/2003GL017938 (2003).

ASTROPHYSICS

Magnified Megacluster

A fortuitous alignment of a deep stellar cluster (redshift of 3.36) with a nearby cluster complex (redshift of 0.5) has created a gravitational lens of the farther cluster, which is called the Lynx arc. What is especially advantageous is that the arc is situated along a fold caustic in the lens and is thus magnified about 10 times. Fosbury *et al.* took advantage of this extreme magnification and obtained spectra and photometry of the arc using the Hubble Space Telescope, ROSAT, and the Keck 10-m telescope. The arc is an H II galaxy with a cluster of about a million extremely hot (between 80,000 and 120,000 K), highly ionized O stars (blue stars). This mega-

CONTINUED ON PAGE 953

cluster of stars is the largest, brightest, and hottest star-forming region observed so far and shows that starbursts were very active when the universe was only about 2 billion years old. In addition, the Lynx spectra suggest an overabundance of silicon in the cluster, and the excess silicon may be a nucleosynthetic marker of pair instability supernovae from a Population III (the first generation of stars) cluster. The progenitors of these supernovae are inferred to be supermassive stars (140 to 260 solar masses), indicating that the first-generation stars were heavyweights. — LR

Astrophys. J. **596**, 797 (2003).

BIOMEDICINE

Genes, Hormones, and Puberty

Hundreds of handbooks have been written to guide adolescents and parents through the emotional turbulence that defines puberty, yet remarkably little is known about the physiological mechanisms regulating this critical stage of human development. Puberty begins when the brain starts to secrete gonadotropin-releasing hormone (GnRH), which in turn triggers the release of pituitary hormones that activate gonadal function.

To identify genetic factors that modulate the onset of puberty, Seminara *et al.* and de Roux *et al.* studied an inherited form of a human disorder called hypogonadotropic hypogonadism, in which individuals fail to go through puberty. The two groups independently identified mutations in *GPR54*, a gene coding for a G protein-coupled receptor, and complementary studies of *Gpr54*-deficient mice by Seminara *et al.* suggested that loss of this receptor disrupts processing or secretion of GnRH. These findings could ultimately lead to new therapies for disorders characterized by precocious or delayed puberty. — PAK

N. Engl. J. Med. **349**, 1614 (2003);
Proc. Natl. Acad. Sci. U.S.A. **100**, 10972 (2003).

GEOCHEMISTRY

Swapping Exhaust for Fuel

Large amounts of methane are stored as hydrates on continental margins and in permafrost regions. If the methane hydrates could be converted into CO₂ hydrates, they would serve double duty as methane sources and CO₂ storage sites. Lee *et al.* have investigated the dynamics

and thermodynamics of the conversion in a solid-state NMR study.

Methane and CO₂ form the same ice-like hydrate structure, with two small and six large cage-like sites per unit cell. When a methane hydrate is exposed to gas mixtures containing CO₂, methane is replaced by CO₂ in many of the large cages. The authors estimate that at least 64% of the methane could be recovered from methane hydrates in this way. Kinetic data show that the replacement is fast but does not reach the theoretical limit, probably because pockets of pure methane hydrates remain in the converted structure. Whether the process is feasible in natural gas hydrate deposits remains to be shown. — JFU

Angew. Chem. Int. Ed. **42**, 5048 (2003).

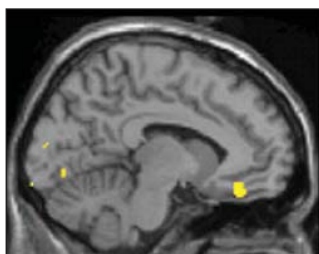
PSYCHOLOGY

Restaurant Behavior

Food is a basic human need, yet our interest in it goes far beyond mere sustenance.

Elaborate and sophisticated treatises describe in great detail the aesthetic and sensory pleasures derived from its preparation, consumption, and postprandial deconstruction. Using brain imaging techniques, Arana *et al.* describe the contributions of three cortical areas to the assessment of food. In order to focus on valuations, the subjects

were tested after having eaten cheese sandwiches *ad libitum*. They were then asked to order from a menu listing favored items, such as aro-



Choosing activates the left medial orbitofrontal region.

matic crispy duck, and less appealing ones, such as seared

plaice. Activity in the amygdala correlated with how highly the particular item was rated. Elsewhere, the medial orbitofrontal region appeared to be involved in integrating these valuations, and activity here varied with the difficulty of making a selection. Finally, the lateral orbitofrontal region came into play when subjects faced an agonizing choice between two highly desirable dishes as compared to blander fare. — GJC

J. Neurosci. **23**, 9632 (2003).



Science

Icy Complications

H. Jesse Smith

Science **302** (5647), 951.

DOI: 10.1126/science.302.5647.951d

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