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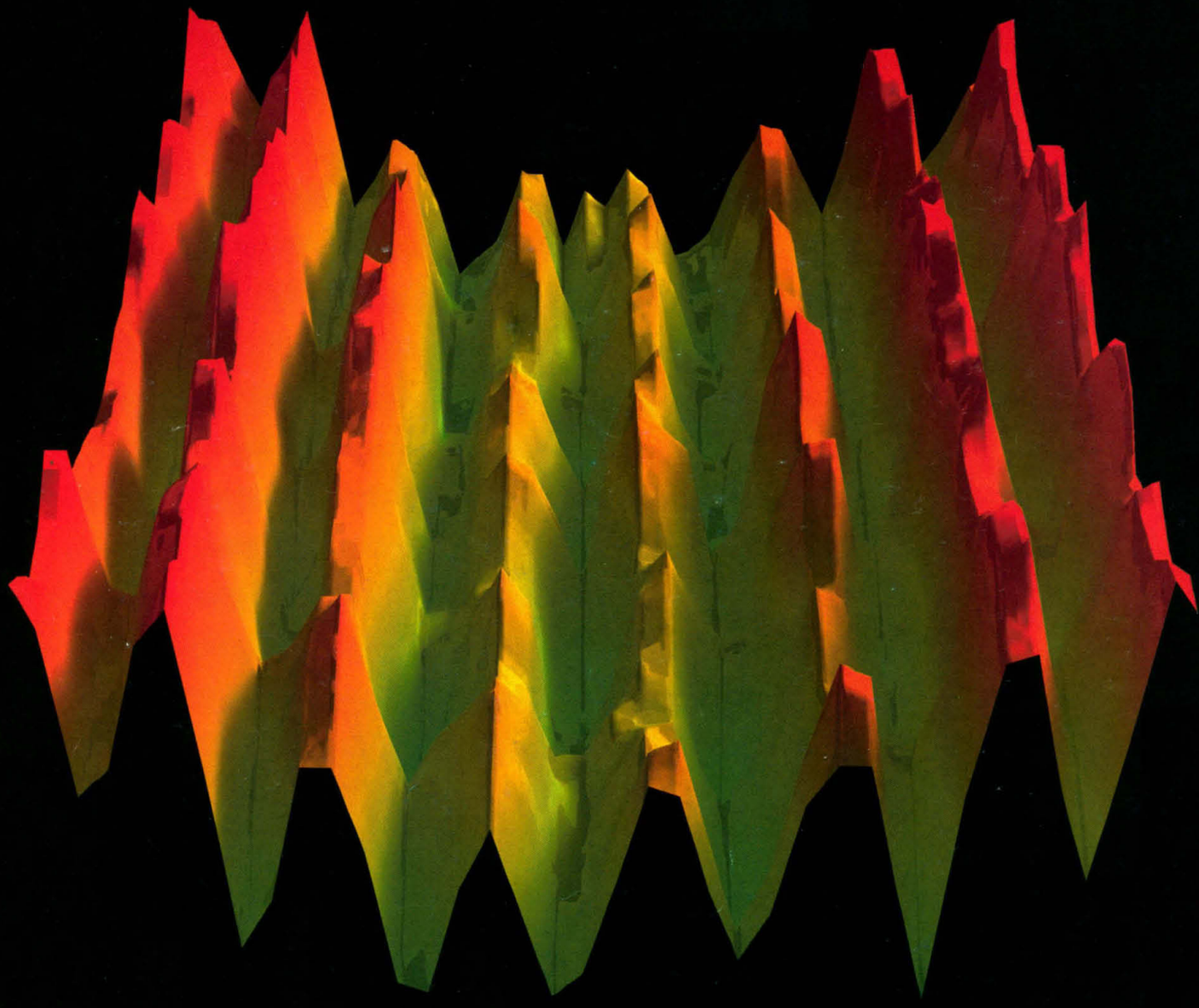

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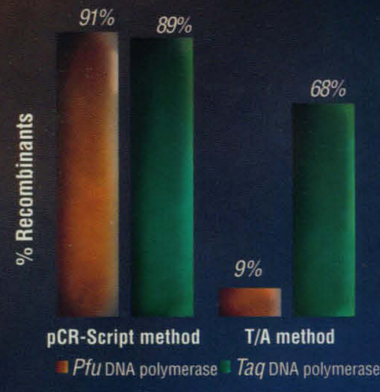

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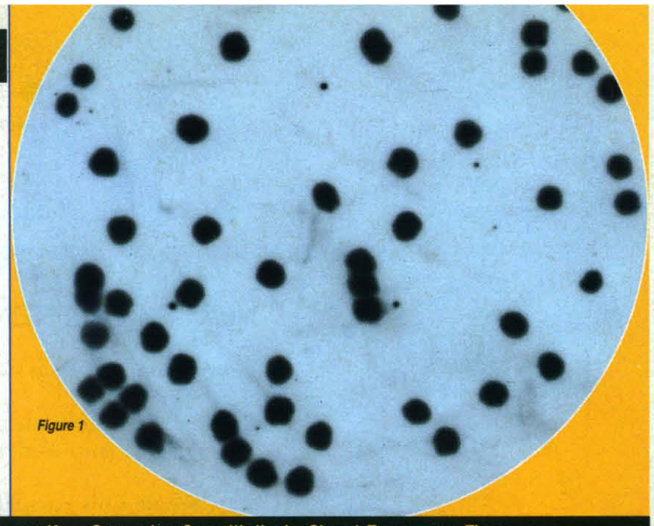

Figure 1

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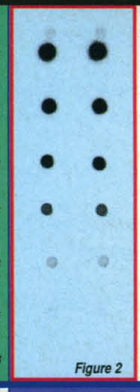

Figure 2

Figure 1. Colonies were screened for the TGF- ß1 gene with a fluorescein-labeled oligonucleotide probe and Enhanced Luminol. *This film demonstrates results obtained using the Renaissance 3'- End Labeling Fluorescein Kit with Antifluorescein-HRP (NEL823) and the detection substrate Enhanced Luminol (NEL201). Discs were exposed to Reflection film for 15 minutes.*

Figure 2. Mouse ß-actin was detected using a fluorescein-labeled ssRNA probe and ready-to-use CDP-Star. *This film demonstrates results obtained using Renaissance RNA Fluorescein Labeling Kit with Antifluorescein-AP (NEL633) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.*

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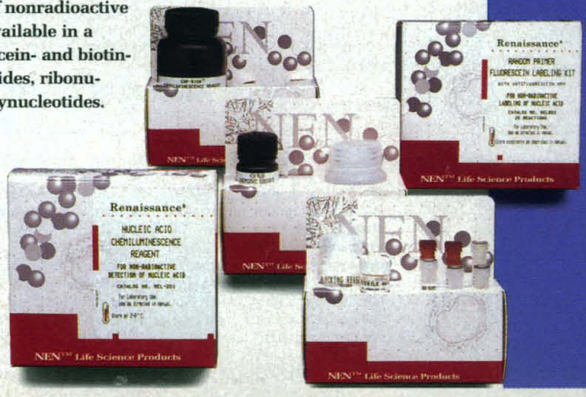

Figure 3. The v-Fos gene was detected in 125 ng of blotted mouse genomic DNA in less than 5 minutes using CDP-Star. *This film demonstrates results obtained using the Renaissance Random Primer Biotin Labeling Kit with Streptavidin-AP (NEL604) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.*

Figure 3

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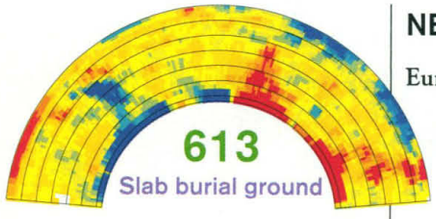

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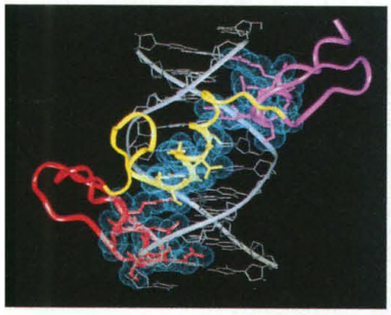
Slab burial ground



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Pointed fingers

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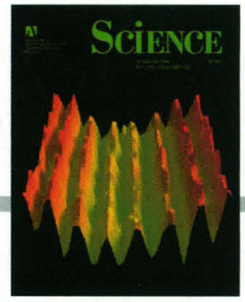
COVER

Matter wave interference of two freely expanding and overlapping Bose-Einstein condensates. The density of atomic sodium (vertical axis, in false color) is shown in an area of 0.1 millimeter by 0.4 millimeter containing about 50,000 atoms. The high-contrast interference fringes demonstrate that Bose-Einstein condensates are "laser-like," made of atoms occupying a single controllable quantum state. See page 637 and the related News story on page 617. [Image: Dallin Durfee]



RESEARCH ARTICLE

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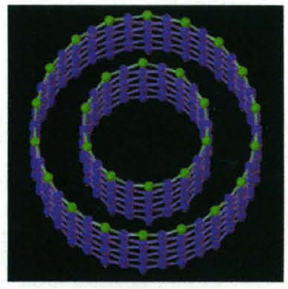
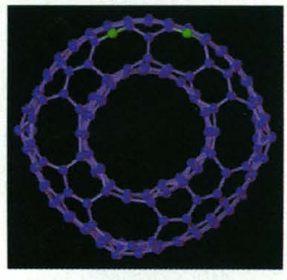
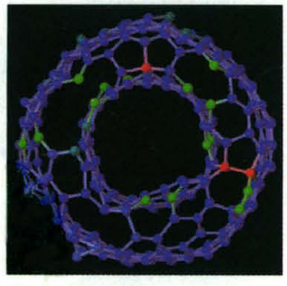
TECHNICAL COMMENTS







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Nanotube growth

◩ **Indicates accompanying feature**

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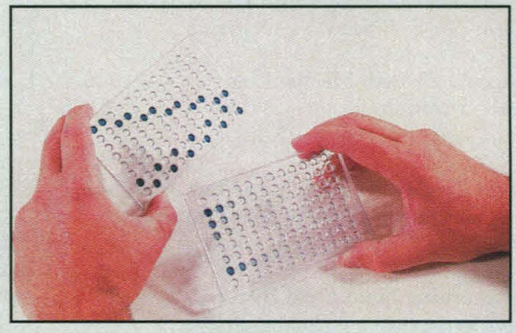

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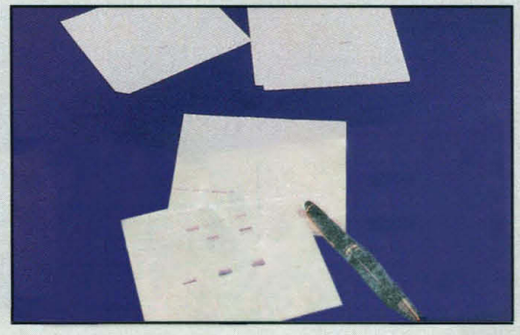

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

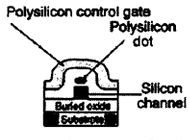
Ice ages on Titan?

Titan's nitrogen-rich atmosphere has been thought to need a steady supply of gases such as methane or hydrogen to help it maintain enough solar and thermal radiation to avoid condensation. However, there is no direct evidence that indicates that methane is maintained at a constant level. Lorenz *et al.* (p. 642) considered the effects of a depletion in methane on Titan with radiative-convective and radiative-saturated models. Without enough methane, Titan's atmosphere cools and nitrogen condenses. With continued methane-rich volcanism, the atmosphere could eventually warm up and lead to an atmospheric reinflation. This cycle could then repeat, which leads to the possibility of repeated "ice ages" on Titan that may be recorded in its surface morphology.

■

One electron at a time

A metal-oxide semiconductor transistor can represent information as charges stored on a floating gate that is built between the device channel and the control gate. One way to increase memory density is to reduce the amount of charge needed to change the state of



the device. Guo *et al.* (p. 649) have made a single-electron memory that incorporates a polysilicon dot (a few nanometers in dimension) as the floating gate. This device changed its output in steps corresponding to charging of the floating gate in single-electron increments at room temperature.

Eavesdropping on the Galileo probe

While the Galileo probe descended into Jupiter's atmosphere and returned measurements from all of its instruments to the orbiter above it, a group of scientists were listening in on this vital communication through two large arrays of radio telescopes on Earth. Folkner *et al.* (p. 644) describe how this radio signal was picked up and then used to estimate the wind speed along its trajectory. This probe-Earth measurement of wind speed was made in a different orientation because the Earth was nearly on the horizon of Jupiter during probe entry. These data not only confirmed the probe-orbiter wind speed measurements but did so at a different orientation, which will help in correcting and defining the winds of Jupiter in more than one dimension.

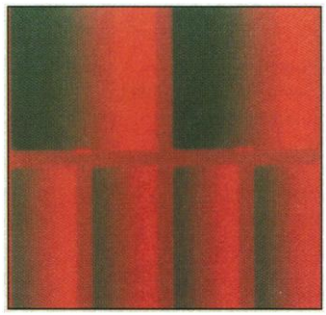
Nanotube growth

Depending on synthesis conditions, carbon nanotubes can form as single-walled or multiwalled structures. The growth of single-walled tubes generally requires metal catalysts to be present, but multiwalled tubes can be grown without them. Charlier *et al.* (p. 646) show through ab initio calculations that, for multiwalled tubes, a fluctuating-bond network between the edges of the sheets provides active sites for facile adsorption of carbon. For single-walled tubes, spontaneous dome closure is observed that makes uncatalyzed growth unfavorable.

■

Membrane corrals

Technologies normally used to make semiconductor devices have been harnessed to control the fluid bilayers of cell membranes. Groves *et al.* (p. 651) have patterned oxidized silicon wafers, which are hydrophilic, into corrals separated by barriers of gold, aluminum oxide, or photoresist. Fluid bilayers readily form within these corrals, and the concentrations of fluorescent probes within individual corrals could be altered by photobleaching or applying



an electric field. Such arrays are not only useful for fundamental studies, such as of diffusion in membranes, but may also find use in device patterning.

■

Biasing T cells

As T cells mature in the thymus, their receptors are biased against self-peptides (negative selection) but also toward nonself peptides. How does this latter positive-selection process prepare the T cell repertoire for encounters with the huge array of nonself sequences? Nakano *et al.* (p. 678) explored this question by studying mice that were injected in the thymus with an adenovirus vector expressing a nonself peptide along with an invariant chain (Ii) of the class II major histocompatibility complex. In this way, the peptide was expressed near its binding groove. Although the T cells could respond to both closely related and unrelated peptide sequences, the particular repertoire changed with even slight changes to the original peptide sequence.

■

Glaucoma gene

Primary open angle glaucoma is one of leading causes of blindness but can often be successfully treated if caught before irreversible damage is done to the optic nerve. Stone *et al.* (p. 668; see the news story by Vogel, p. 621) used a genetic linkage and haplotype sharing analysis to identify a candidate gene, *TIGR*, for a juvenile onset form. Mutation screening showed that 13 of 330 unrelated patients carried mutations in this gene on chromosome 1. Genetic screening may help identify individuals at greater risk for this disease.

■

Akt actions

Two reports provide new insight into the biological regulation and function of the protein kinase Akt (also called PKB), the product of the *Akt* oncogene. Many growth factor receptors activate a phosphoinositide 3-kinase, and Franke *et al.* (p. 665) show that the product of this enzyme, phosphatidylinositol-3,4-bisphosphate, binds to and activates Akt. Dudek *et al.* (p. 661) explored the biological actions of activated Akt and found that Akt is required for insulin-like growth factor 1 to promote survival of primary cultures of cerebellar neurons. Implications of recent advances in understanding of Akt and its functions are discussed in a Perspective by Hemmings (p. 628).

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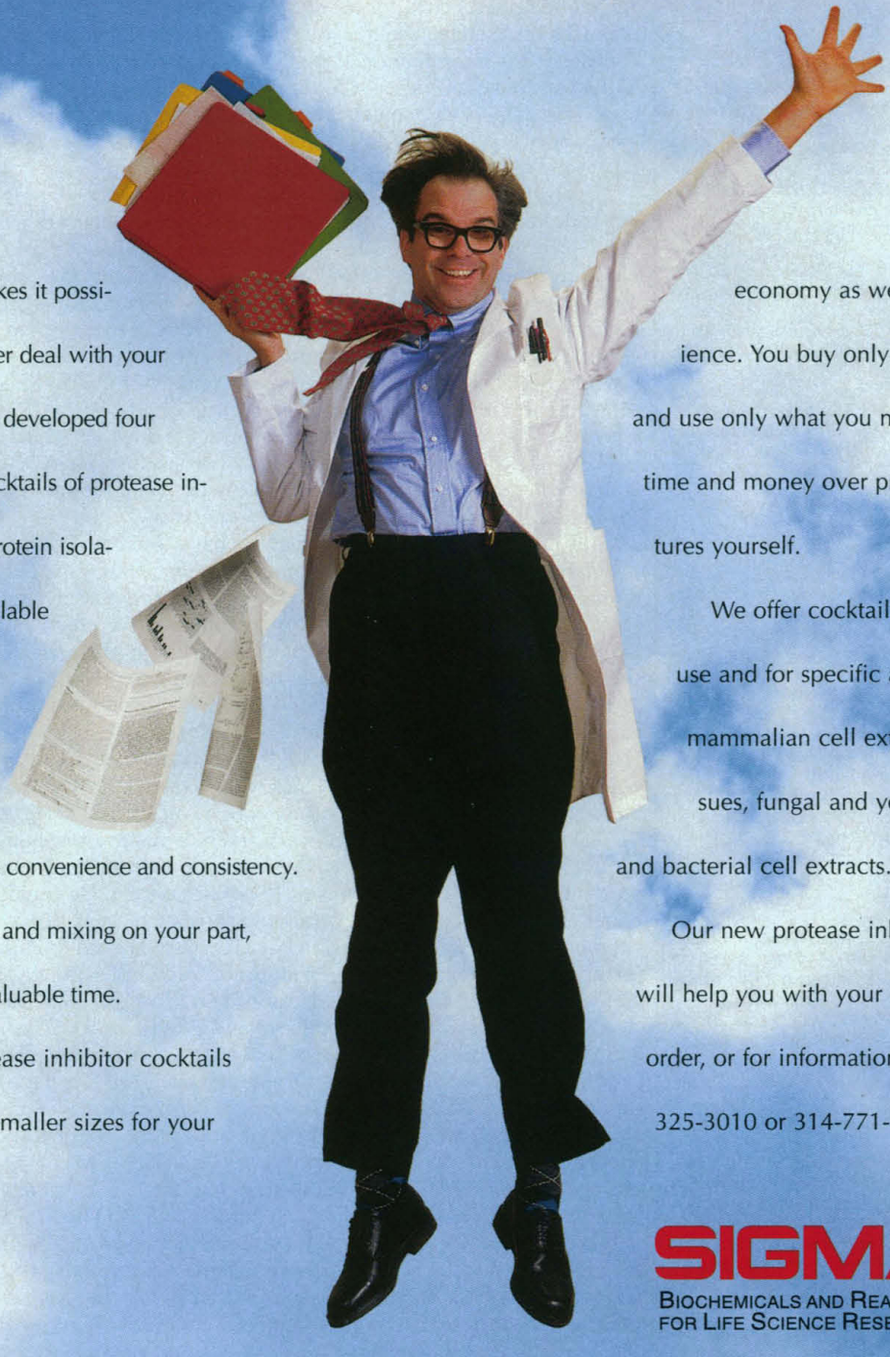

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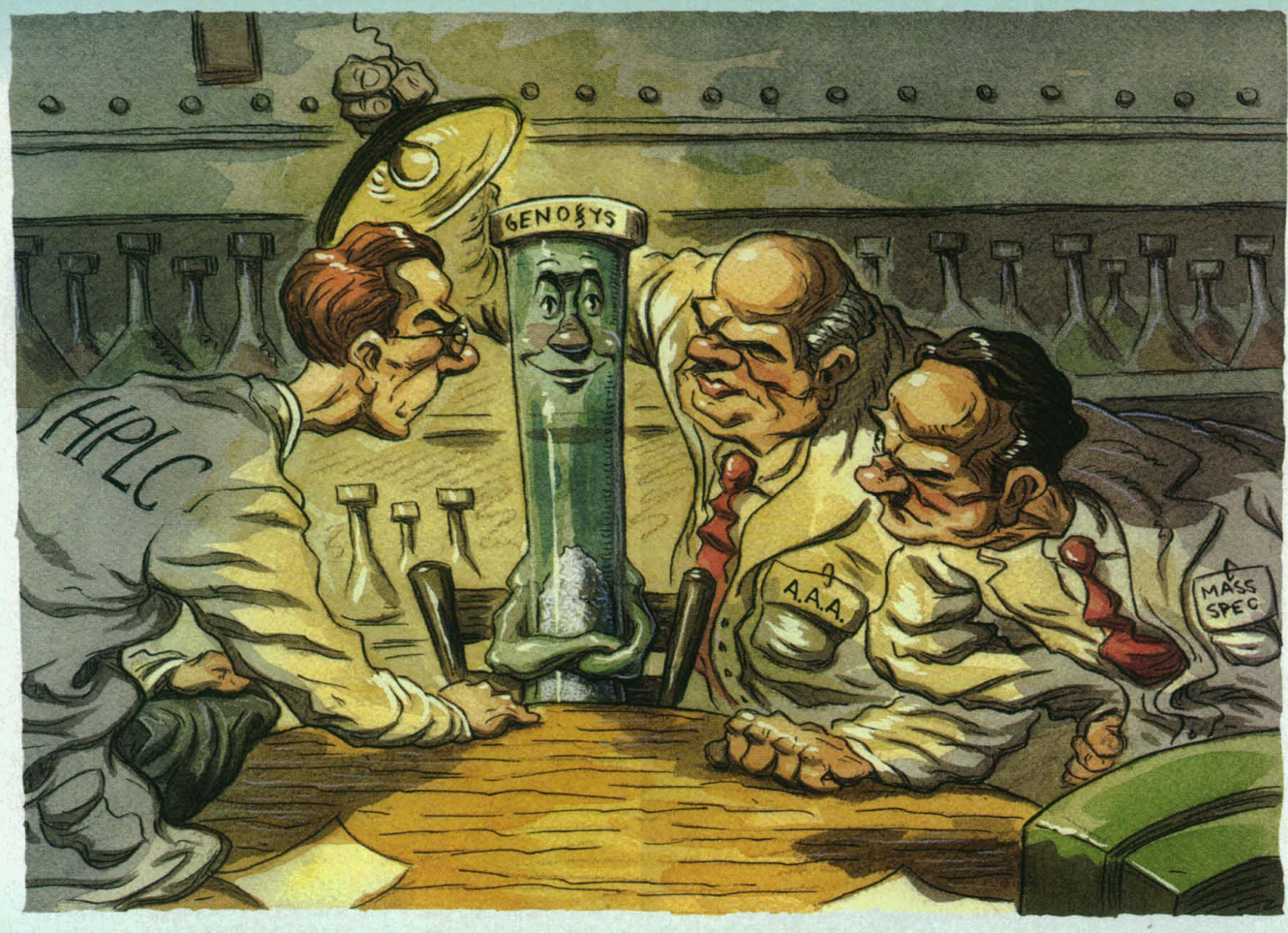

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