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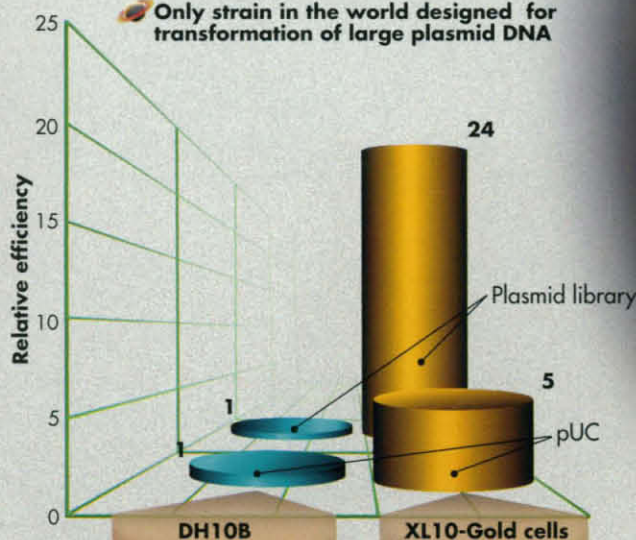
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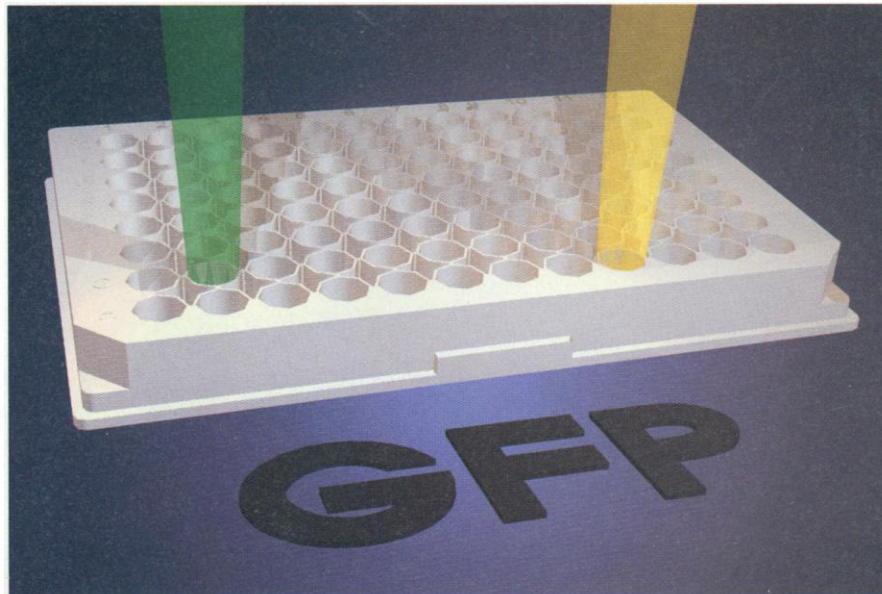
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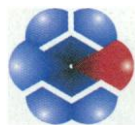


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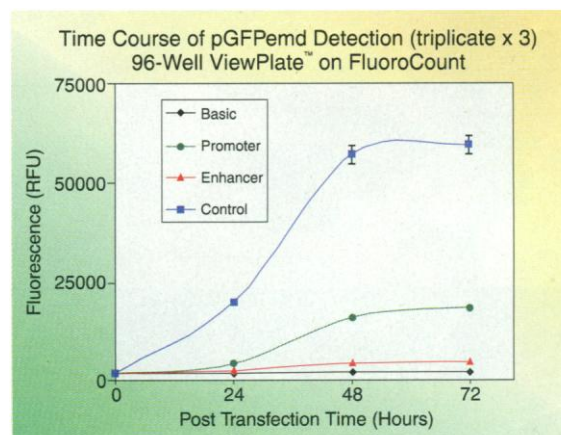
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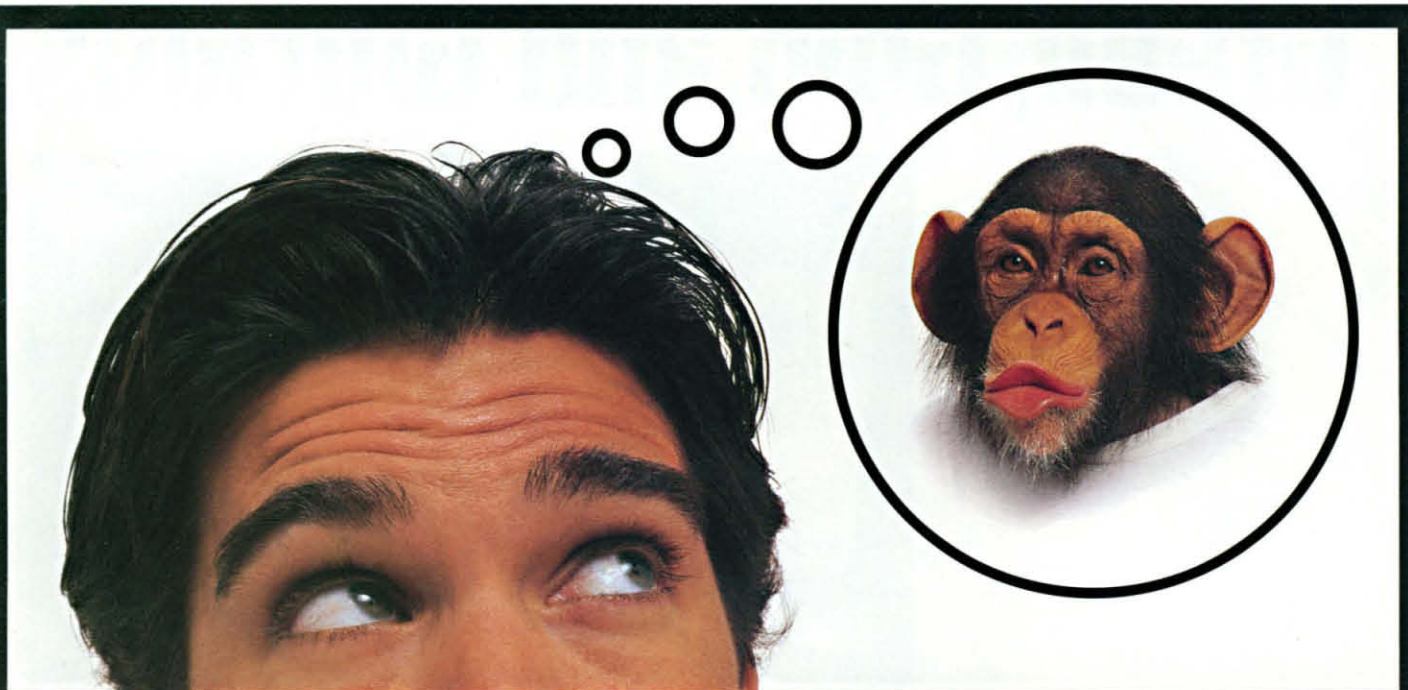


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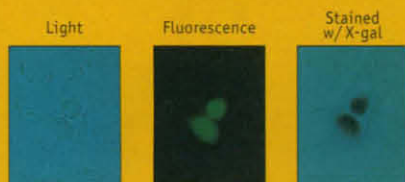
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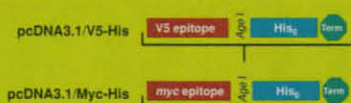


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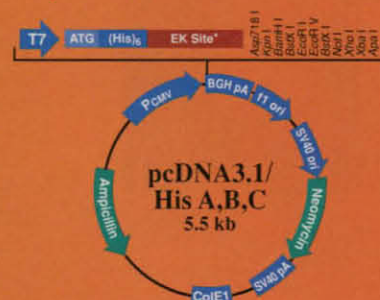


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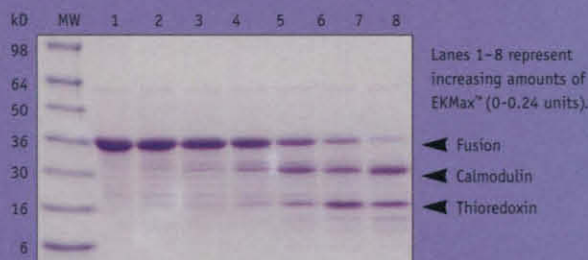
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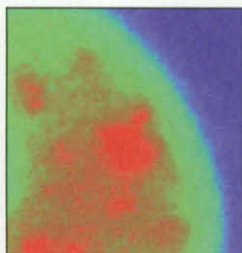
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## COVER

Ruth and Annié Nyström are 93-year-old monozygotic Swedish twins who are participants in "OCTO-Twin," a longitudinal study on genetic and environmental influences on individual differences in aging funded by the National Institute on Aging. The study involves same-

sex twins 80 or more years of age and measures a broad array of behavioral variables. The report in this issue focuses on cognitive functioning. See page 1560 and the related Perspective on page 1522. [Collage: Preston Morrighan, also an identical twin]



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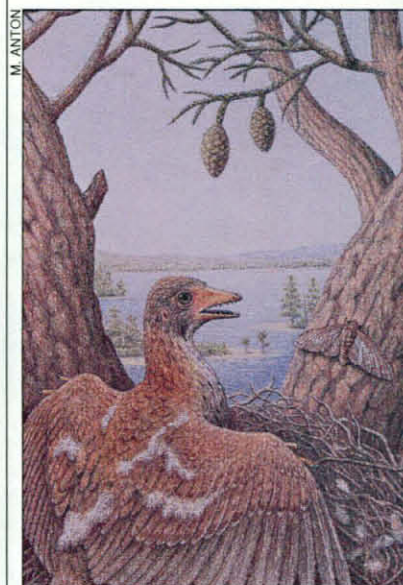
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1501 &amp; 1543

Heads up for early birds

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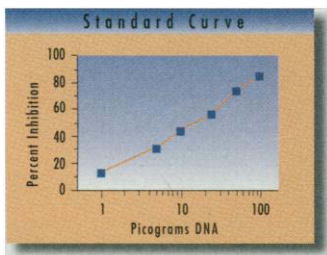
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# THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

## Our not-so-icy moon?

When the Clementine satellite was used to bounce radar signals off the moon for detection here on Earth, the signals from the lunar polar regions were suggestive of ice, which perhaps was in shadowed craters. Stacy *et al.* (p. 1527) have used the Arecibo radar system and detected a radar signal similar to that seen in the Clementine experiment. However, they also mapped the lunar poles at a higher resolution than Clementine and determined that some of the areas that produced the unusual radar signal are in sunlight. Rather than being an ice signature, the authors suggest that the radar signal is due to surface roughness.

## Green spectroscopy

Atmospheric scientists have long observed and used the green nighttime emission at 5577 angstrom wavelength to study the Earth's ionosphere. The source of this emission has been thought to be molecular oxygen ions (such as  $O_2^+$ ), which are created by daytime solar ultraviolet exposure but recombine with electrons and dissociate at night. Direct measurement of the recombination processes from different electronic states that might produce the green light has proven difficult. Kella *et al.* (p. 1530), using an imaging technique at a heavy-ion storage ring, directly measured the yield of oxygen atoms in the  $^1S$  excited state from  $O_2^+$  and found that the yield is greater than theory would predict. This measurement should help to reconcile inconsistencies between atmospheric models and observations for planetary ionospheres of Earth and other planets.

## Sending out the wrong signals

In the fruit fly *Drosophila*, the gene *transformer* controls sexual characteristics. Expression of *tra* in certain areas of the brain of a male can change his sexual orientation to that of a female. Ferveur *et al.* (p. 1555) expressed *tra* selectively in abdominal endocrine cells of *Drosophila*, the oenocytes, which changed the pheromone profile on the surface of the fly from that of a male (monoenes) to that of a female (dienes). These flies have normal male sexual orientation but elicited inappropriate courtship behavior from other males (as if they were female). These results emphasize the multifaceted nature of the genetic control of behavior.

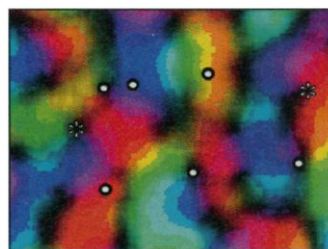
## Simpler solitons

In a nonlinear medium, solitary waves (or solitons) can propagate for long distances yet retain their shape. Conventional models of solitons are mathematically very complex, even more so when soliton interactions such as collisions are involved. Snyder and Mitchell (p. 1538; see the Perspective by Shen, p. 1520) report a model in which the complexity can be radically simplified. With this model, the authors offer a straightforward analysis of soliton collisions. Moreover, they suggest the possibility of a photonic switch in which light is controlled by light.

## Visual cortex connections

A central tenet of visual processing is that neurons in the primary visual cortex respond strongly to lines of a single orientation and weakly or not at all to lines of other orientations. The neurons are grouped by their preferred orientation in columns extending into the deeper cortex, and these columns appear to be arrayed circularly when viewed with optical imaging from above the cortical surface, yielding a pinwheel-like arrangement. The central parts of these pinwheels

revealed little orientation-specific activity, suggesting that nonselective neurons might exist. Maldonado *et al.* (p. 1551)



have combined optical imaging with multielectrode recordings to show that the orientation preferences of the columns do project faithfully into the center of the pinwheel, in much the same fashion as the spokes of a wheel meeting at the hub. How the connectivity and selective response of these central neurons are established and maintained still remain to be determined.

## Bird evolution

*Archaeopteryx* has been one of the key fossils in terms of understanding the early evolution and origin of birds, in part because the fossils are beautifully preserved and also contain dramatic feather imprints. Sanz *et al.* (p. 1543; see the news story by Morell, p. 1501) describe the fossil of a nestling bird from Spain that contains feather im-

prints but also provides a clear view of the neck and head. The fossil evidence and comparison with *Archaeopteryx* implies that the distinctive bird skull did not evolve until late in their evolution.

## Self avoidance

After a pollen grain lands on the flower's stigma, it takes up water and begins the growth process that leads eventually to a fertilized seed unless the pollen and flower are incompatible. Certain species of plants have a self-incompatibility system that ensures that pollen from the same flower cannot function, allowing pollen transported in from other flowers, with a new set of genes, to fertilize the flower. Thus, the problems caused by excessive inbreeding are kept to a minimum. Ikeda *et al.* (p. 1564) identified mutations in a protein, MOD, that can suppress self-incompatibility; MOD has features that suggest it may transport water across the cell membrane.

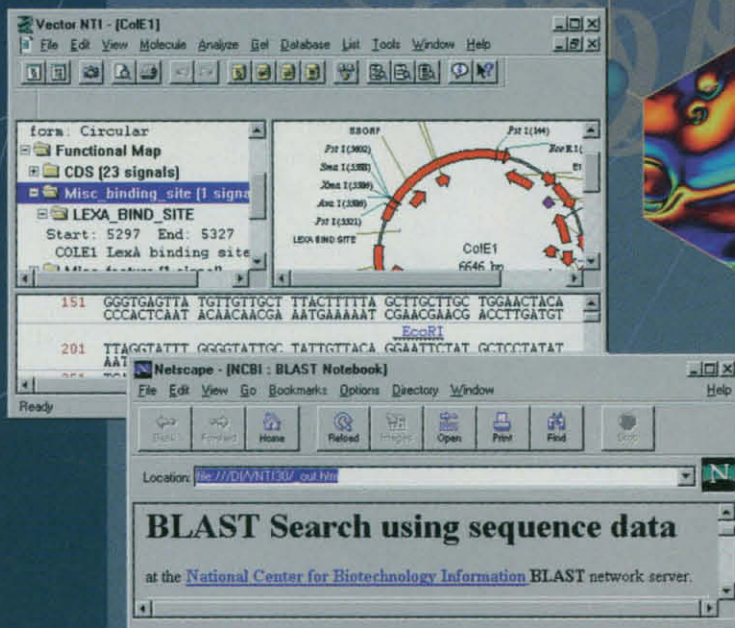
## Acid and plants

Agricultural productivity can be lower in excessively acidic soils, a problem that affects about 40 percent of arable land. Although treatment of the soil can help, another approach is to develop plants with greater tolerance. De la Fuente *et al.* (p. 1566; see the news story by Barinaga, p. 1497) have demonstrated that transgenic plants carrying a bacterial gene that supports overexpression and release of citric acid are more resistant to one of the problematic aspects of acidic soil—that of excess soluble aluminum.

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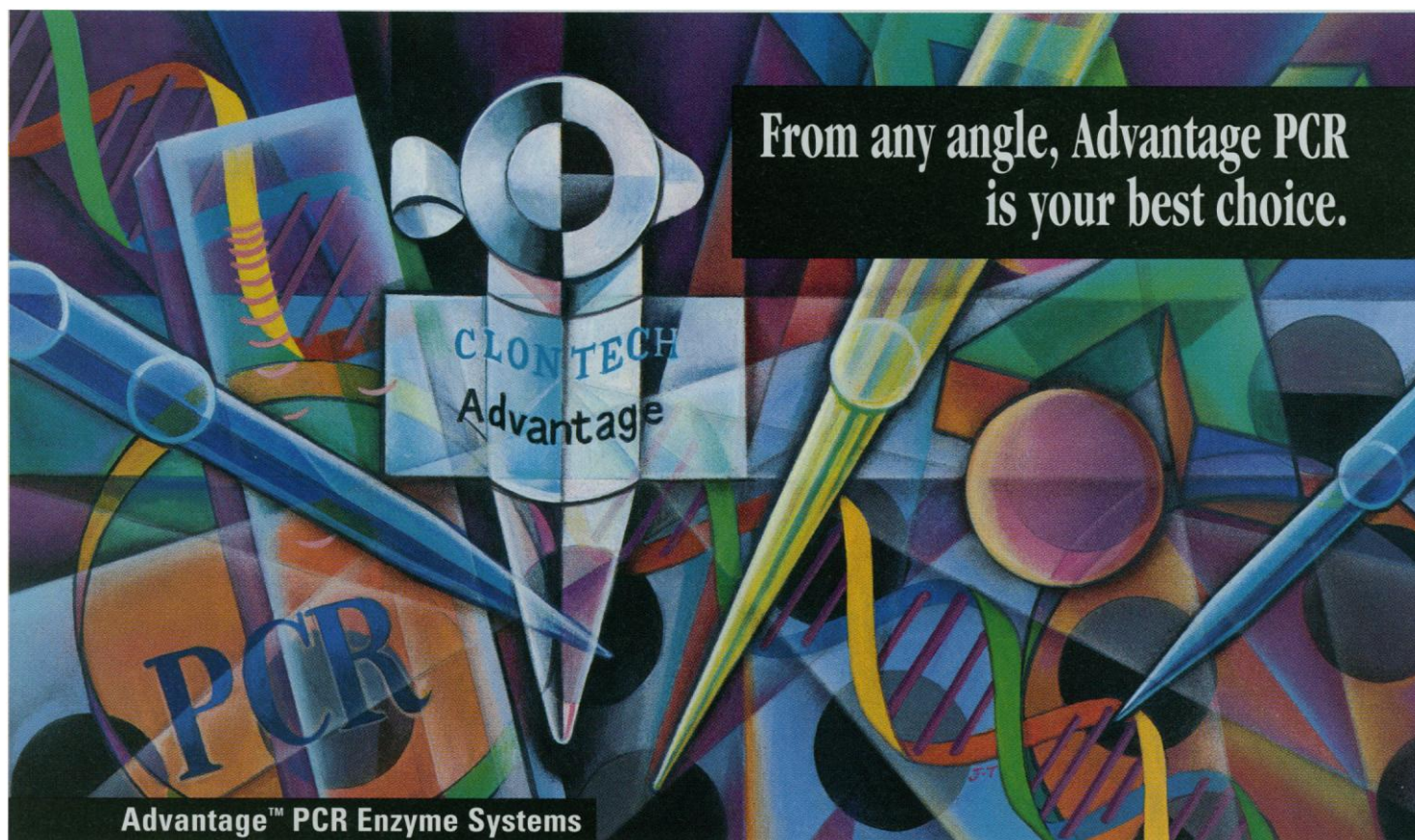
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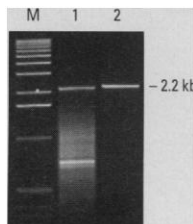
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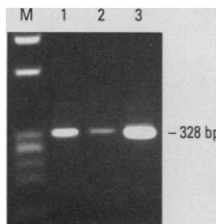


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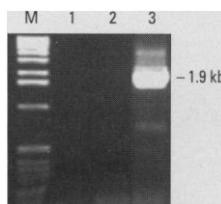
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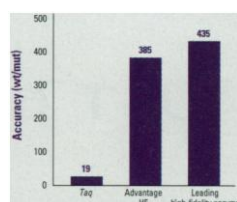
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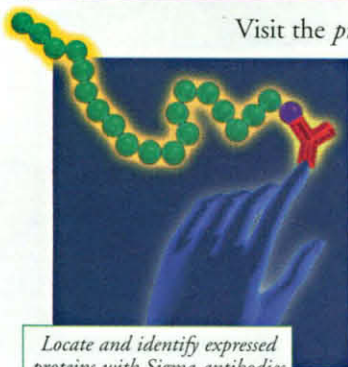
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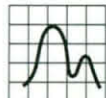
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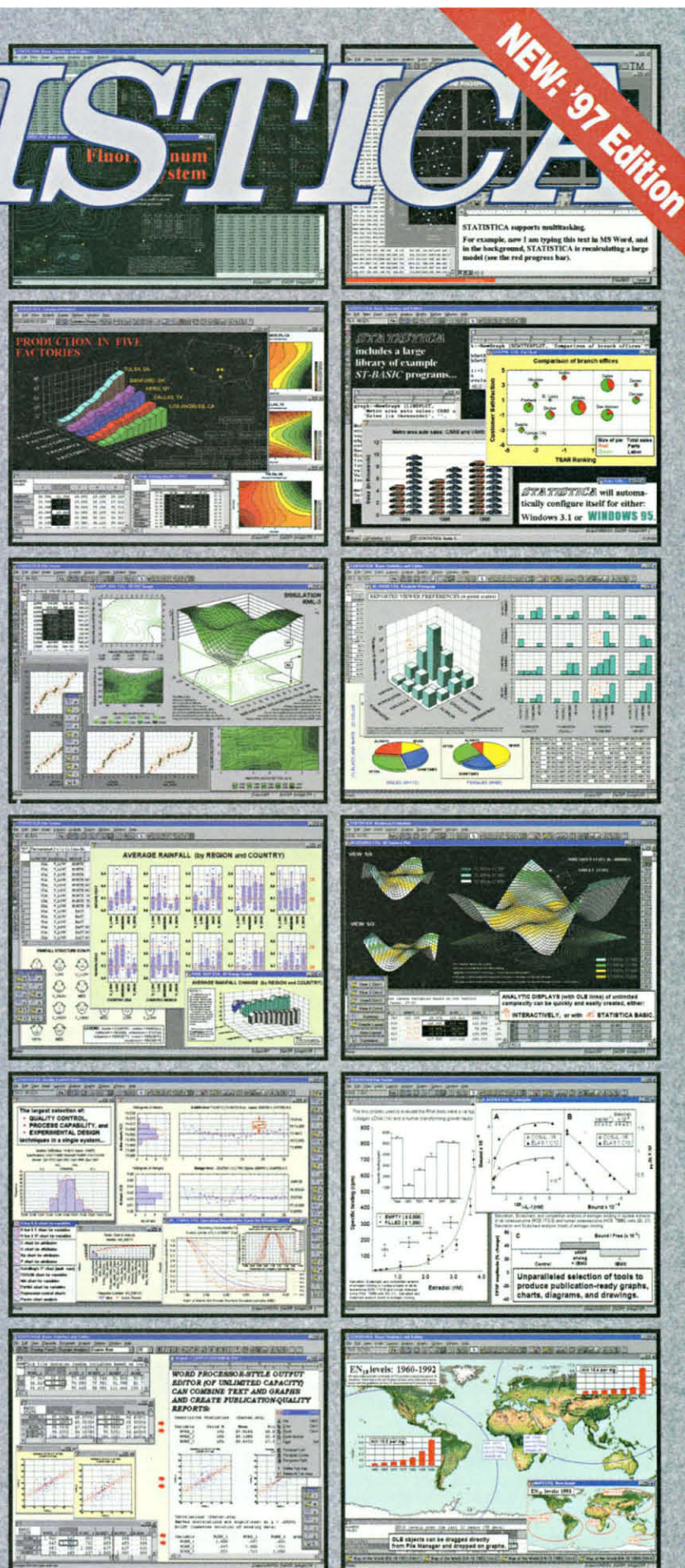
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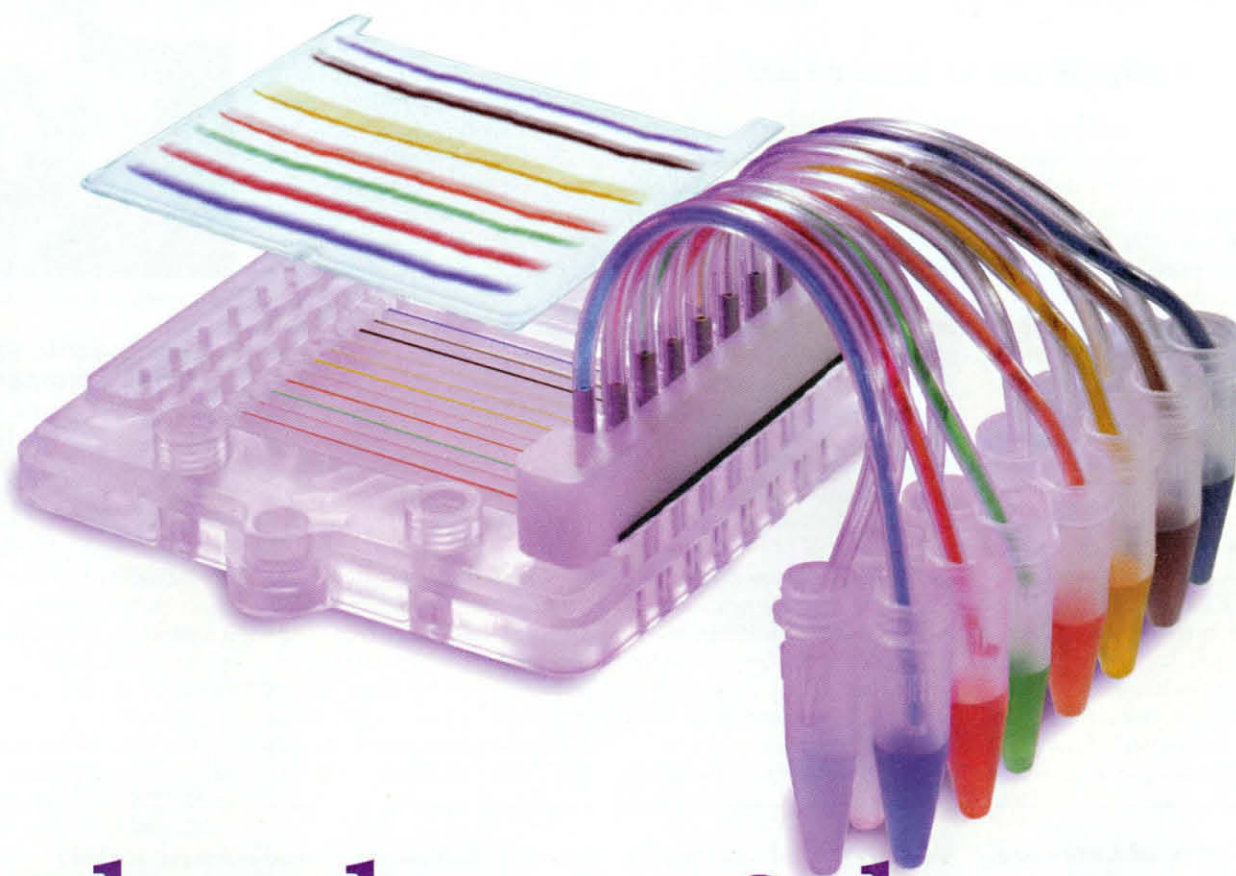
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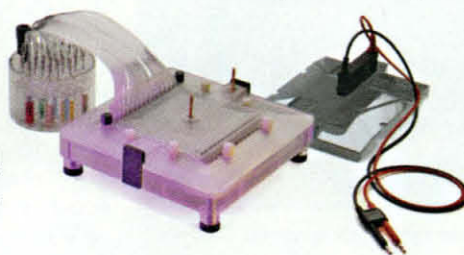
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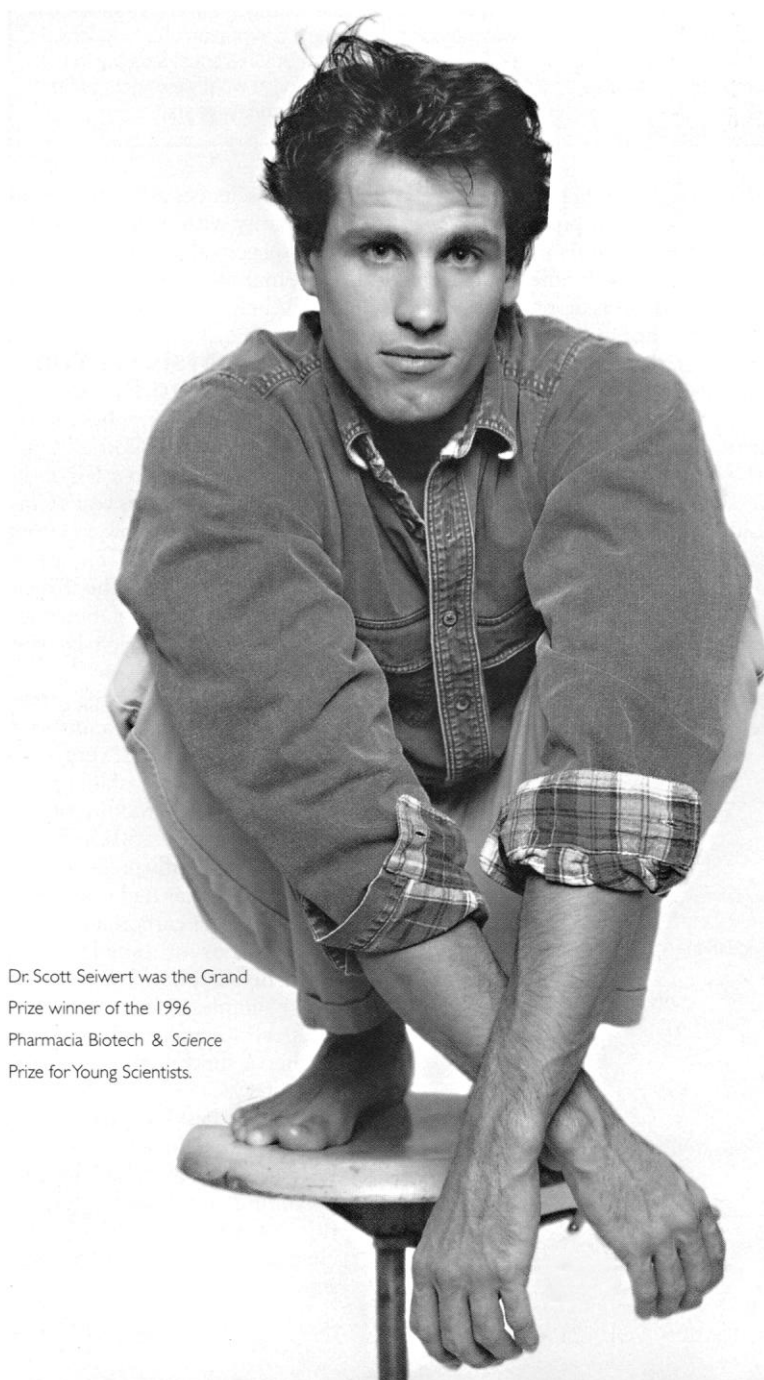
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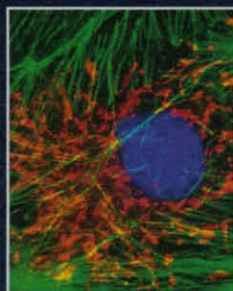
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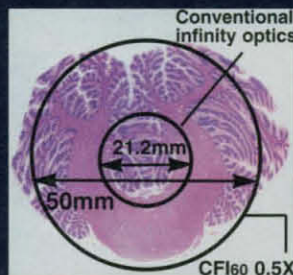
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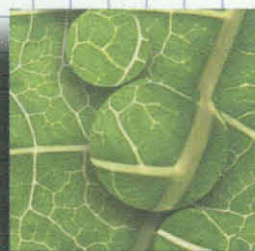
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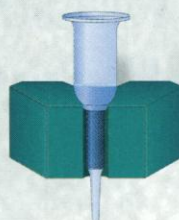
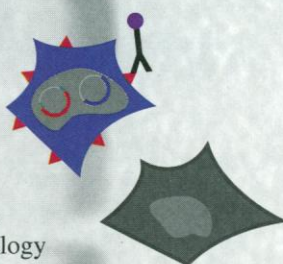
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- RNAs Selected in vitro by the HIV-2 Tat Protein: *Hyangshuk, R.; Rice, A.P. (Houston, Tex.)*
- Targeting to the HIV-1 RRE of the Influenza Virus NS1 Protein Effector Domain as a Potent, Specific Anti-HIV Agent: *Zhang, M.J.; Dayton, A.I. (Rockville, Md.)*
- Transcriptional Silencing of Retroviral Vectors: *Lund, A.H.; Duch, M.; Pedersen, F.S. (Aarhus)*
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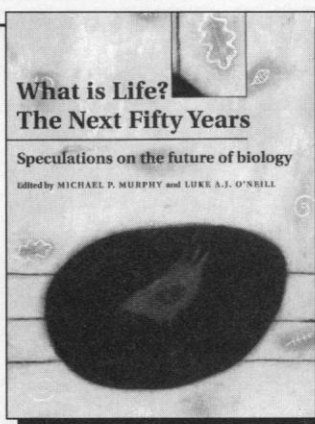
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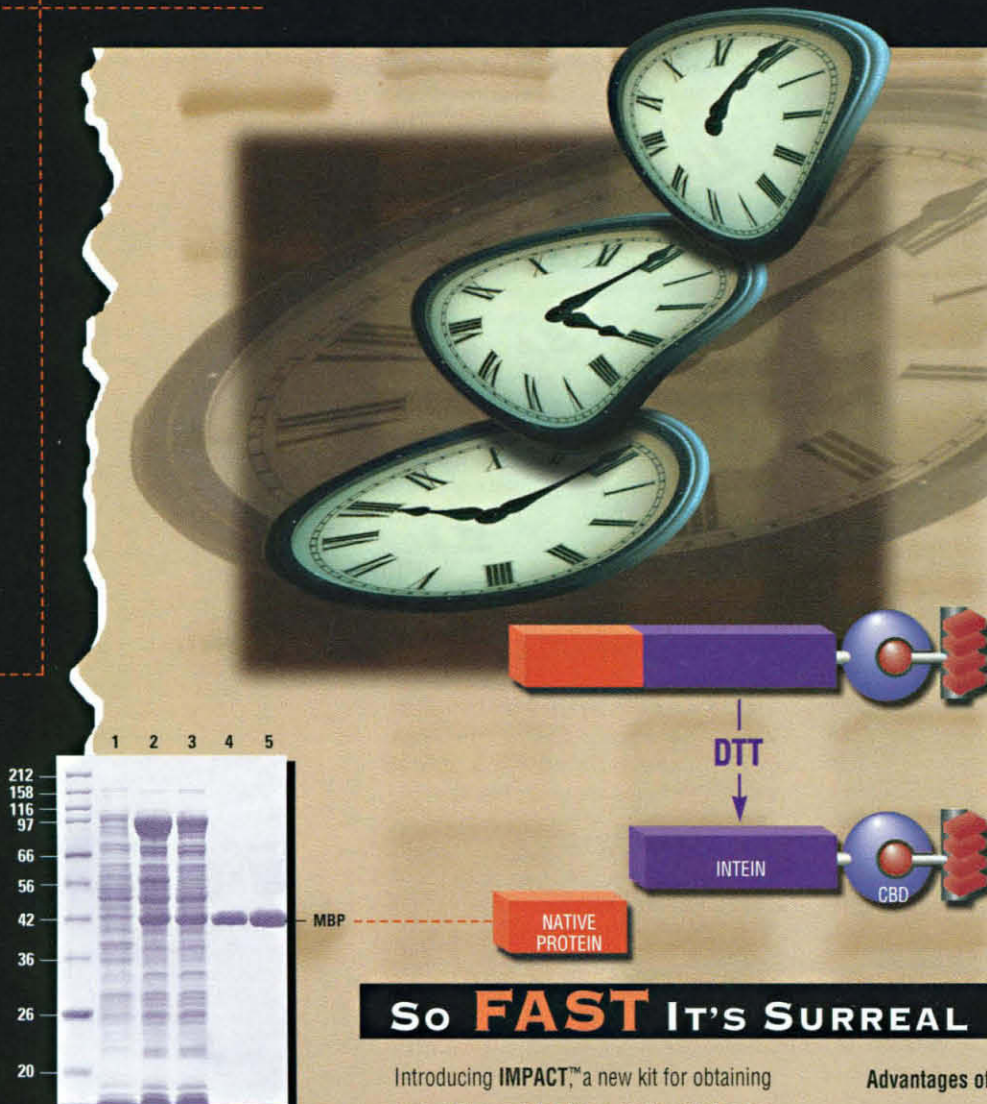
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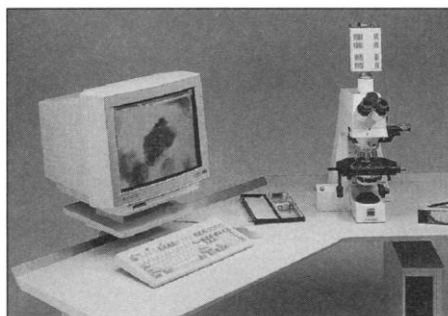
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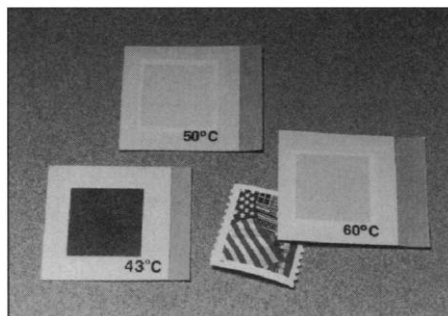
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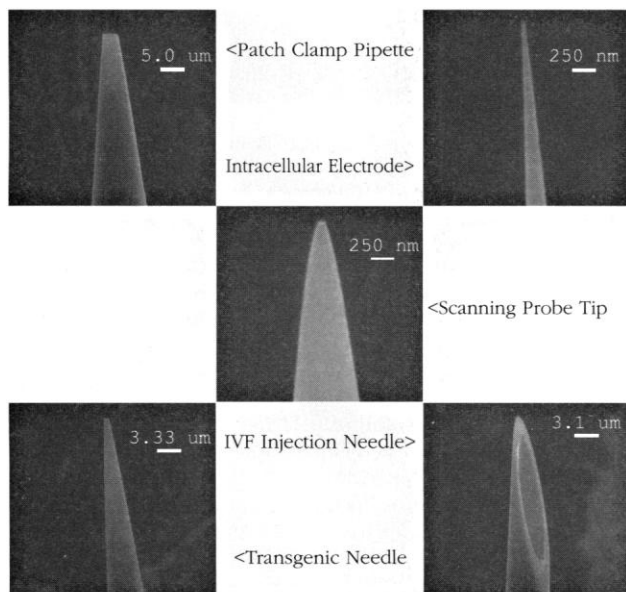
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 Wang, X. et al. *Cancer Research*, 54, 4726-28, 1994.  
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 Hoffman, R., J. *Cellular biochem*, 56, 1-4, 1994.

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