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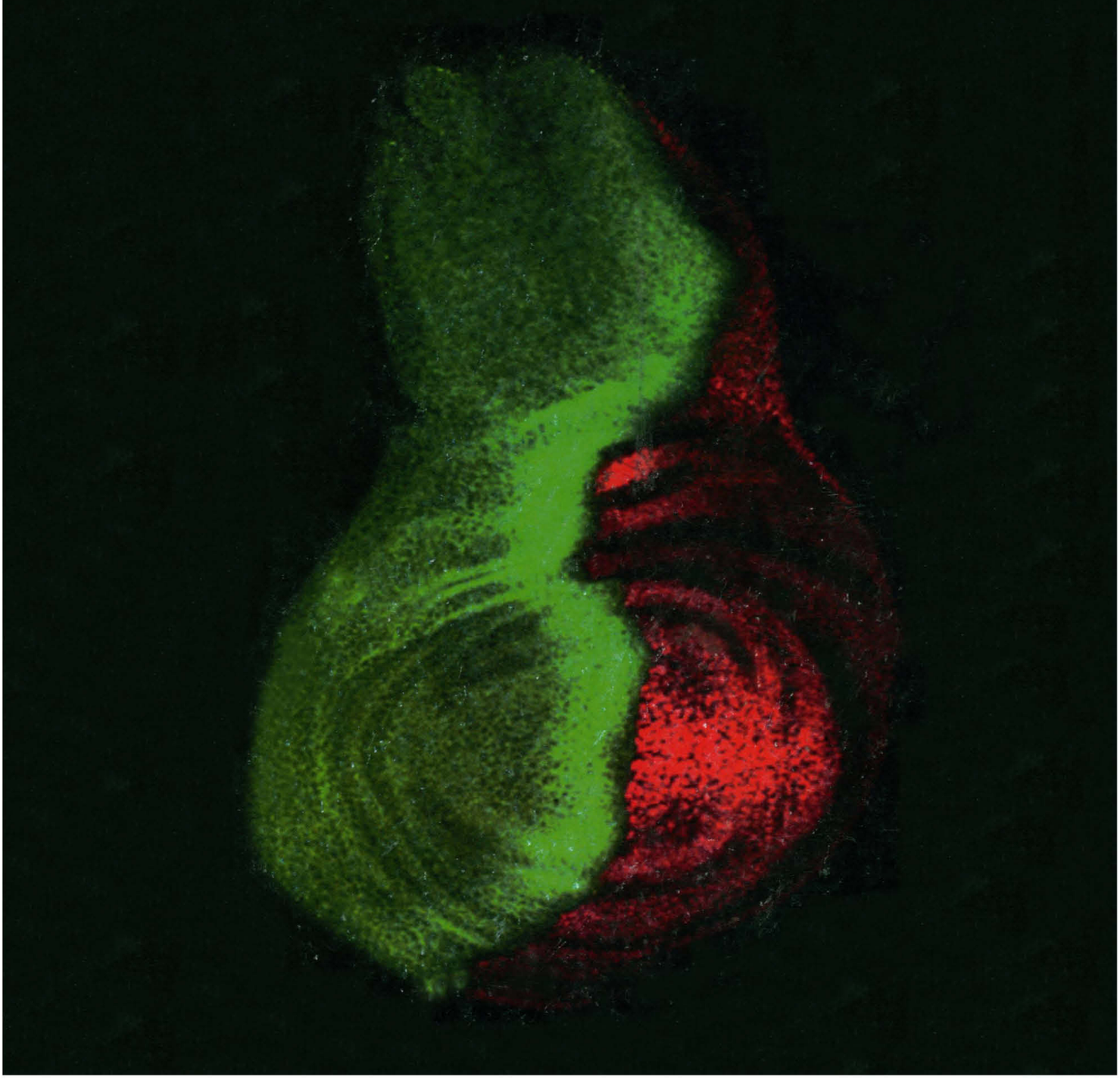

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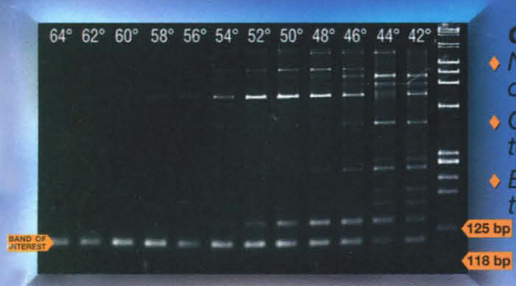

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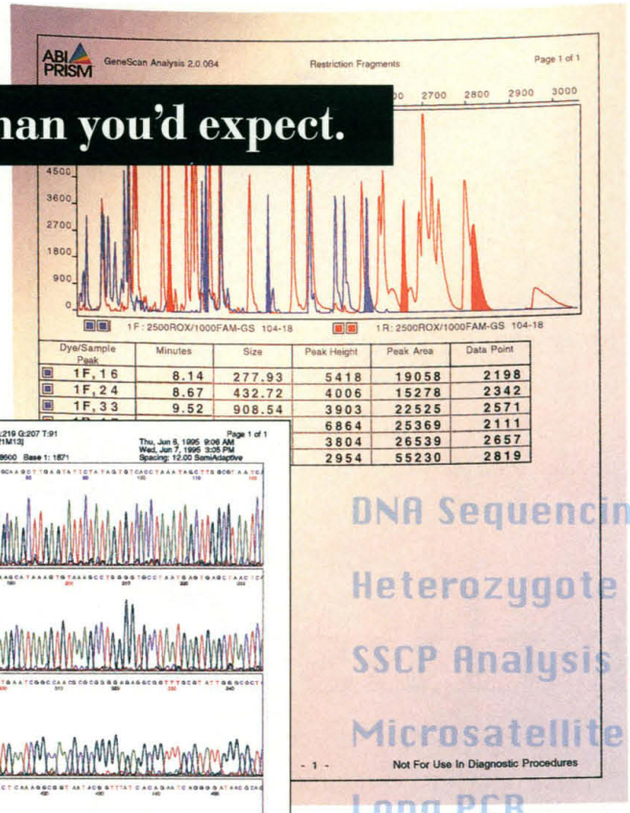

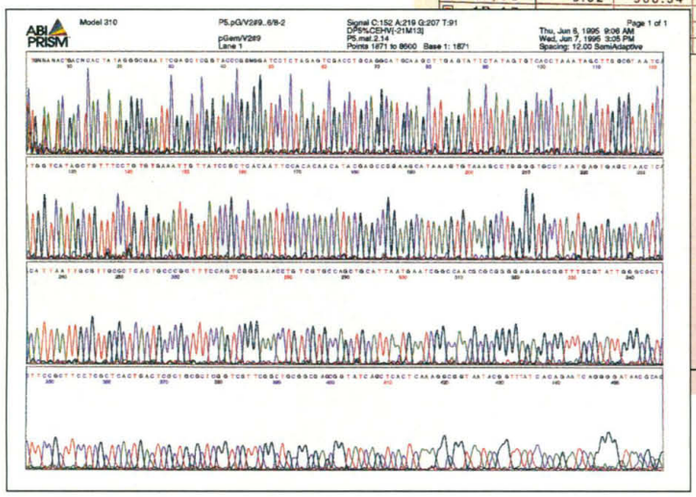

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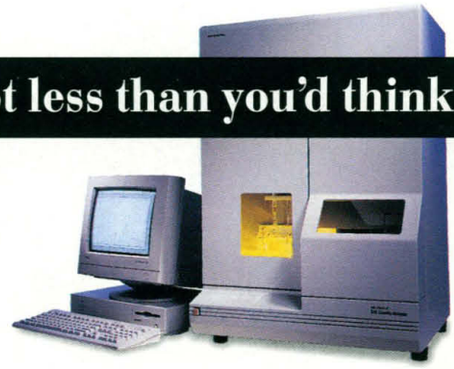

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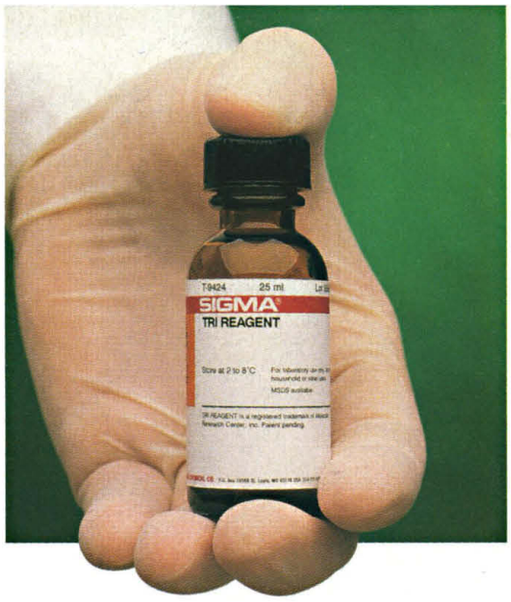

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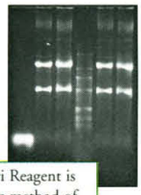

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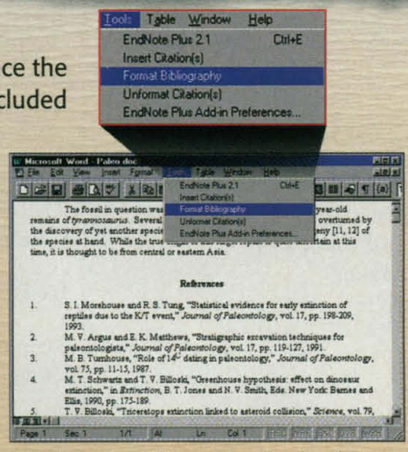

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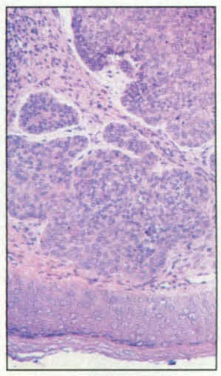

1583, 1621 & 1668
Developmental pathways and cancer

1626
Dusty plasmas

NEWS & COMMENT

DOE Labs: Is Evolution Enough? 1576
Small Labs Make Big Targets 1578

Ariane Failure Casts Shadow Over ESA's Science Program 1579

IVF Project Stirs Debate Over How to Preserve Pandas 1580

Civil War Leaves Once-Proud Georgian Science in Tatters 1581
Observatory Fades Away in Splendid Isolation 1582

RESEARCH NEWS

Gene Linked to Commonest Cancer 1583

Ice Bubbles Confirm Big Chill 1584

Simple Mice Test Antibody Complexity 1585

Did Neandertals Lose an Evolutionary "Arms" Race? 1586

Bose-Einstein Condensates Display Their First Tricks 1587

Galileo Suggests Deep Roots to Jupiter's Fierce Winds 1589

Distant Universe: Precocious Structures Found 1590

PERSPECTIVES

Nonequilibrium Structures in Condensed Systems 1596
A. S. Mikhailov and G. Ertl

Polar Clouds and Sulfate Aerosols 1597
M. A. Tolbert

Bacteria Also Vote 1598
D. Kaiser

Molybdenum Bolsters the Bioinorganic Brigade 1599
E. I. Stiefel

ARTICLE

Spatial Response of Mammals to Late Quaternary Environmental Fluctuations 1601
FAUNMAP Working Group: R. W. Graham, E. L. Lundelius Jr., M. A. Graham, E. K. Schroeder, R. S. Toomey III, E. Anderson, A. D. Barnosky, J. A. Burns, C. S. Churcher, D. K. Grayson, R. D. Guthrie, C. R. Harington, G. T. Jefferson, L. D. Martin, H. G. McDonald, R. E. Morlan, H. A. Semken Jr., S. D. Webb, L. Werdelin, M. C. Wilson

RESEARCH ARTICLES

Structural Analysis of Substrate Binding by the Molecular Chaperone Dnak 1606
X. Zhu, X. Zhao, W. F. Burkholder, A. Gragerov, C. M. Ogata, M. E. Gottesman, W. A. Hendrickson

DEPARTMENTS

THIS WEEK IN *SCIENCE* 1561

EDITORIAL 1567
Science Policy in Japan
H. Hayashida

LETTERS 1569
Respect for the RAC: E. Parens • Exhilarating Editorial: V. J. LiCata; C. Clark; N. Landau; W. C. Dewey • Nesting Dinosaur: A. Feduccia, L. D. Martin, J. E. Simmons • Benefit-Cost Analysis and the Environment: J. F. Kasting and P. A. Schultz; K. J. Arrow *et al.* • Loco Cow Logo: G. M. Zu Rhein

SCIENCESCOPE 1575

RANDOM SAMPLES 1591

BOOK REVIEWS 1594
The End of Science, reviewed by D. L. Goodstein • *Color and Light in Nature*, B. E. Schaefer • *Science in the Making*

PRODUCTS & MATERIALS 1675

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COVER

The *Drosophila* wing imaginal disc (~300 micrometers wide) is divided into two populations of cells: those expressing the signaling protein Hedgehog (Hh) (posterior, stained red) and those responsive to Hh (to the left). The zinc-finger protein Cubitus interruptus in anterior cells (stained green) maintains this difference between the populations by preventing the production of, and conferring competence to, the Hh signal. See page 1621 and the related report (page 1668) and News story (page 1583). [Image: M. Domínguez, M. Brunner, E. Hafen, and K. Basler]

Crystal Structure of DMSO Reductase: Redox-Linked Changes in Molybdopterin Coordination 1615
H. Schindelin, C. Kisker, J. Hilton, K. V. Rajagopalan, D. C. Rees

Sending and Receiving the Hedgehog Signal: Control by the *Drosophila* Gil Protein Cubitus interruptus 1621
M. Domínguez, M. Brunner, E. Hafen, K. Basler

REPORTS

Microscopic Particle Motions in Strongly Coupled Dusty Plasmas 1626
Lin I, W.-T. Juan, C.-H. Chiang, J. H. Chu

Electrical Properties of the Venus Surface from Bistatic Radar Observations 1628
G. H. Pettengill, P. G. Ford, R. A. Simpson

High-Resolution Molecular Spectroscopy of van der Waals Clusters in Liquid Helium Droplets 1631
M. Hartmann, R. E. Miller, J. P. Toennies, A. F. Vilesov

Direct pH Measurement of NaCl-Bearing Fluid with an in Situ Sensor at 400°C and 40 Megapascals 1634
K. Ding and W. E. Seyfried Jr.

Climate Change During the Last Deglaciation in Antarctica 1636
P. A. Mayewski, M. S. Twickler, S. I. Whitlow, L. D. Meeker, Q. Yang, J. Thomas, K. Kreutz, P. M. Grootes, D. L. Morse, E. J. Steig, E. D. Waddington, E. S. Saltzman, P.-Y. Whung, K. C. Taylor

Melting of $H_2SO_4 \cdot 4H_2O$ Particles upon Cooling: Implications for Polar Stratospheric Clouds 1638
T. Koop and K. S. Carslaw

Compensatory *ahp*C Gene Expression in Isoniazid-Resistant *Mycobacterium tuberculosis* 1641
D. R. Sherman, K. Mdluli, M. J. Hickey, T. M. Arain, S. L. Morris, C. E. Barry III, C. K. Stover

Arrested DNA Replication in *Xenopus* and Release by *Escherichia coli* Mutagenesis Proteins 1644
N. Oda, J. D. Levin, A. Y. Spoonde, E. G. Frank, A. S. Levine, R. Woodgate, E. J. Ackerman

Thymine-Thymine Dimer Bypass by Yeast DNA Polymerase ζ 1646
J. R. Nelson, C. W. Lawrence, D. C. Hinkle

A Quasi-Monoclonal Mouse 1649
M. Cascalho, A. Ma, S. Lee, L. Masat, M. Wabl

Identification of MAP Kinase Domains by Redirecting Stress Signals into Growth Factor Responses 1652
A. Brunet and J. Pouysségur

Enzymatic Synthesis of a Quorum-Sensing Autoinducer Through Use of Defined Substrates 1655
M. I. Moré, L. D. Finger, J. L. Stryker, C. Fuqua, A. Eberhard, S. C. Winans

Site-Directed Hydroxyl Radical Probing of the rRNA Neighborhood of Ribosomal Protein S5 1659
G. M. Heilek and H. F. Noller

Activation of Gal4p by Galactose-Dependent Interaction of Galactokinase and Gal80p 1662
F. T. Zenke, R. Engels, V. Vollenbroich, J. Meyer, C. P. Hollenberg, K. D. Breunig

Optical Imaging of Functional Organization in the Monkey Inferotemporal Cortex 1665
G. Wang, K. Tanaka, M. Tanifuji

Human Homolog of *patched*, a Candidate Gene for the Basal Cell Nevus Syndrome 1668
R. L. Johnson, A. L. Rothman, J. Xie, L. V. Goodrich, J. W. Bare, J. M. Bonifas, A. G. Quinn, R. M. Myers, D. R. Cox, E. H. Epstein Jr., M. P. Scott

TECHNICAL COMMENTS

Is EIAV Tat Protein a Homeodomain? 1672
P. Rösch and D. Willbold

1665
The moving image

Indicates accompanying feature

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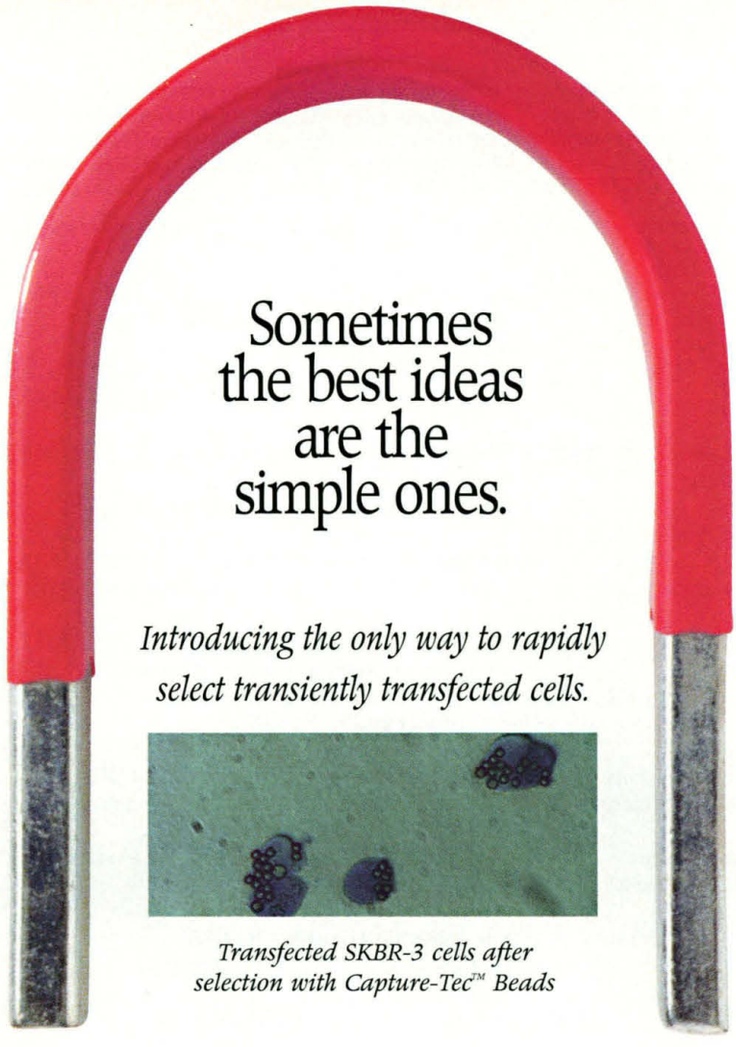

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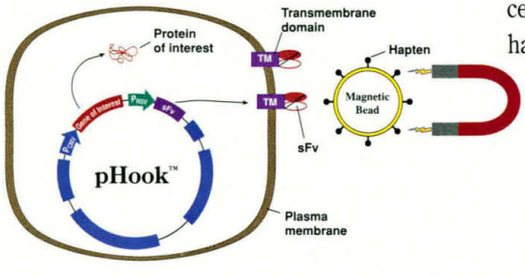

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Went their own way

When climate change affects an ecosystem, do biological ties within a community prevail over this external pressure on the system? Graham *et al.* (p. 1601) used a large database from the United States to address these questions by examining the response of mammals to the warming since the last glaciation. During periods of a few thousand years, ranges of species shifted in different directions and at different rates. Thus coherent mammalian ecosystems were not maintained.

Supercritical pH

Measuring properties of supercritical fluids has been difficult in both geology and engineering. Ding and Seyfried (p. 1634) now describe and apply an in situ pH sensor for supercritical fluids in experiments. Their electrochemical cell contains a yttrium-doped zirconia membrane and Ag/AgCl reference electrode. Measurements of the pH of NaCl-HCl bearing fluids at 400°C and 4 megapascals shows good agreement with theoretical predictions.

Cool molecules

Vibrational and rotational spectra of complex molecules are made even more complex by the population of numerous excited states. Cooling the molecules can simplify the spectra by bringing the levels near the ground states. Hartmann *et al.* (p. 1631) have isolated molecules and small molecular clusters in ultracold liquid helium droplets, and resolved their vibrational and rotational structure. Superfluidity of the helium droplets is indicated by the quasi-free rotation of the nonspherical clusters within the droplets.

A *patched* path to cancer

Little has been known about the genes involved in the pathogenesis of basal cell carcinoma (BCC), the most common human cancer. The majority of BCCs develop sporadically during middle age, but patients with an inherited disorder called basal cell nevus syndrome (BCNS) develop BCCs at high frequency at an early age. Johnson *et al.* (p. 1668; see the news story by Pennisi, p. 1583) identified the gene responsible for BCNS—and most likely for a subset of sporadic BCCs—as the human homolog of the gene *patched*. In fruit flies, *patched* codes for a transmembrane protein that downregulates expression of certain growth factor genes and that is required for normal pattern formation during development. Patients with BCNS also suffer from a variety of developmental abnormalities, suggesting that the role of *patched* is evolutionarily conserved.

Losing inhibitions

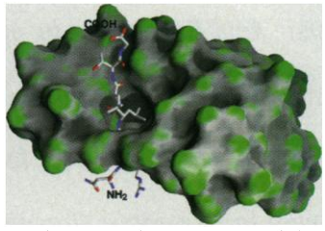
The yeast Gal4p protein is a key regulator of galactose metabolism. Gal4p activity is inhibited by Gal80p. This inhibition is relieved in the presence of galactose, but the mechanism has been unclear. Zenke *et al.* (p. 1662) found that galactokinase, the first enzyme of galactose metabolism, interacts with the inhibitor Gal80p in the presence of galactose to form a Gal80p-Gal1p complex, which prevents Gal80p from inhibiting Gal4p.

Worth repairing

When damage to a cellular DNA is catastrophic, the best response may be apoptosis or death to that particular cell, but what if the DNA damage is something less than catastrophic but perhaps unrepairable? Oda *et al.* (p. 1644) found that replication of DNA molecules with even minimal damage is arrested in some eukaryotic cells. This arrest can be bypassed by certain prokaryotic mutagenesis proteins. Some eukaryotic cell types may have a similar system to bypass a limited number of unrepairable DNA lesions.

Neatly folded

Proteins may unfold or fold improperly in cells under stress. Molecular chaperones of the 70-kilodalton heat-shock protein (hsp70) family assist folding by binding to the aggregation-prone protein segments that become unsuitably exposed. Zhu *et al.* (p. 1607) describe crystal structures of the substrate-binding unit from DnaK, the bacterial hsp70, in a complex with a peptide substrate. The peptide is encapsulated in a channel through DnaK, and it appears that an adenosine triphosphate–driven change of conformation promotes the substrate exchange required to control proper folding.



The A list

In *Drosophila*, the appendages develop from imaginal discs, which are composed of two distinct cell populations known as the anterior (A) and posterior (P) compartments. Cells in the P compartment express *engrailed* (*en*), which is necessary for establishing P cell identity. Domínguez *et al.* (p. 1621) found that A cell identity is not determined simply by a lack of *en* expression but also requires the expression of the zinc finger protein Cubitus interruptus (Ci). Because *ci* loss-of-function mutations are embryonic lethal, they studied the role of Ci in genetic mosaics. Expression of Ci in A cells is required to limit the expression of the signaling molecule Hedgehog (Hh) to cells of the P compartment and that *ci* confers competence to respond to Hh by activating *decapentaplegic* expression. Thus *ci* plays a role in establishing the AP boundary.

About face

The visual system executes a complex parsing of our visual world into features that then are recombined into shapes and objects and colors, leading to perception. Neurons with similar response properties are usually grouped in columns perpendicular to the surface of the cerebral cortex. Wang *et al.* (p. 1665) used optical imaging and unit recordings to find a similar organization of cells in the monkey inferotemporal cortex, one of the late stages of the visual pathway that is specialized for object recognition. In a series of presentations of faces, rotated from a left-profile to right, the location of active neurons shifted systematically within this cortical region.

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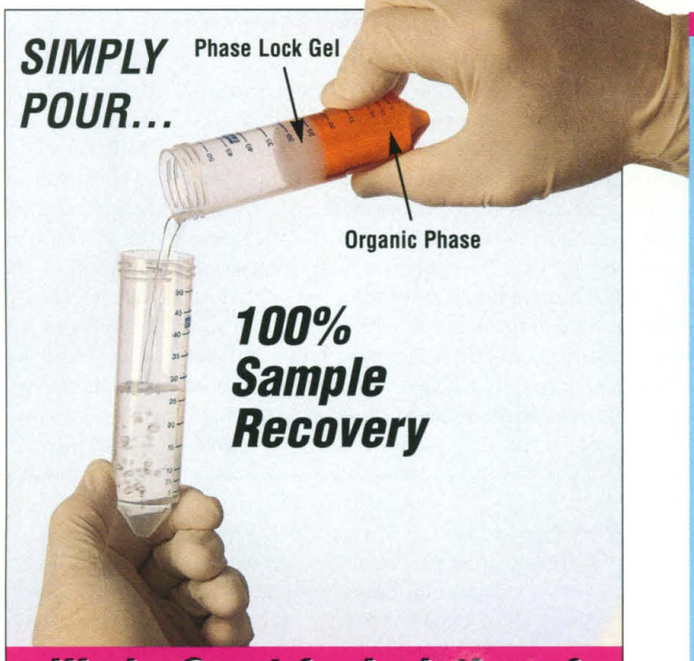

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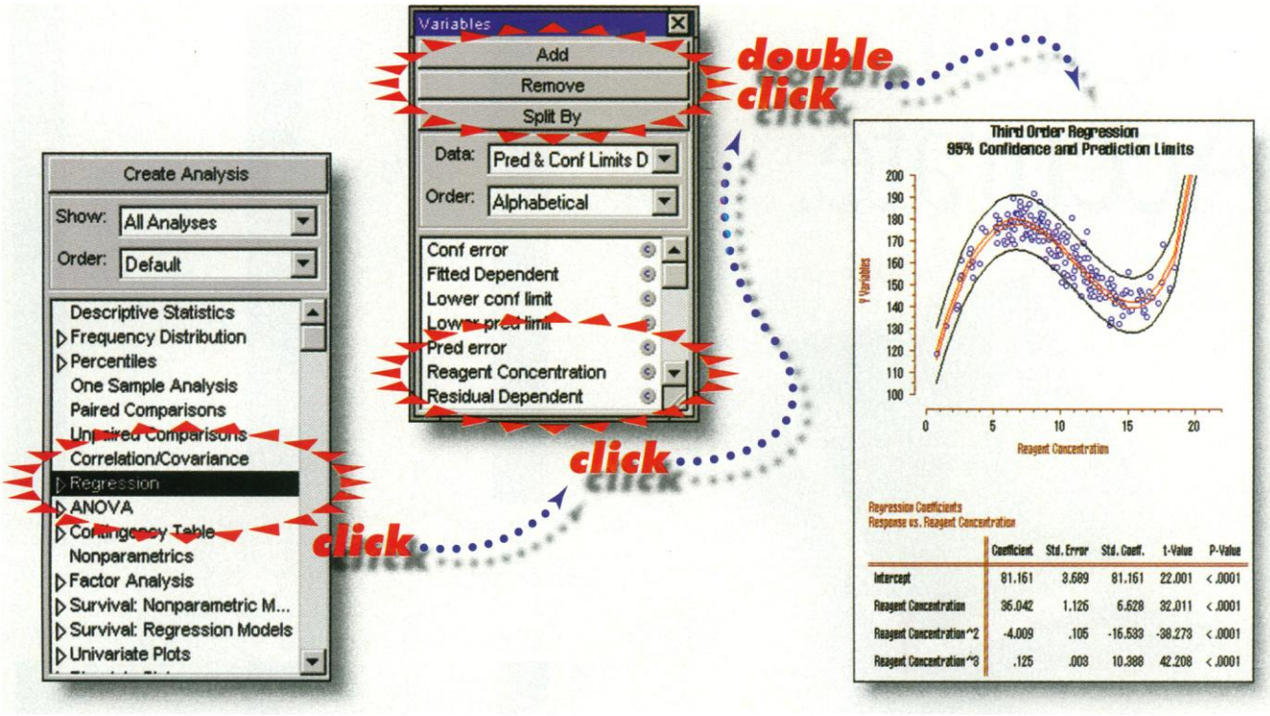

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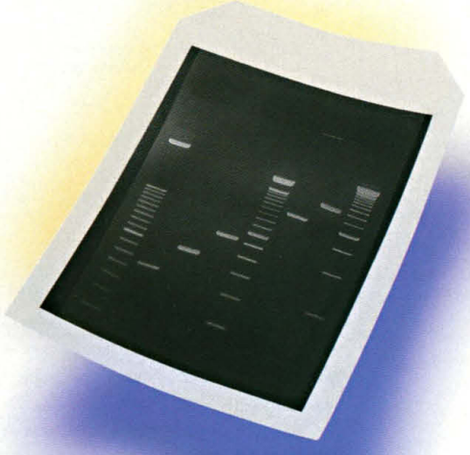

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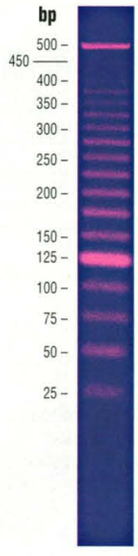

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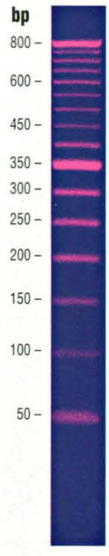

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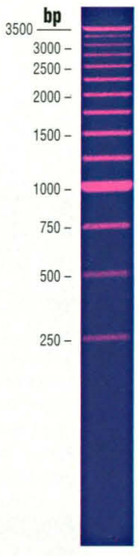

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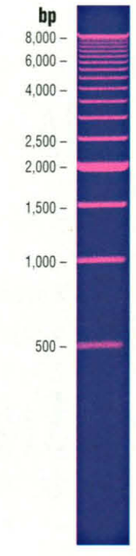

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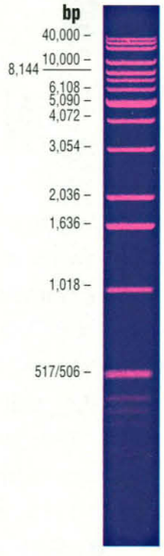

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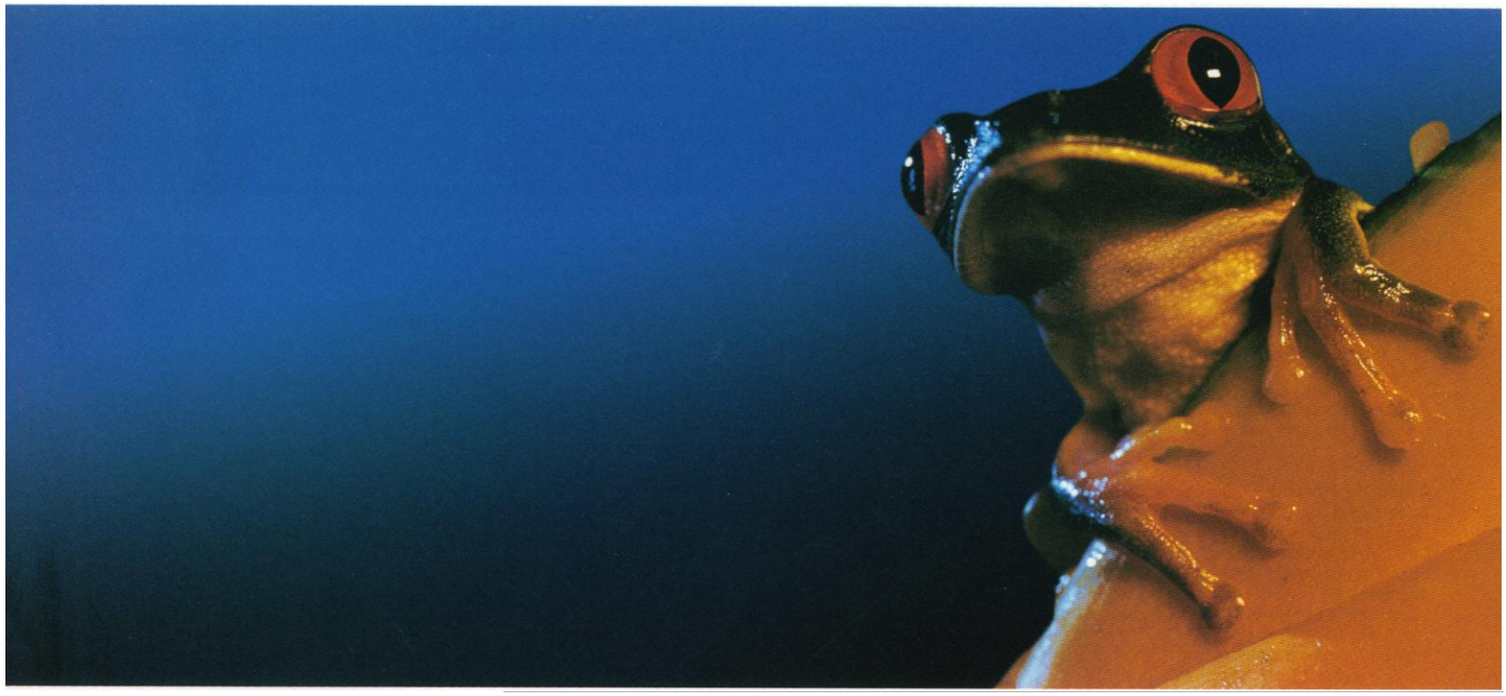

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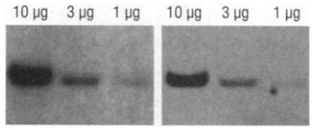

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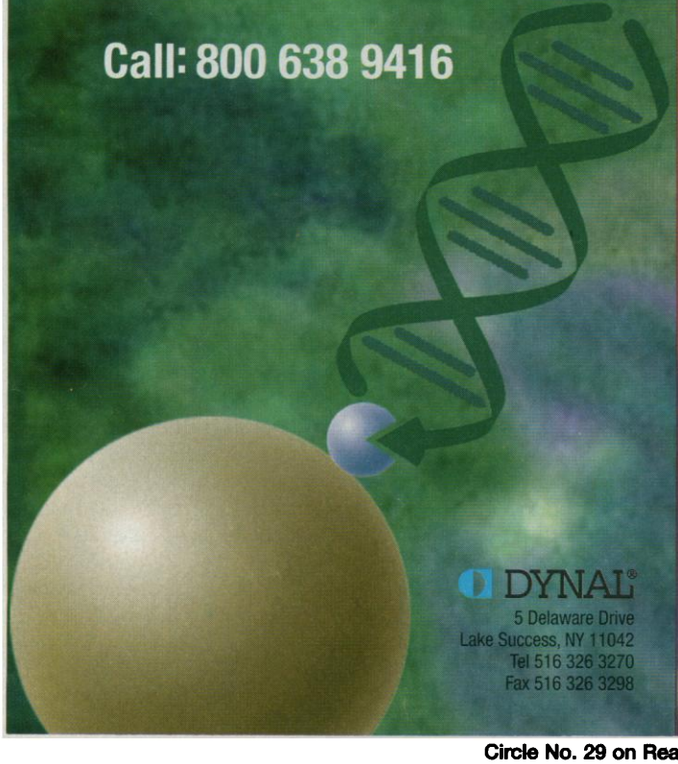

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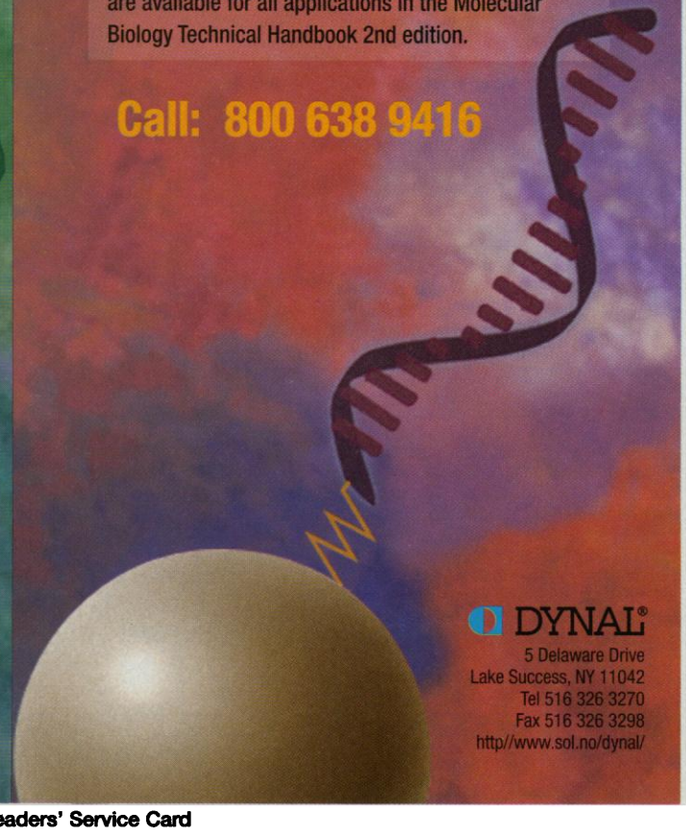

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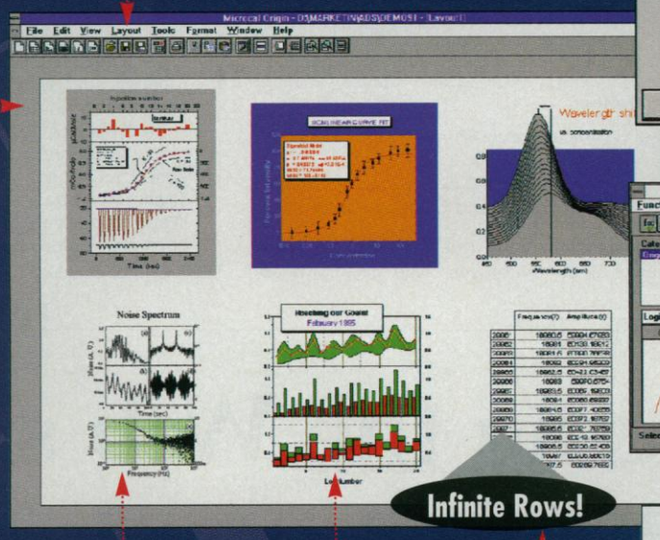

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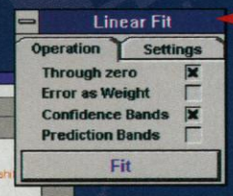

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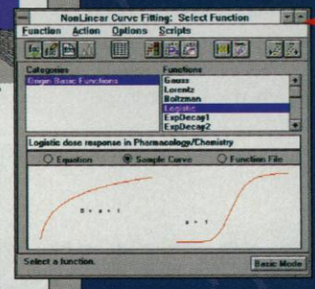

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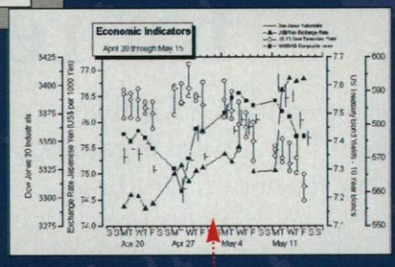

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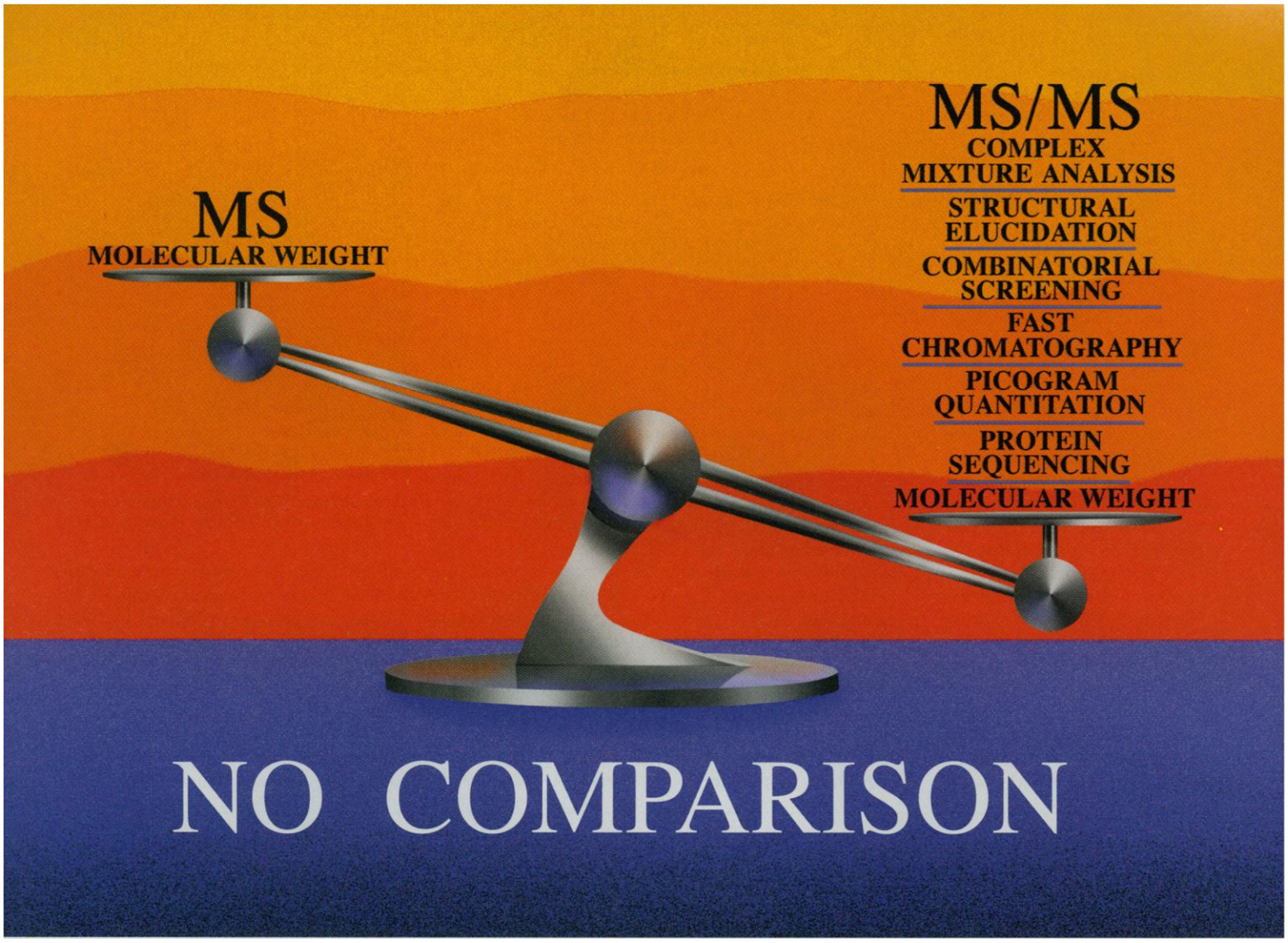

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