American Association for the Advancement of Science

Science

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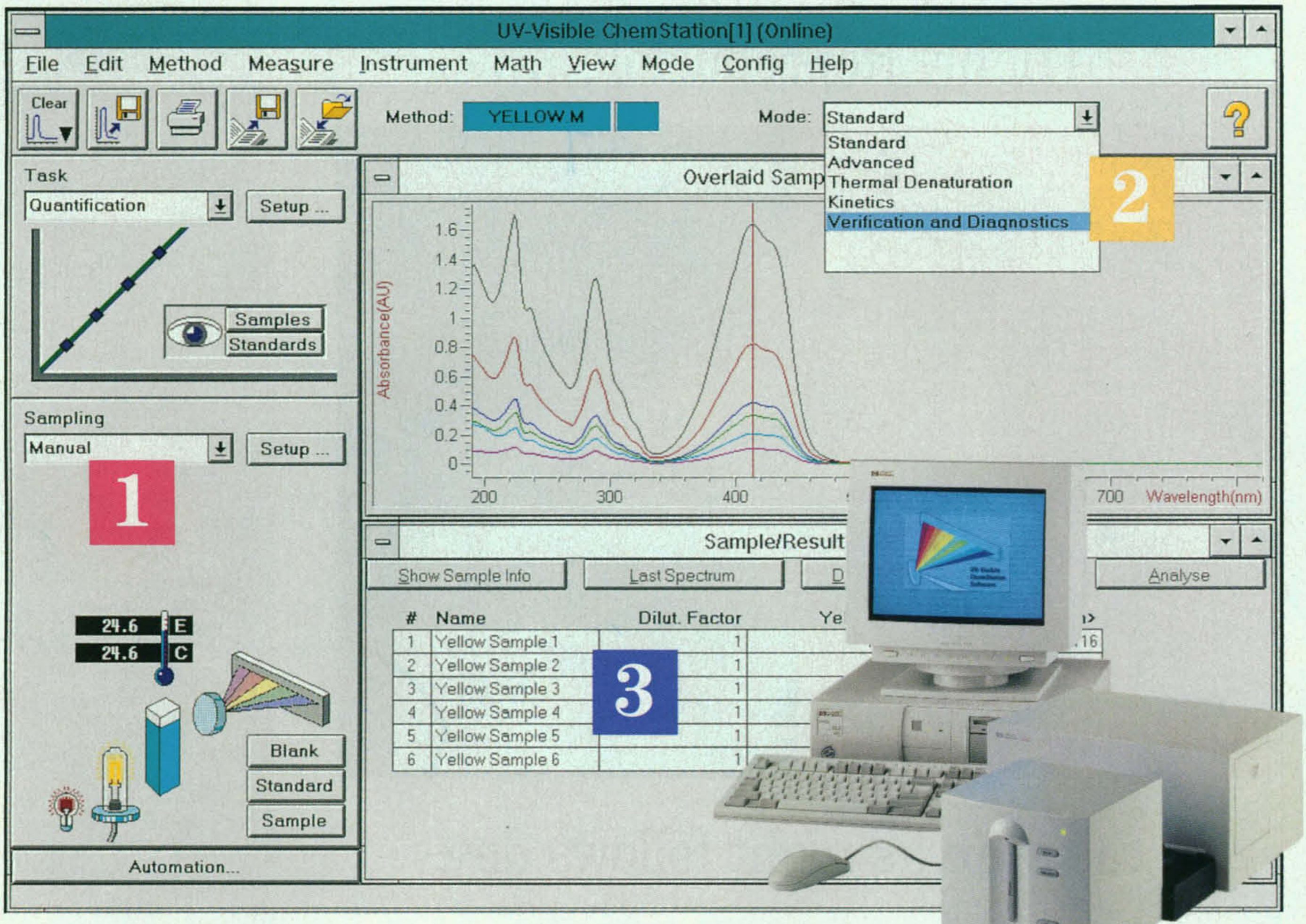
BOOK ISSUE

Using our new UV-Vis system is easy as one, two, three.



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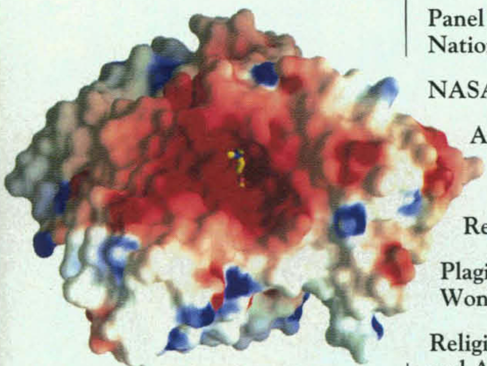

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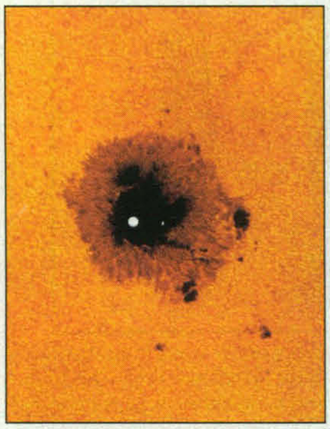
Charging ahead



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Solar steam

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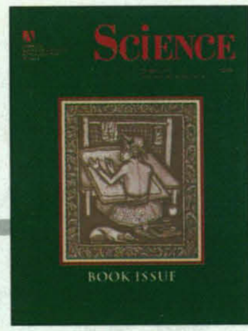

Self-portrait by the Balinese painter I. Madé Djata (around 1938), from Hildred Geertz's book *Images of Power*, reviewed on page 1218. Botanical art, German rocketry, discoveries of the Challenger expedition, and galactic photography are among the subjects of books treated in this special issue, beginning on page 1196. A listing of publishers' addresses and an index of books reviewed in the past year are also included. [Note: The graphic devices that separate the groups of reviews are details from an illustration in *Images of Power*]

TECHNICAL COMMENTS

SPECIAL BOOK SECTION

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Cracking under stress

◩ **Indicates accompanying feature**

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edited by DAVID LINDLEY

Hot water

The photosphere of the sun is too hot for molecular water to exist, but Wallace *et al.* (p. 1155) have found spectral evidence for water in the infrared bands recorded from the relatively cool environment of sunspot umbrae. At 3500 kelvin, the umbrae are just cool enough for water rather than OH to be the dominant oxygen-containing molecule.

Layer by layer

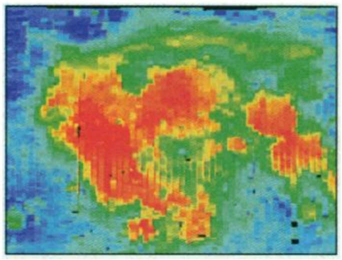
The mechanism of high temperature superconductivity in the cuprate oxides remains obscure. Anderson (p. 1154) observes that the far-infrared reflectivity of lanthanum-strontium cuprate shows anomalies if the superconductivity is viewed via a Fermi liquid model with Bardeen-Cooper-Schriffer interactions. But if the data are interpreted with a model where the pair condensation energy comes from interlayer Josephson coupling, determinations can be made of the electron coherence length and penetration depth that agree with experiment.

Sleep learning

Artificial neural networks are typically constructed from connected layers of neurons. Hinton *et al.* (p. 1158) describe an architecture with two parallel systems of connections: A bottom-up system converts input data into a network representation, while a top-down path generates "fantasy" input from representations in higher layers. The system runs in either a "wake" phase, in which generative connections are adjusted in accordance with a recognition task, or a "sleep" phase, in which the fantasy inputs are used to adjust the recognition connections.

Ironing out the moon's origin

The moon's composition, particularly its iron and aluminum contents, offers important clues to its origin. Apart from the significant but limited Apollo samples, most information derives from remote sensing. Interpretation is complicated because lunar reflectivity depends not only on the Fe content, but on processes such as solar wind exposure and physical changes associated with soil formation. Using laboratory studies of these effects, Lucey *et al.* (p. 1150) derived an empirical relation that yields Fe content from reflectance. Analyzing Clementine data, they find that the abundance of anorthosite—a rock rich in Al and poor in Fe—is much greater than previously thought. Overall, the moon is poorer in Fe and richer in refractory elements than was suspected. Together these data support the notion that the moon is the product of a giant impact into an early Earth.



Chlorine to go

Some microorganisms are capable of treating and degrading industrial wastes before they are released to the environment, but certain compounds, such as highly halogenated organic compounds, are often bioremediated very slowly, if at all. Sorokin *et al.* (p. 1163) show that 2,4,6-trichlorophenol, a byproduct of paper production, can be efficiently oxidized to biodegradable products by hydrogen peroxide and an easily accessible biomimetic catalyst, iron sulfophthalocyanine.

Proteins that bind (I)

Many RNA-binding proteins in eukaryotes recognize uridine-rich regions known as polypyrimidine tracts, which are located upstream of 3' splice sites. Singh *et al.* (p. 1173) define the binding sequence preferences of three RNA-binding proteins: $U2AF^{65}$, an essential splicing factor; Sex-lethal, a splicing regulator; and polypyrimidine tract–binding protein (PTB). Each of these proteins has distinct RNA sequence binding preferences, and it appears that PTB can regulate alternative splicings by repressing the use of certain 3' splice sites that contain a PTB binding site.

Proteins that bind (II)

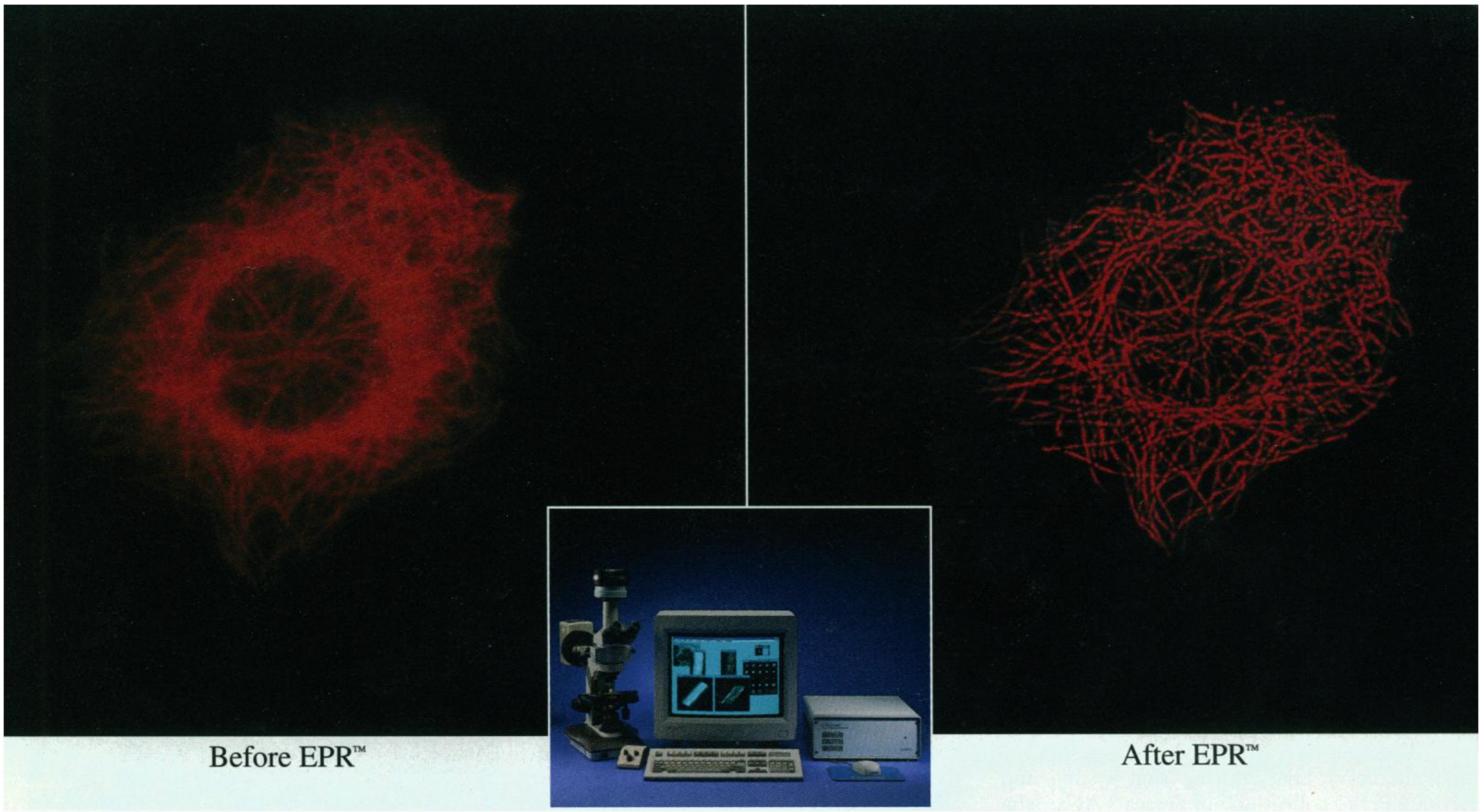
Tyrosine-phosphorylated proteins, generated by the activity of tyrosine kinases and subsequently assembled into signaling complexes, are essential to the signaling process initiated by growth factors and oncogenes. Both the Src homology 2 (SH2) domain and the more recently identified phosphotyrosine binding (PTB) domain bind to tyrosine-phosphorylated proteins, but Kavanaugh *et al.* (p. 1177) have now shown that the PTB domains bind to different targets than the SH2 domains; PTB domains recognize an amino acid motif that the SH2 domain passes over. The additional requirement of a specific secondary structure for high-affinity binding may offer new regulatory signaling pathways.

Paternity suite

Human evolutionary history may be discernible from sequence analysis of the paternally inherited Y chromosome, depending on its polymorphism. Dorit *et al.* (p. 1183; see also Perspective by Pääbo, p. 1141) obtained sequences of an identifiable 729–base pair intron of the Y chromosome from 38 men of varied geographical origin, and found no polymorphism: All the sequences were identical. The corresponding regions in chimpanzees, gorillas, and orangutans do show quantifiable sequence variability, ruling out functional constraints on this intron sequence as an explanation for human monomorphism. If recent common ancestry is the reason for this lack of variation, a divergence date of 270,000 years ago is indicated.

Unhelpful helpers

In insulin-dependent diabetes mellitus, an autoimmune disease, insulin production in the pancreas is destroyed by the action of a disparate population of leukocytes, including $CD4^+$ T cells as well as many other types. Katz *et al.* (p. 1185) have investigated the idea, partially supported by some mouse experiments, that of the two broad types of $CD4^+$ cells, T helper 1 (T_H1) cells promote this kind of diabetes, while T_H2 cells protect against it. Helper cells of the specific subsets were generated that expressed a T cell receptor known to cause diabetes. When introduced into mice susceptible to diabetes, both kinds of T helper cells invaded the islets of Langerhans, but only the T_H1 cells induced a damaging autoimmune response. The T_H2 cells neither affected the course of diabetes nor protected against T_H1-induced damage.



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Above: Normal Rat Kidney cell with a rhodamine label against tubulin. Images acquired by Douglas Bowman of the UMass Medical School using a conventional fluorescence microscope.

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General Guidelines

Accepted posters will be assigned a 4'x 8' space. Authors will be required to be present for a designated 2-hour period. Posters may be presented in one of five (see categories below) poster sessions at AMSIE'96. An individual may be senior author on only one poster in a session and may present only one poster per day.

Categories for Poster Sessions At AMSIE'96

Science Innovation — Focuses on new and emerging technologies and methodologies for research in molecular biology, physiology, computer science and medicine. Topics include (but not limited to) molecular genetics, the genome, molecular sequencing, clinical applications of immunology, tissue engineering, gene therapy, networks and complex systems, optics, microscopy, imaging, cardiology, neurobiology, single atom technologies, and stuructural biology.

Life and Physical Sciences — Encompasses life science (including medicine, environment, physiology, biology, etc.); physical science (physics, mathematics, chemistry, geology, etc) and engineering or industrial science.

Social Sciences and Education — A general session that includes all areas of social science and education.

DelMarVa Region — Research activities at laboratories, universities, and colleges in the mid-Atlantic region. Submissions in all areas of science are encouraged. Students entering a poster in the Student Poster Competition may also request to present their paper in this special session.

Student Poster Competition — Recognizes the individual achievements of graduate and undergraduate students — full-time and part-time students actively working toward a college-level degree are eligible. Work presented must be the entrant's own research and not the product of a research team to which they partially contribute. Posters submitted will be divided between life sciences, physical sciences, and social sciences (including education). See Student Poster Awards for further information.

Student Poster Awards

A poster competition for research by undergraduate and graduate students. Categories include life, physical, and social sciences, and education. The most outstanding posters will be recognized with a monetary award. In addition, winners and honorable mention recipients will receive a FREE one-year (51 issues) subscription to SCIENCE. To be included in this session, type the words "Student Award Entry (Graduate or Undergraduate)" above the abstract (outside the 5" X 5" inch box). A photocopy of a current student identification card or enrollment form must be submitted with the abstract. Entries without this documentation will be ruled ineligible. To qualify individuals must be full-time or part-time students actively working toward a college-level degree.

Session Aides Needed — **FREE** Registration for Students

Upper division undergraduate and graduate students are eligible to serve as Session Aides for the meeting. Those who volunteer for two four-hour shifts will receive a FREE registration fee to AMSIE'96, and those who volunteer for four four-hour shifts will receive a FREE registration fee and a FREE one-year subscription to SCIENCE. For further information and application forms contact: "Session Aide Coordinator" at the address indicated.

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Deadline: All abstracts must be received by November 1, 1995.

Endorsement: All abstracts MUST be endorsed by a member of AAAS. Members may endorse their own abstracts. All individual SCIENCE subscribers are members of AAAS. Librarians or employees of institutions holding subscriptions to SCIENCE are ineligible.

Abstract Submission Forms: To obtain an abstract form contact: "AMSIE'96 Abstract Form" at the address indicated.

How to Format Abstracts: All abstracts must fit within a 5" x 5" square in the center of an 8.5" x 11" sheet of white paper. At the top of the sheet and outside of the abstract box, type the appropriate category name. Use a typewriter or letter-quality printer with type no smaller than 10 points (12 characters per inch). Do not double-space text. After the title, list the presenting author's name and address first, then list any co-author(s) name(s) and affiliation(s). Below and to the left of the abstract (outside the box), type the presenter's name, mailing address, and phone and fax numbers. Below and to the right of the square, type the name, institution, and complete membership number (from SCIENCE mailing label) of the endorsing AAAS member along with their signature. Abstracts that are illegible or will not reproduce suitably (e.g., facsimiles or cloth ribbon typewriters with poor ribbons) will be returned. Abstracts can be submitted via internet (see Mailing Instructions). Facsimile submissions are unacceptable. Computer display equipment, sound or projection equipment, or free-standing displays are not permitted.

Registration Requirements: All poster presenters must be registered for AMSIE'96. Authors submitting abstracts before August 1, 1995 must submit a registration form immediately upon acceptance. Authors submitting abstracts after August 1, 1995 must enclose a completed registration form, including registration fee. In the event an abstract is not accepted, the full registration fee will be refunded. Abstracts received via internet will not be processed until receipt of registration form with payment.

Mailing instructions: Mail one original plus five photocopies of the abstract flat (do not bend) to: "AMSIE'96 Contributed Papers" at the address below. Note: internet submissions must be in ascii text. Authors are responsible for text accuracy.

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American Association for the Advancement of Science

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A MOMENT OF TRUTH FOR AMERICA.

Imagine life without polio vaccines and heart pacemakers. Or digital computers. Or municipal water purification systems. Or space-based weather forecasting. Or advanced cancer therapies. Or jet airliners. Or disease-resistant grains and vegetables. Or cardiopulmonary resuscitation (CPR).

We take for granted these and thousands of other technological breakthroughs that have made American society the most advanced in history. They have made our economy more competitive, created millions of jobs, and underpinned our entire standard of living. They have vastly improved our health and extended our life span. In a very real sense, they epitomize the American Dream.

But these breakthroughs didn't just happen. They are the products of a long-standing partnership that has, as a matter of national policy, fostered the discovery and development of new technologies. For many years, Administrations of both parties, working with Congress, have consistently supported university research programs as a vital investment in our country's future. Industry has played an equally critical role, carefully shepherding these new technologies into the marketplace.

This partnership — the research and educational assets of American universities, the financial support of the federal government and the real-world product development of industry — has been a critical factor in maintaining the nation's technological leadership through much of the 20th century.

Just as important, university research has also helped prepare and train the engineers, scientists and technicians in industry whose discipline and skill have made technological breakthroughs possible. It has sparked innovation and prudent risk-taking. And as a result of the opportunity afforded such skilled workers in our technologically advanced economy, many disadvantaged young people have used high-tech jobs as a "stepping stone" to more productive and satisfying lives.

Unfortunately, today America's technological prowess is severely threatened. As the federal government undergoes downsizing, there is pressure for critical university research to be slashed.

University research makes a tempting target because many people aren't aware of the critical role it plays. It can take years of intense research before technologies emerge that can "make it" in the marketplace. History has shown that it is federally sponsored research that provides the truly "patient" capital needed to carry out basic research and create an environment for the inspired risk-taking that is essential to technological discovery. Often these advances have no immediate practical usability but open "technology windows" that can be pursued until viable applications emerge. Such was the case with pioneering university research done on earthquakes in the 1920s, which led over time to the modern science of seismology and the design of structures that better withstand earthquake forces.

Today, we, the undersigned — executives of some of America's leading technology companies — believe that our country's future economic and social well-being stands astride a similarly ominous "fault line." We can personally attest that large and small companies in America, established and entrepreneurial, all depend on two products of our research universities: new technologies and well educated scientists and engineers.

Technological leadership, by its very nature, is ephemeral. At one point in their histories, all the great civilizations — Egypt, China, Greece, Rome — held the temporal "state of the art" in their hands. Each allowed their advantage to wither away, and as the civilization slipped from technological leadership, it also surrendered international political leadership.

For all these reasons, it is essential that the federal government continue its traditional role as funder of both basic and applied research in the university environment. If we want to keep the American Dream intact, we need to preserve the partnership that has long sustained it. As we reach the final years of the century, we must acknowledge that we face a moment of truth:

Will we nurture that very special innovative environment that has made this "the American century"? Or will we follow the other great civilizations and yield our leadership to bolder, more confident nations? As the Congress makes its decisions on university research, let there be no mistake: We are determining the 21st century *today*.

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