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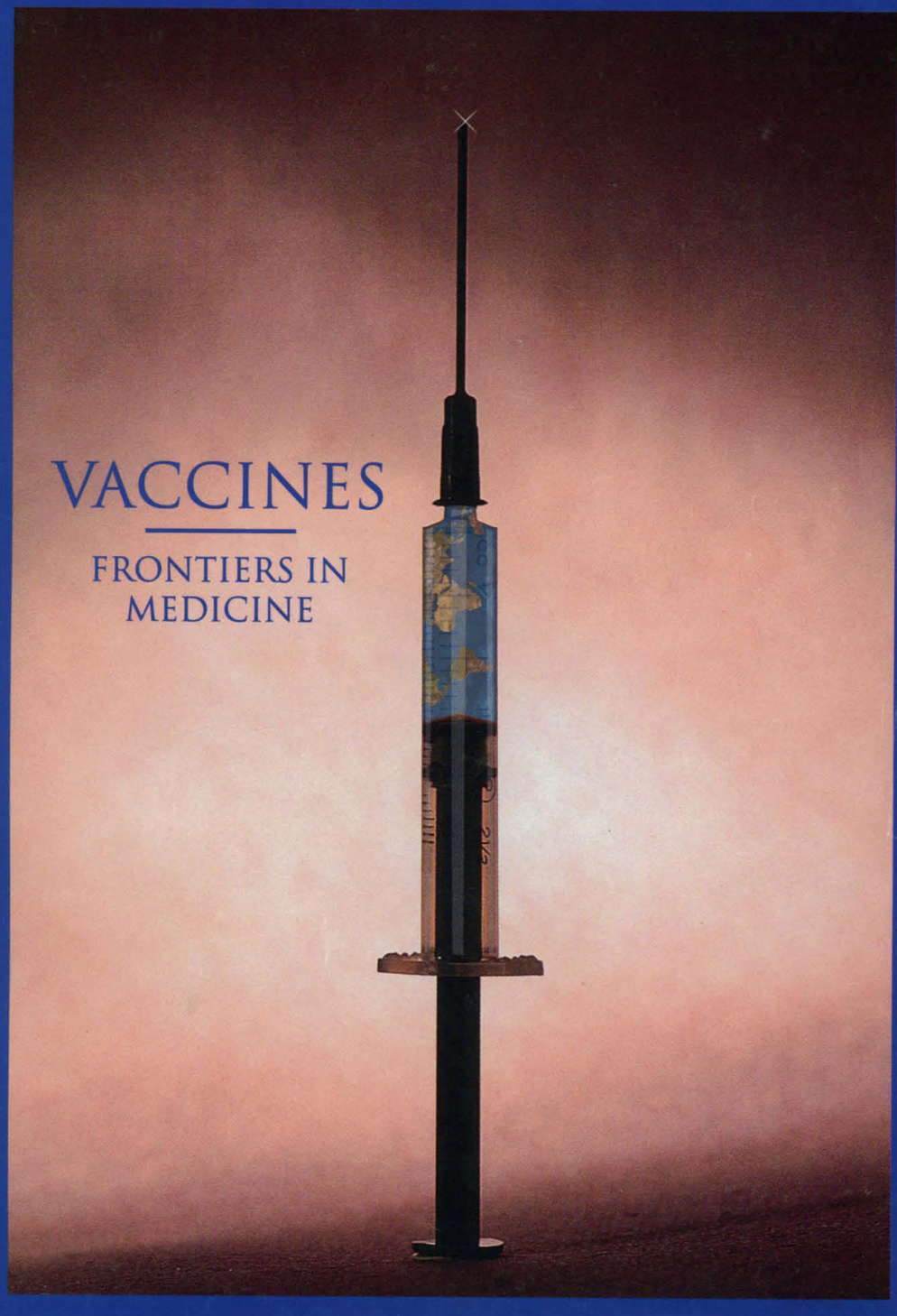

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1. Pleasure, S.J., and Lee, V.M.Y. (1993) **J. Neurosci. Res.** 35:585-602
2. Pleasure, S.J., et al. (1992) **J. Neuroscience** 12: 1802-1815
3. Younkin, D.P., et al. (1993) **Proc. Natl. Acad. Sci. USA** 90: 2174-2178
4. Wertkin, R., et al. (1993) **Proc. Natl. Acad. Sci. USA** 90: 9513-9517
5. Hirka, G., et. al. (1991) **J. Virol.** 65: 2732-2735

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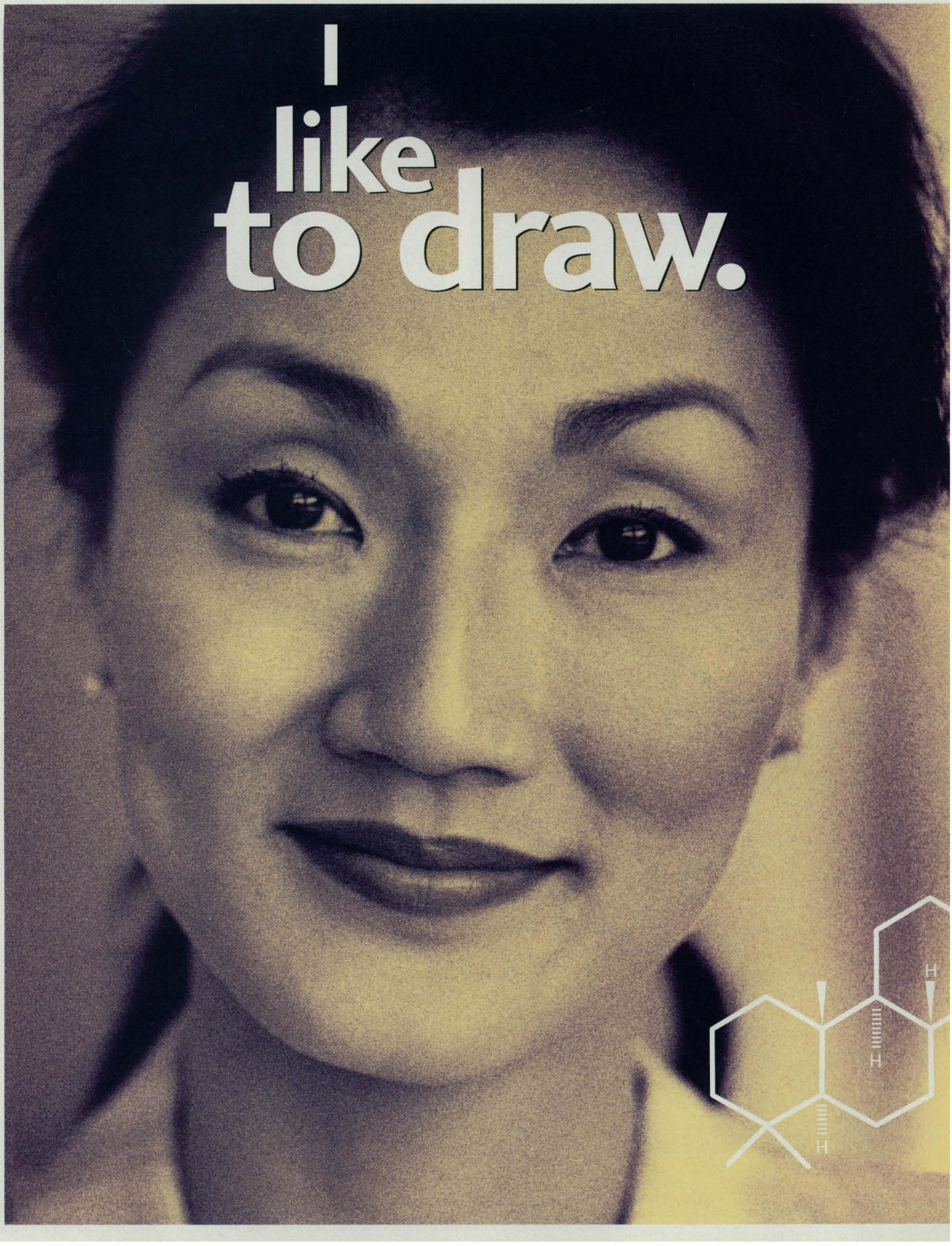
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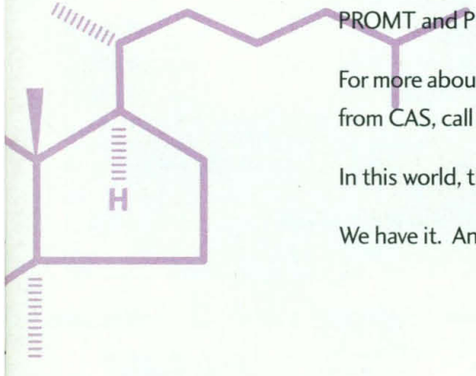

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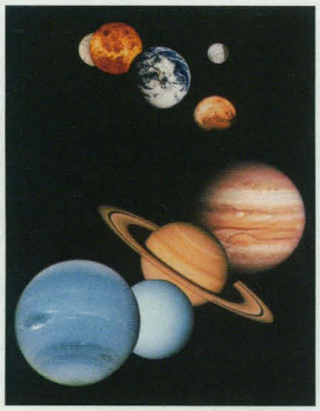
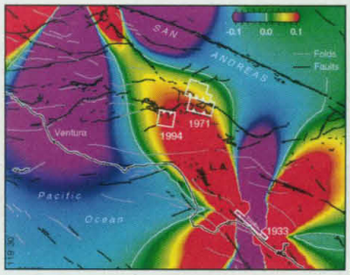


1360
Motley crowd of planets



1432
Connecting California earthquakes

NEWS & COMMENT

RESEARCH NEWS

RESEARCH ARTICLE

REPORTS

FRONTIERS IN MEDICINE: VACCINES

NEWS REPORTS

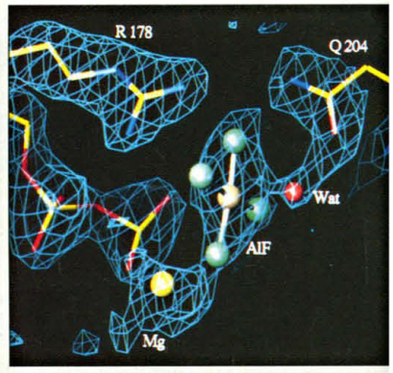
POLICY FORUM

PERSPECTIVES

DEPARTMENTS

COVER

This Frontiers in Medicine issue addresses the science and politics of vaccines. The hypodermic syringe, a classic tool of vaccination, may soon be out-of-date. A global effort is under way to produce a "supervaccine" that would confer, in a single oral dose, lifetime immunity against many of the major infectious diseases. A special section begins on page 1371 and related Reports on pages 1448 and 1451. [Images: needle, Peter Steiner/The Stock Market; globe, Tom Van Sant/Geosphere Project/The Stock Market. Illustration: E. Carroll]



1405

A Gα protein transition state analog complex: GDP-AlF_4^-

Indicates accompanying feature

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Photo courtesy of Dr. A. Kierszenbaum, City University of New York Medical School.

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edited by PHIL SZUROMI

In their cups

Many organic molecules that adsorb onto a clean metal surface are held in place by relatively weak intermolecular forces. Schierbaum *et al.* (p. 1413) have used self-assembly to adsorb organic molecules that, through molecular recognition, can selectively adsorb a small nonpolar organic molecule, C_2Cl_4. The cup-like resorcin[4]arene monolayer adsorbed on a gold surface increased the desorption temperature for adsorbed C_2Cl_4 molecules. Such self-assembled layers could have applications as highly selective sensors.

Catalyst tips

Numerous scanning tunneling microscope (STM) studies have been reported of surfaces that can act as catalysts. McIntyre *et al.* (p. 1415) have used a platinum-rhodium STM tip itself as a catalyst to hydrogenate carbonaceous layers on a platinum surface. When short voltage pulses were applied to these tips operating in predominantly or pure hydrogen environments, hydrocarbon clusters near the tip were rehydrogenated.

Fuel for thought

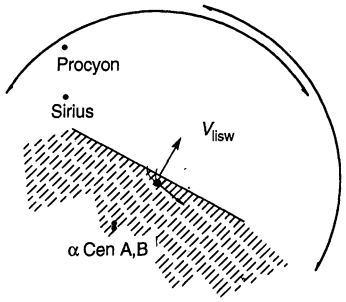
Practical fuel cells are powered by hydrogen, which is not a primary energy source. For example, alkanes such as methane, which is abundant in natural gas, are steam-reformed to generate hydrogen; direct oxidation of alkanes in fuel cells is slow. Bergens *et al.* (p. 1418) have taken advantage of reaction in which platinum black adsorbed on graphite oxidizes methane to carbon dioxide while converting iron (III) to iron (II) in concentrated sulfuric acid solutions. They coupled this reaction with a vanadium reaction that reduces oxygen to create a working fuel cell based on methane. This system operates at relatively low temperature (120°C) compared to hydrogen cells (700° to 900°C).

G protein structures and GTP hydrolysis

A crucial step in signal transduction by G proteins is the hydrolysis of guanosine triphosphate (GTP) to guanosine diphosphate (GDP). However, hydrolysis of GTP by G_α subunits such as $G_{i\alpha1}$ is actually quite slow, usually only a few hundred times faster than the background rate, and unraveling the mechanism has proven difficult. Coleman *et al.* (p. 1405) present crystal structures of the $G_{i\alpha1}$ subunit complexed with GTPγS and with GDP·AlF_4^-. These studies show that two highly conserved residues, Gln^{204} and Arg^{178}, stabilize the transition state—the former helps orient the nucleophilic water molecule, while the latter helps stabilize negative charge that builds up on the γ phosphate oxygen atoms.

Our place in space

The solar system resides in a cloud of interstellar gas that appears to be the quiescent remnant of a supernova explosion of uncertain age. The ionized gas in the cloud imposes absorption lines on spectra of nearby stars, and Frisch (p. 1423) used the wavelength and strength of



lines in several stellar spectra to reconstruct the geometry of the cloud, the sun's position within it, and its ionization state. Our system appears to be skating along just inside the cloud, suggesting that we entered it no more than a few thousand years. Comparison of lines due to different elements indicates that the gas is in ionization equilibrium, a state which at the low densities involved must take million of years to attain.

Underlying causes

Two reports examine possible temporal and spatial connections between earthquakes and faults in California. Stein *et al.* (p. 1432) modeled how stress was transferred due to large earthquakes in Los Angeles. Their results suggest that quakes in 1933 and 1952 slightly increased stresses on the fault that ruptured in the 1971 San Fernando quake, and that this quake increased stresses on the fault that ruptured in the 1994 Northridge quake. Brocher *et al.* (p. 1436) examined the deep structure of the San Andreas, Hayward, and other faults near San Francisco. Seismic data revealed a prominent subhorizontal reflector at a depth of about 15 kilometers that may be a detachment surface that truncates the shallow faults.

Role in repair

The Ku protein, a heterodimer that was originally identified as an autoantigen in sera, is known to bind to the free ends of double-stranded DNA. Taccioli *et al.* (p. 1442) show that its 80-kilodalton subunit, Ku80, is the product of the human DNA repair gene *XRCC5*. They found that introducing the gene that encodes Ku80 complemented the *xrs-6* mutation in Chinese hamster ovary cells that leads to defects in repair of DNA double-strand breaks and V(D)J recombination. Study of the role of Ku protein in these processes may also shed light on the action of DNA-dependent protein kinase, in which Ku serves as a DNA-binding component.

In the blood

Recently the cytokine that regulates platelet production, thrombopoietin (TPO), was purified and cloned. Gurney *et al.* (p. 1445) have investigated the specificity of TPO for its receptor, c-Mpl, in mice that have had this gene deleted. These mice were normal except for a marked decrease in platelet numbers and high concentrations of circulating TPO. Such results are important in considering the possible side effects of administering TPO to immunodeficient patients.

Who's who

A major unsolved mystery in evolution is the genetic basis of speciation. One significant cause of speciation may be mating discrimination. Coyne *et al.* (p. 1461) show that one factor in sexual isolation for several *Drosophila* species is differences in the hydrocarbons of the female cuticle. When females of different fly species are crowded together, the cuticular hydrocarbons can be transferred between females of different species and can subsequently alter male sexual behavior toward females of another species.

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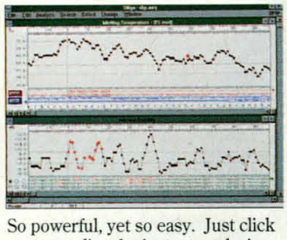

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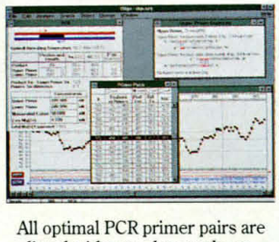

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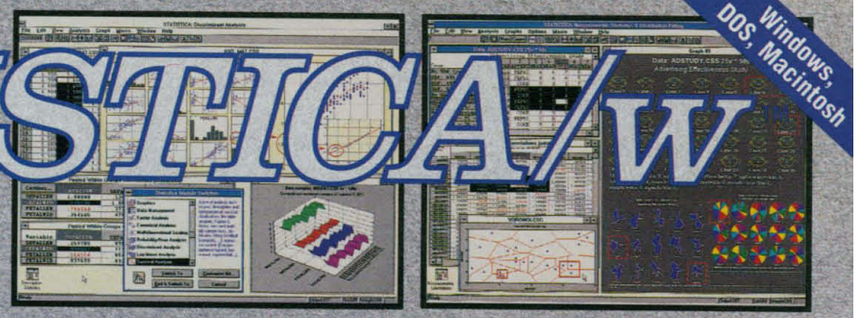

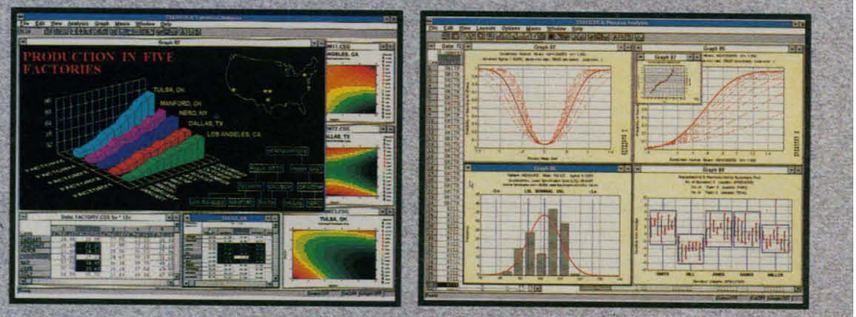

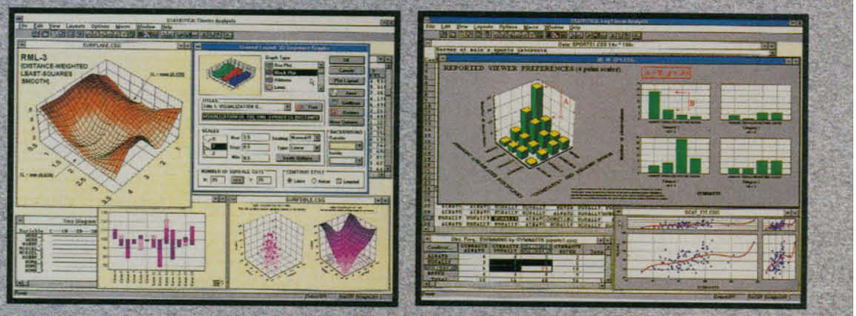

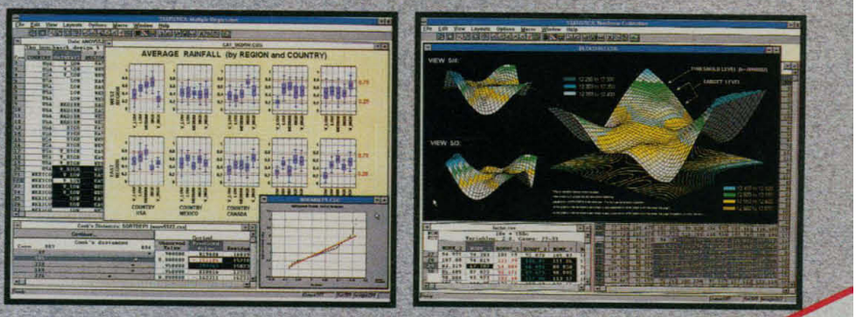

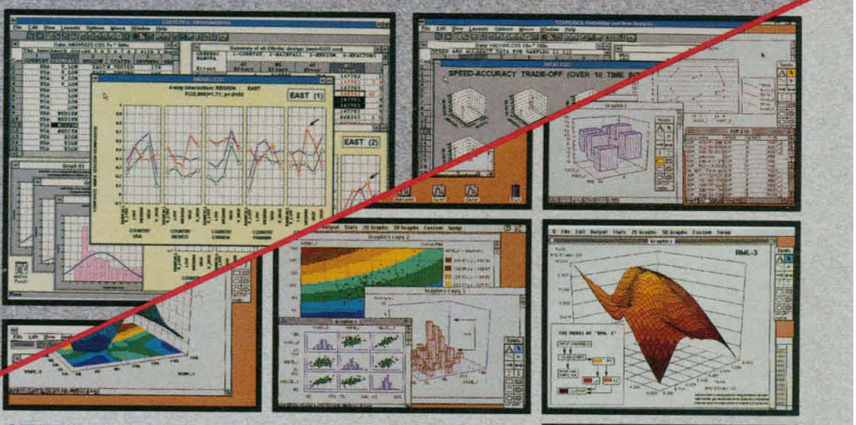

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For Information Contact:

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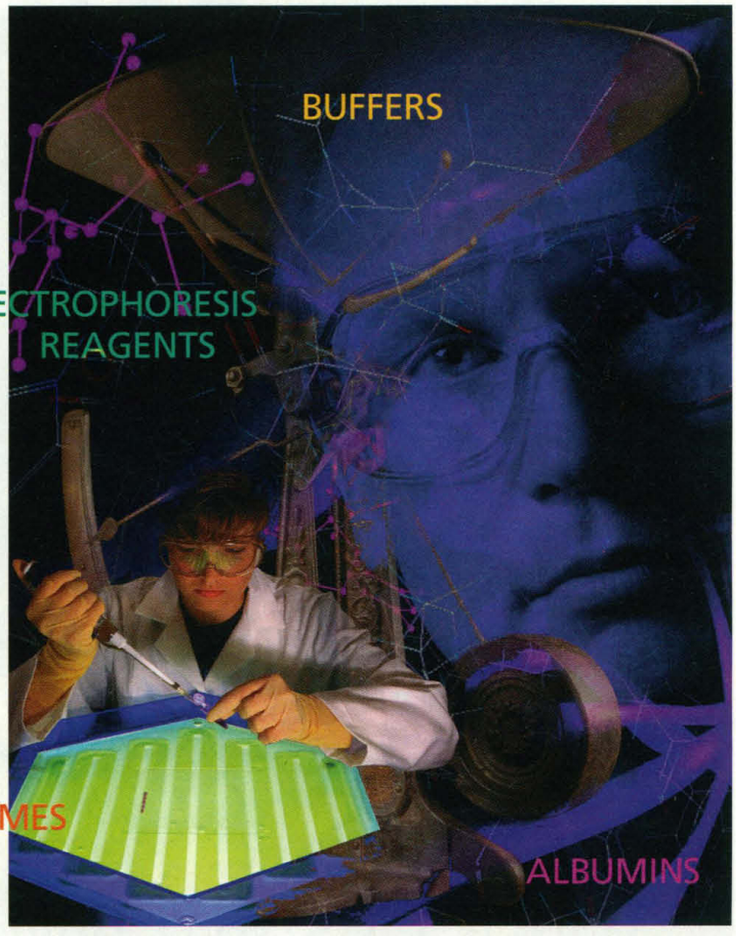

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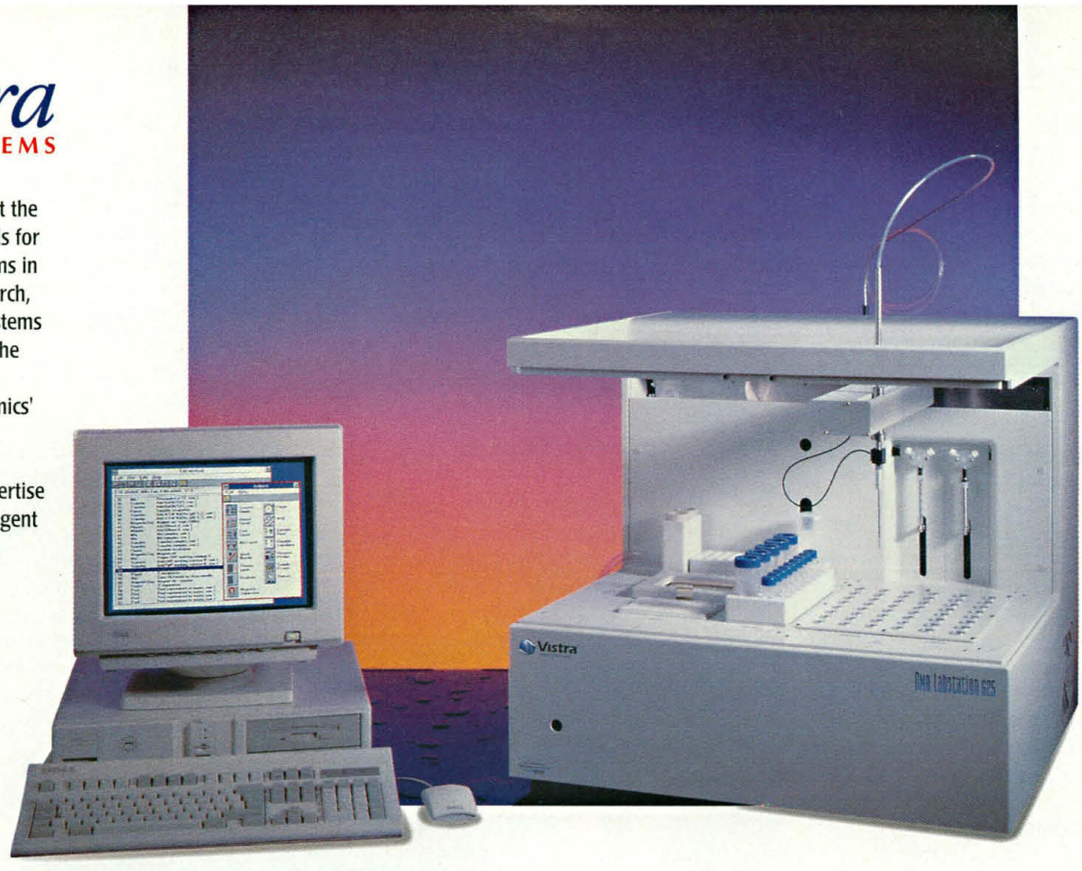

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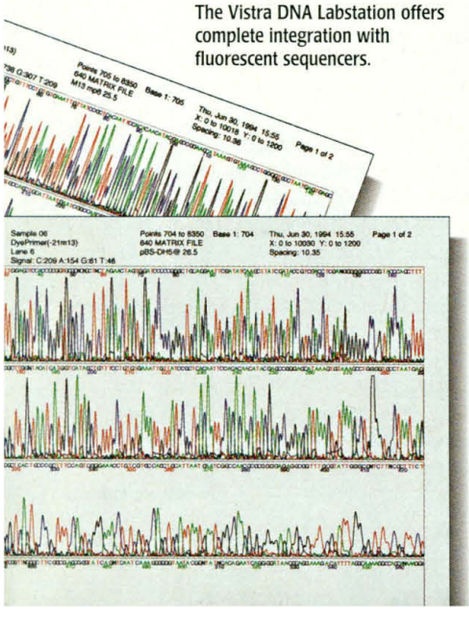

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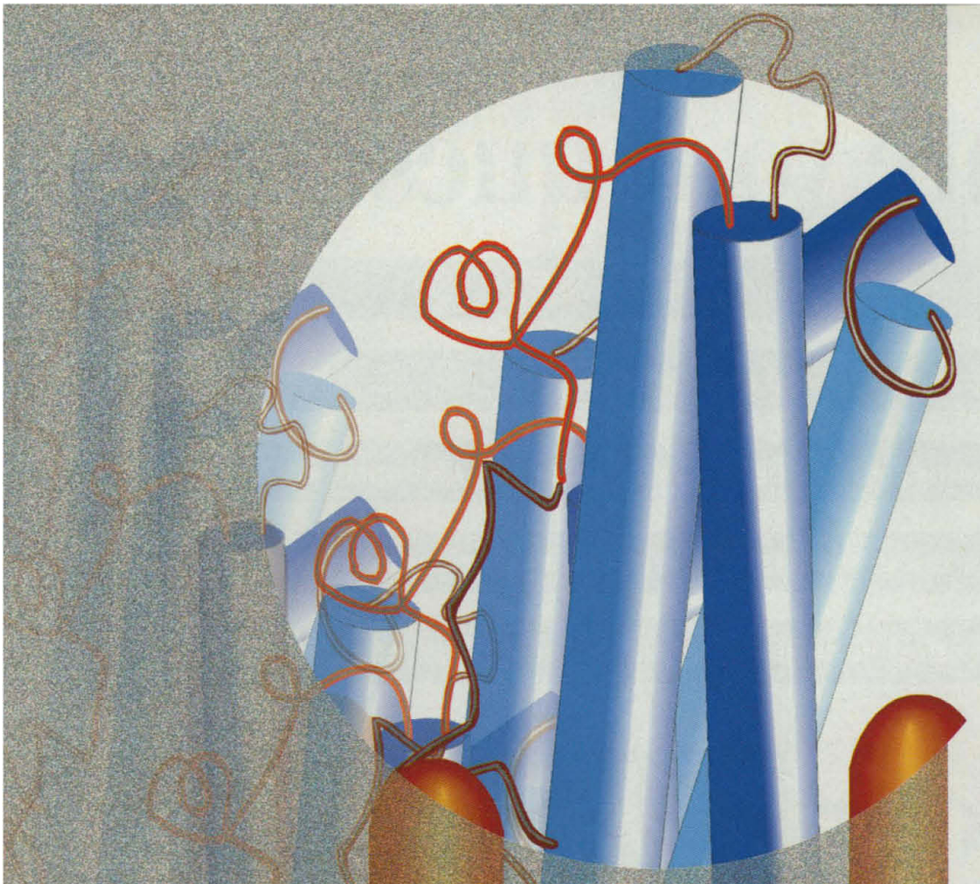

Biomolecular Interaction Analysis - the shortest route between structure and function

Comparison of a structural and functional binding domain in human growth hormone using real-time BIA

B. C. Cunningham and J. A. Wells
(J. Mol. Biol. (1993) 234, 554-563)

From a structural point of view, the complex between human growth hormone (hGH) and the extracellular domain of its receptor (hGHbp) is one of the best characterized hormone-receptor complexes. One molecule of hGH binds sequentially to two molecules of hGHbp, involving separate sites on the hormone molecule and resulting in dimerization of the receptor.

The work of Brian C Cunningham and James A Wells of Genentech Inc, USA, used Biomolecular Interaction Analysis (BIA) to measure the progress of the macromolecular interactions in real-time, allowing the evaluation of the kinetics as well as the affinity of the interactions. By this method it was possible to determine the effect of replacing each of the 30 contact residues in the hGH site 1 structural binding domain with alanine.

The results indicated that only one quarter of the residues account for the major part of the binding energy. Thus the functional binding domain is considerably smaller than the structural binding domain. The results are potentially valuable in the design of hormone analogues for therapeutic purposes, identifying critical residues for the binding interaction and implying that it might be possible to design smaller hormone mimics.

Establishment of a clearly defined experimental situation for the real time BIA studies was aided by the specific immobilization chemistry on the sensor chip. By immobilizing the receptor through a single cysteine residue introduced at a chosen position, the properties of the surface-bound interaction could be closely controlled. This work clearly demonstrates the value of real-time BIA in analysing functional aspects of macromolecular interaction.

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