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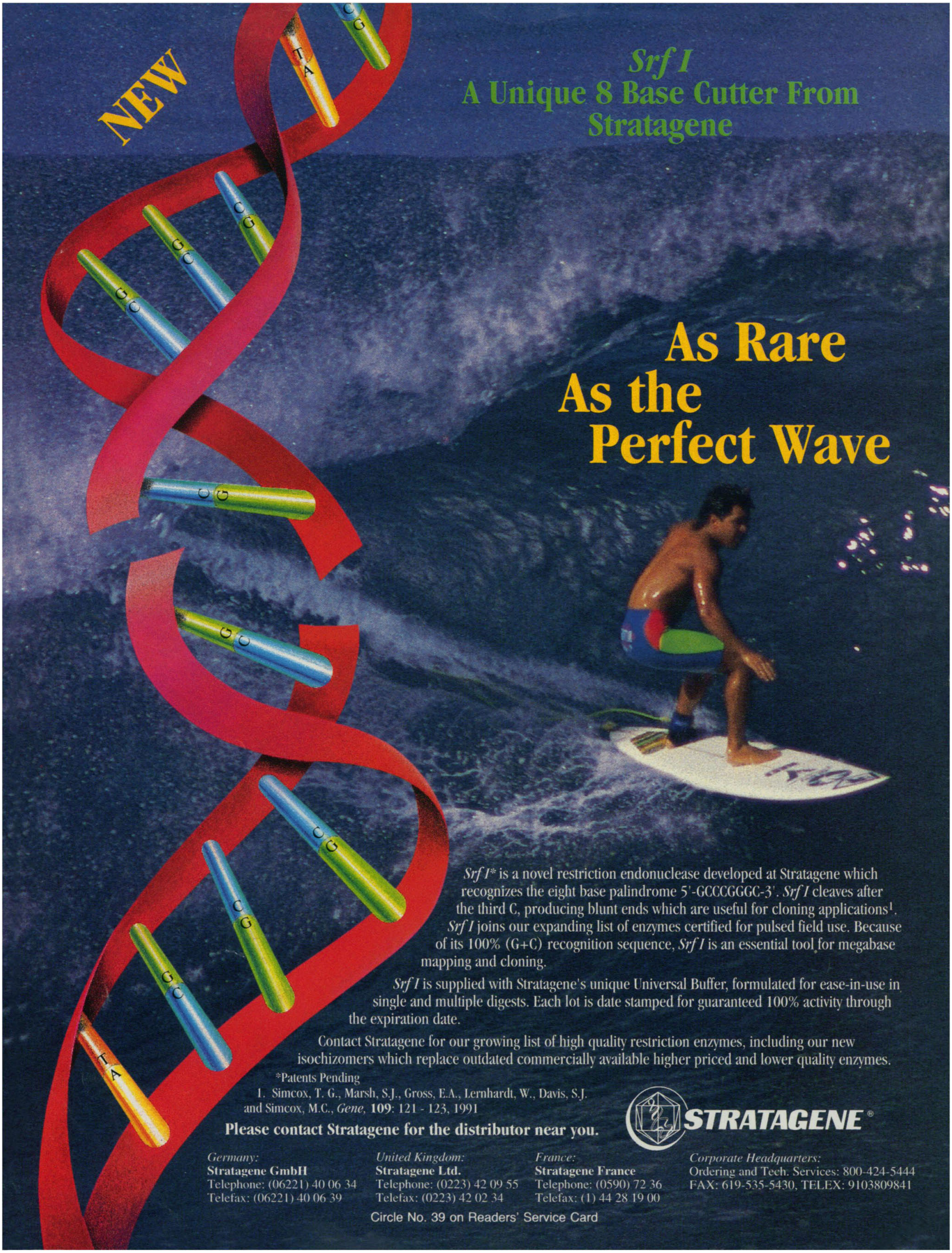
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1. Simcox, T. G., Marsh, S.J., Gross, E.A., Lernhardt, W., Davis, S.J. and Simcox, M.C., Gene, 109: 121 - 123, 1991
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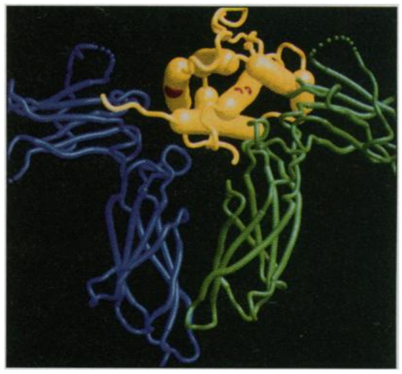
SHARON GUYNAP

1620 R. J. Reynolds subpoenas a researcher's notes

NEWS & COMMENT

RESEARCH NEWS

ARTICLES



1677 Binding of human growth hormone to its receptor

DEPARTMENTS

COVER

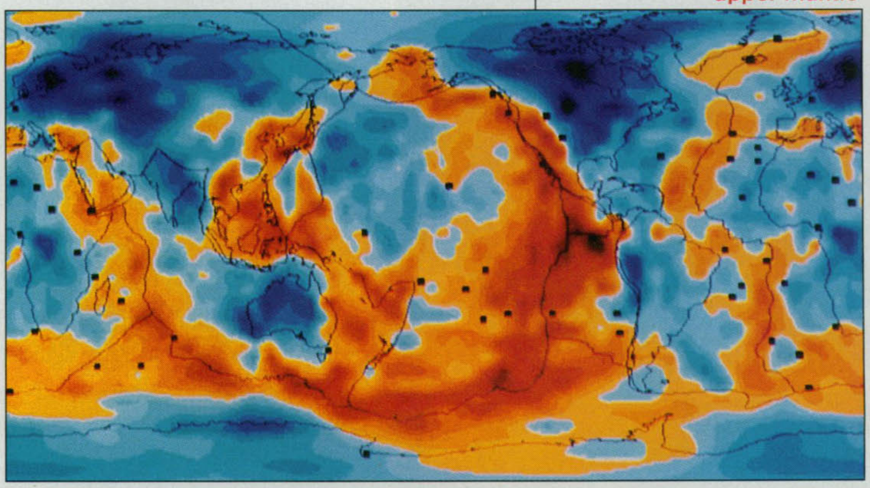
Computer visualization of the relation of neuronal activity in the motor cortex of a monkey to the forces exerted during hand movement. The neuronal population vector (green) predicts the dynamic force (red) but not the total force exerted by the monkey (purple) in the presence of a constant bias force (pink). See page 1692. Vectors are successive 10-millisecond samples; yellow lines indicate overlapping green and red lines. [Computer graphics: Masato Taira and Apostolos Georgopoulos. Photography: Roger Paul. Production: Medical Media Service, Minneapolis VAMC]

RESEARCH ARTICLE

REPORTS

TECHNICAL COMMENTS

1645
Dynamics of the upper mantle



◩ Indicates accompanying feature

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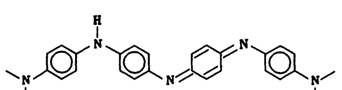
edited by PHIL SZUROMI

No greater disparity

A wide variety of fauna not recognized earlier appeared suddenly during the Early Cambrian, about 570 million years ago. The cause of this "explosion" and the diversity of the fauna, particularly with regards to the unusual arthropods found in the Burgess Shale, has been debated. To evaluate the significance of the explosion and possible evolutionary mechanisms, Briggs *et al.* (p. 1670) compare the range of morphology among living arthropods to that of Cambrian arthropods. They conclude that the disparity of forms was not greater in the Cambrian, as suggested by the taxonomy, but comparable to modern counterparts.

Polyaniline conductivity

Charge conduction in conducting polymers, organic materials that can have metallic properties, is often understood in terms of electron movement along a single chain, but scanning tunneling microscopy (STM) studies suggest that charge moves by percolating between grains of conducting material within the polymer. Jeon *et al.* (p. 1662) used STM to study both the micromorphology and the electrical conductivity of polyaniline films. Different electro-



chemical preparations allowed the doping and thus the conductivity of the films to be varied. Conductivity was more uniform over small scan areas (below 200 to 300 angstroms in width) and showed greater variation over larger scan areas. Consistent with these results was the observation of negative differential resistance, in which increasing the bias voltage on the sample can decrease the flow of current.

Superconductor spins

Nuclear magnetic resonance studies of copper oxide superconductors reveal that the electron spins behave in a manner different from either normal metals or conventional superconductors. Ruvalds *et al.* (p. 1664) calculate the spin susceptibility in the case where Fermi surfaces (contours of constant electron energy in momentum space) are nested. The authors find that the temperature dependence of the spin dynamics in their model is in good agreement with recent neutron scattering experiments. Such comparisons may shed light on the mechanism for superconductivity in these materials.

Soluble aluminum silicates

Aluminum-silicate minerals dominate the mineralogy of many crustal rocks and soils. Chemical weathering and low-temperature alteration thus likely involves the formation of soluble Al-Si species, but identification of these species has been difficult. Browne and Driscoll (p. 1667) used a fluorescence probe technique to characterize low-order Al-Si complexes in dilute acidic solutions and to determine the stoichiometry and equilibrium constants for likely water-rock and aqueous reactions. The results suggest that low-order Al-Si species are the dominant reservoir of mononuclear Al in natural waters and thus control the solubility of Al-Si minerals.

Rational receptor antagonists

A single growth hormone molecule binds sequentially to two receptor molecules through two distinct sites on the hormone. To investigate the effects of such binding on signal transduction by the receptor, Fuh *et al.* (p. 1677) made hybrid receptors in which the extracellular domain of the human growth hormone receptor was coupled to the transmembrane and intracellular portions of a receptor that causes cell proliferation. In cells expressing the hybrid receptor, sequential binding of both sites and resultant dimerization of the receptor were necessary to stimulate proliferation. The authors also designed a growth hormone antagonist by modifying human growth hormone so that it would not bind to a second receptor.

Triplex-helix preference

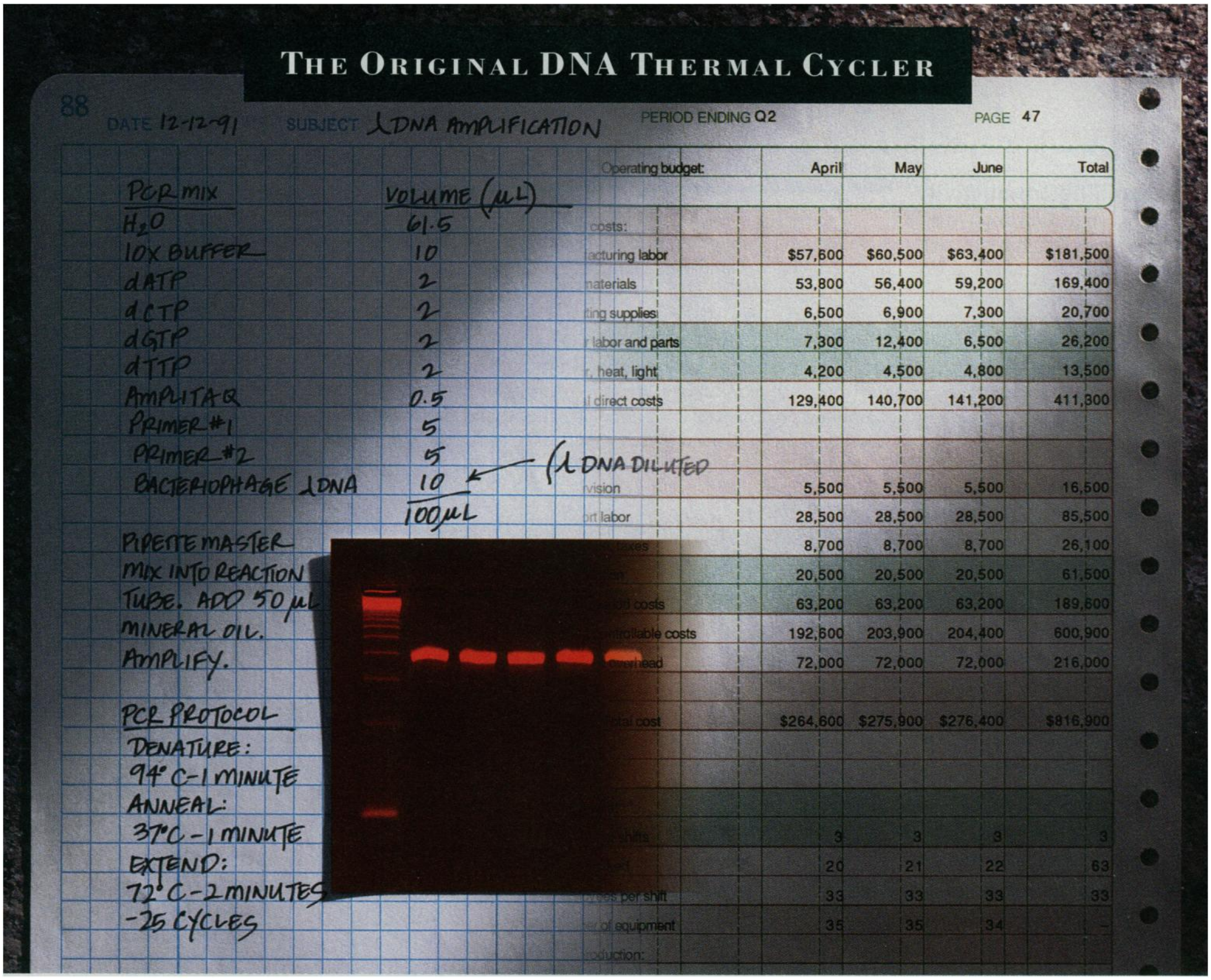
Molecules have been synthesized that bind preferentially to DNA in its triple-helix form, in which the bases of a third single strand of DNA form hydrogen bonds with the base pairs of a double helix. Mergny *et al.* (p. 1681) have found that a benzo[*e*]pyridoindole derivative (BePI) strongly stabilizes such a structure relative to the double helix by intercalation. Thus BePI can stabilize the binding of single strands of DNA along a gene and thus be used to selectively destabilize the binding of proteins to DNA. For example, the inhibition of the initiation of the *Escherichia coli* RNA polymerase transcription complex for the β-lactamase gene by a triple helix was much greater in the presence of BePI. Ultraviolet irradiation can be used with BePI to form covalent bonds that can further stabilize the triple helix.

Rate of exchange

Many proteins undergo conformational changes when they bind or unbind small molecules, but measuring the free energy of such structural changes can be difficult. Englander *et al.* (p. 1684) determined the structural free energy change in various types of hemoglobins by measuring hydrogen exchange. Local folding and unfolding of the protein exposes particular NH groups of the peptide chain. The rate of hydrogen-tritium exchange into these groups provides a measure of how easily the protein undergoes its conformational change at equilibrium. The values are in good agreement with the allosteric free energy values that can be measured for hemoglobins in separate oxygen-binding studies.

Cell-associated HIV vaccine

Effective vaccination against the human immunodeficiency virus (HIV) must not only provide protection against the free form of the virus but also against virus that might be transmitted through infected cells. Fultz *et al.* (p. 1687) immunized chimpanzees with various HIV-1 antigens such as the gp160 peptide and regions of the V3 loop. These animals were as much as 1 year later challenged with HIV-1–infected peripheral blood mononuclear cells. Antibody titers were stable after challenge, and the virus could not be isolated from blood or tissue samples (see news story by Palca, p. 1632).



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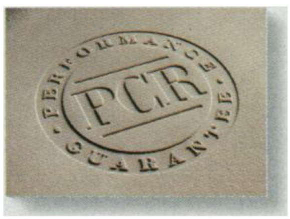

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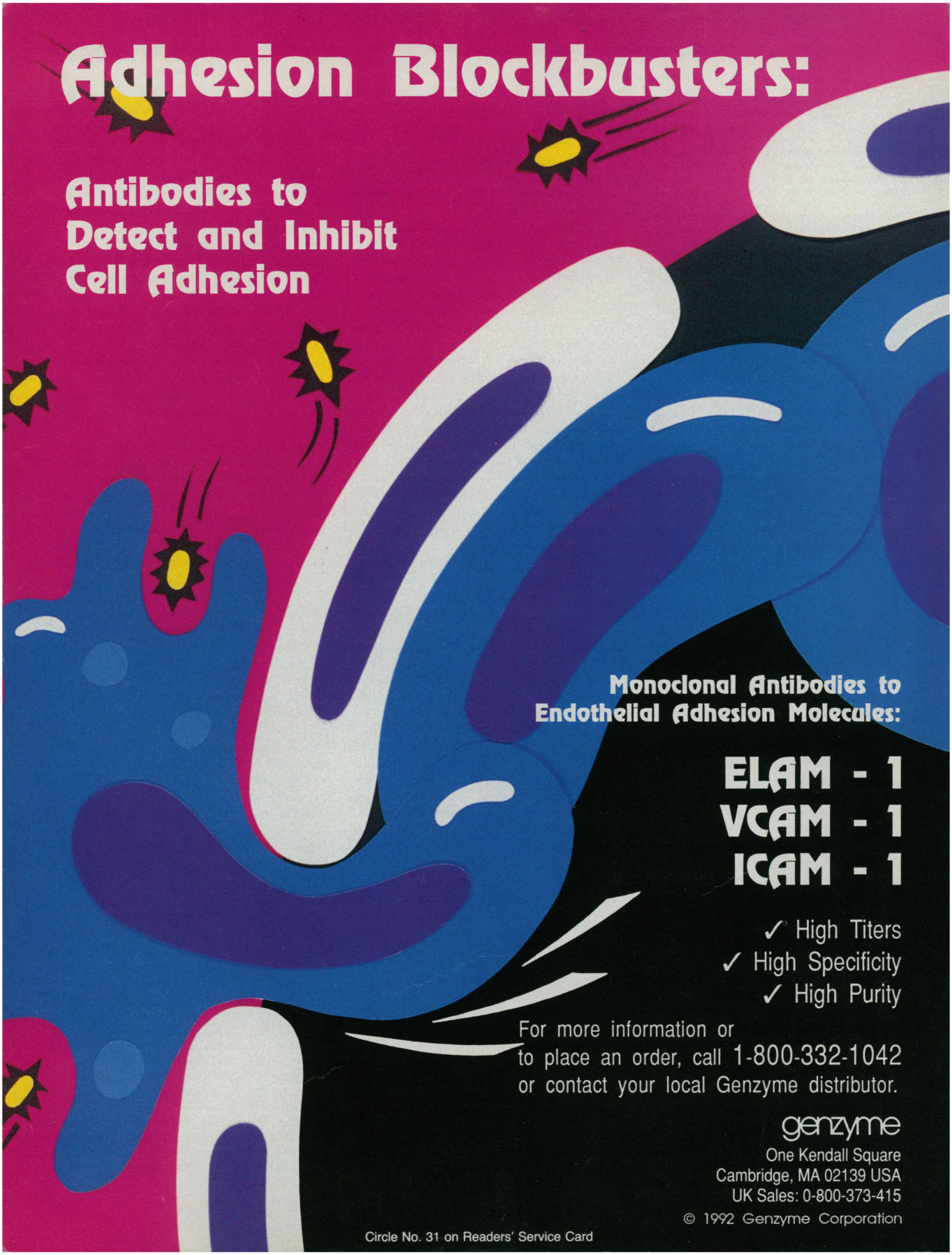
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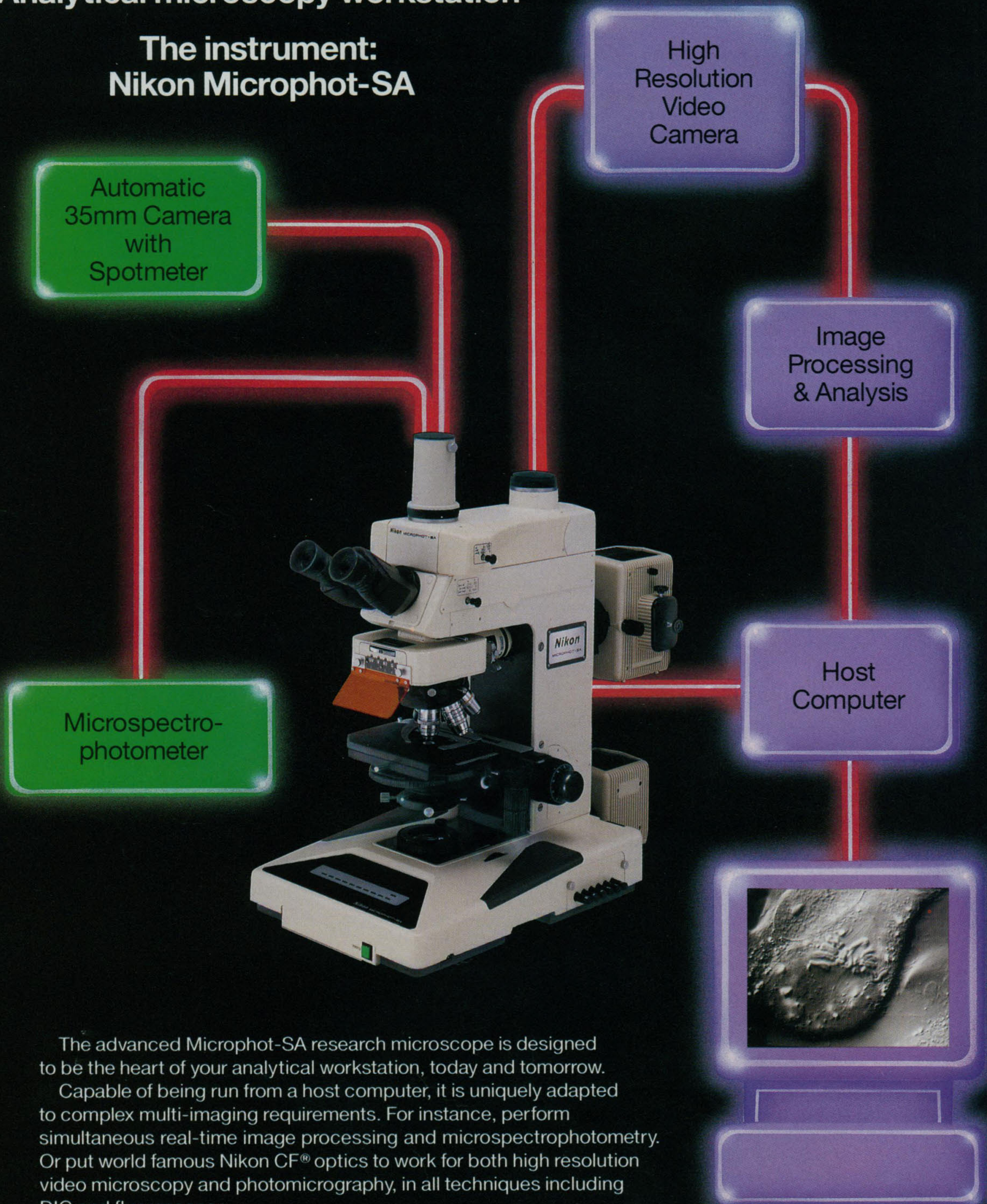

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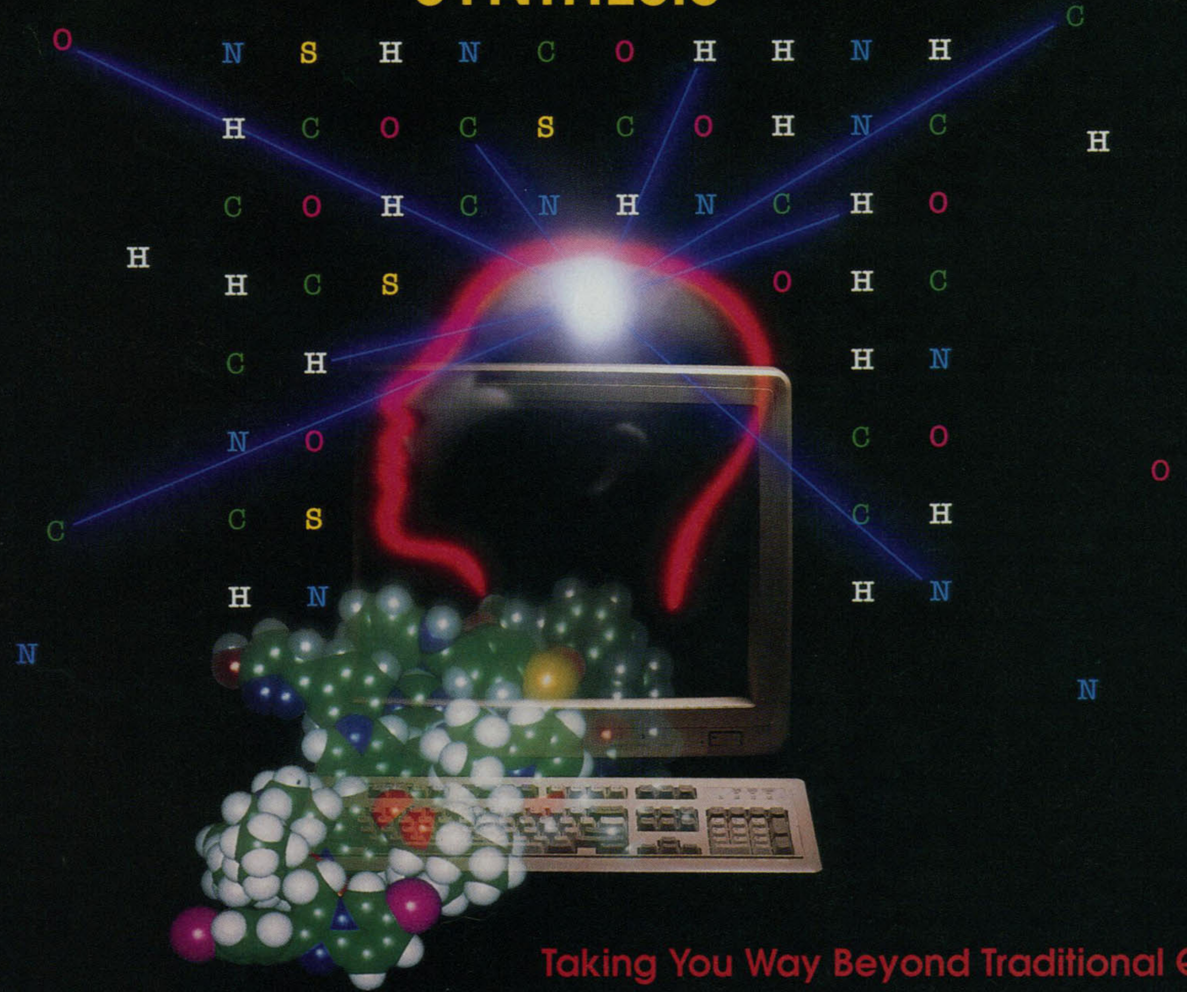

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