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14 February 1992
Vol. 255 ■ Pages 769–892
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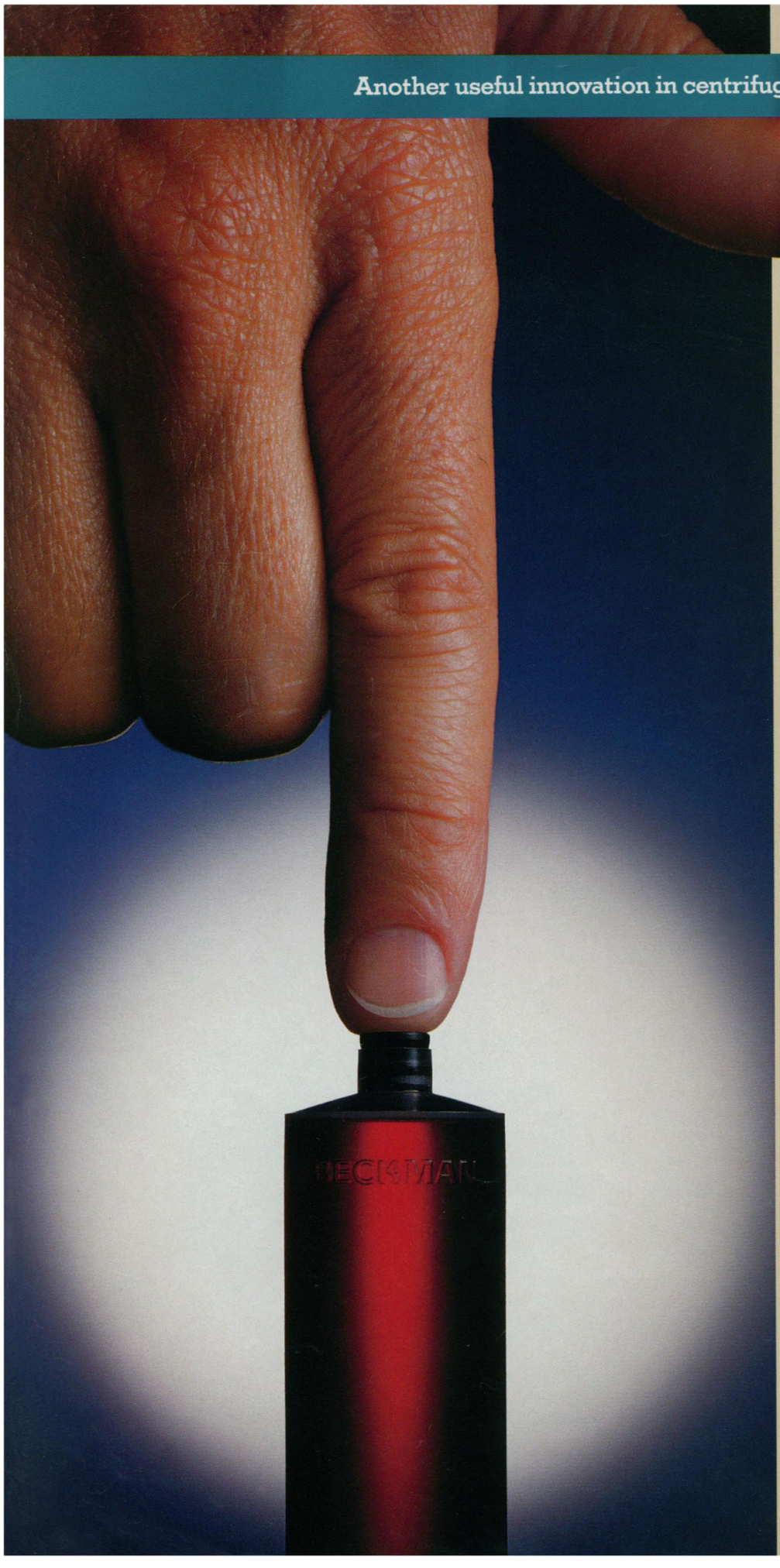

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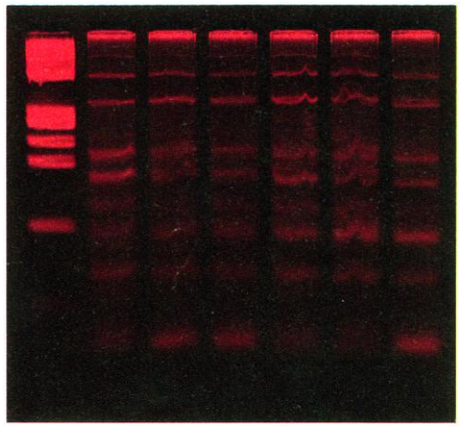

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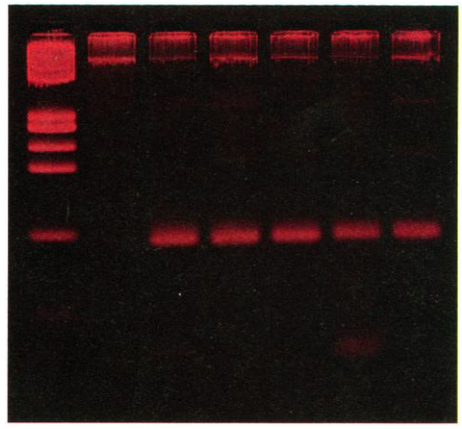

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SCIENCE

ISSN 0036-8075
14 FEBRUARY 1992
VOLUME 255
NUMBER 5046

■ **SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005.** Second-class postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Domestic individual membership and subscription (51 issues): $87 ($47 allocated to subscription). Domestic institutional subscription (51 issues): $195. Foreign postage extra: Mexico, Caribbean (surface mail) $50; Other countries (air assist delivery) $95. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. **Change of address**: allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster**: Send change of address to *Science*, P.O. Box 2033, Marion, OH 43305–2033. **Single copy sales**: $6.00 per issue prepaid includes surface postage; Guide to Biotechnology Products and Instruments, $20. Bulk rates on request. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

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COVER A cluster of the sea star *Pisaster ochraceus* on a beach of the Pacific Rim National Park, Vancouver Island, British Columbia. The oocytes from this echinoderm have been used as a source of the mitogen-activated protein (MAP) kinase $p44^{mpk}$, which is now shown to be phosphorylated and activated by the lymphocyte protein tyrosine kinase $p56^{lck}$. See page 853. [Photograph by Peter Thomas]

Reports

Book Reviews

Products & Materials

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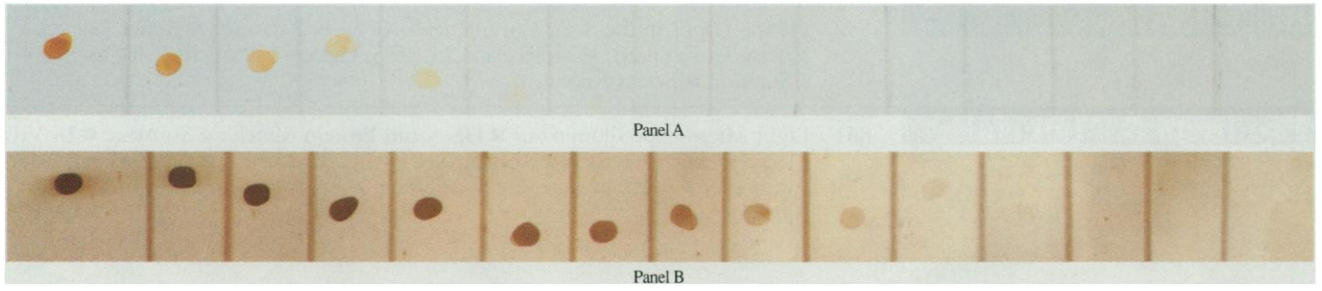

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This Week in
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Multiple elements

Structural studies of an autonomously replicating sequence, *ARS1*, in yeast show that this replication origin has a modular structure that includes one essential element (A) and three additional elements (B1, B2, and B3), which are redundant and yet functionally distinct. Marahrens and Stillman (p. 817) performed functional studies of linker substitution mutations constructed across the entire *ARS1* origin. Element B3 binds a transcription factor, ABF1, but other transcription factor binding sites can substitute for it. The yeast replication origin is similar to eukaryotic promoters, with the A element resembling the TATA box and the B elements resembling activators.

Below Triton's frost

Voyager revealed that Triton is geologically young and covered with a relatively smooth icy frost. Although geyserlike plumes were seen, large-scale volcanic features or edifices that could account for extensive surface reworking were not immediately evident. Helfenstein *et al.* (p. 824) processed Voyager images and looked at albedo contrasts below the surface frost layer. Three large quasi-circular features that may be volcanic in origin were revealed; the largest is 935 kilometers across and has a dark center region surrounded by a bright annulus.

Fractal landscapes

Fractal analysis has suggested that drainage patterns in landscapes are scale-independent; the same general morphology is evident in gullies and mountainsides. Montgomery and Dietrich (p. 826) examined this hypothesis in a field study of a variety of landscapes. Relations among drainage area, slope, and basin length indicated that there is a threshold between channeled and unchanneled regions that is related to the drainage area necessary to support a channel. Once formed, however, drainages appeared to be similar across a variety of scales. Expansion or retreat of channels at the smallest scale in response to climate change may depend on changes in the channelization threshold.

Simulated diamond

Molecular dynamics simulations of the growth of diamond films on the {001}(2×1) reconstructed surface from small hydrocarbon molecules suggests that a dimer-opening mechanism initiates growth. Garrison *et al.* (p. 835) used an empirical many-body potential function that allows reactions to be included in the simulation. Adsorbed $-CH_2$ species were found to insert into the strained C–C dimer bond, whereas $-CH_3$ species could not.

Gene transduction

The proviral DNA copy of a retrovirus can be integrated within or near a proto-oncogene; if the cleavage or polyadenylation events at the end of the transcription process do not occur, then transcription can "readthrough" into the oncogenic sequence. These transcripts can be packaged into viral particles, and the cellular sequence can be incorporated into provirus by illegitimate recombination. This mechanism for oncogene transduction has been mimicked in a tissue culture system by Swain and Coffin (p. 841), who used Rous-associated virus and a cassette containing the *neo* gene as a marker. The observed transduction events need not have involved deletions in the cellular DNA.

Chinese fossil bird

A sparrow-sized skeleton from Lower Cretaceous lake deposits represents a new bird species, *Sinornis santensis*, and provides important clues to the early evolution of flight. The 135-million-year-old fossil, described by Sereno and Rao (p. 845; see news story by Barinaga, p. 796), is strikingly complete and fills an important gap between the oldest bird, *Archaeopteryx*, and Late Cretaceous birds that show advanced flight apparatus. The skull and skeleton of *Sinornis* share a number of primitive features found so far only in *Archaeopteryx* among the birds. However, *Sinornis* also has advanced characteristics directly related to flight or perching. The appearance of these capabilities in *Sinornis* suggests that only 15 million years after *Archaeopteryx* birds had shifted to arboreal habitats, and in this case an inland habitat as well.

Early chemistry

In the prebiotic world, molecules that reacted in a cooperative way and catalyzed their own formation could have proliferated, only to mutate and create new molecules that could compete with the old forms and replace them. Hong *et al.* (p. 848; see news story by Amato, p. 800) have modeled such processes with synthetic replicators, molecules that catalyze their own formation and that form self-recognizing structures analogous to nucleic acids. Two such molecules were synthesized that cooperate; they catalyze each other's formation. A mutant produced by irradiating one of the molecules proved to be a superior replicator.

Kinase cascade

Mitogen-activated protein (MAP) kinases are serine-threonine kinases that are activated by phosphorylation on tyrosine and threonine in cells stimulated by a variety of growth factors. Ettehadieh *et al.* (p. 853; cover) show that $p56^{lck}$, a member of the Src family of tyrosyl kinases, phosphorylates and activates a MAP kinase in T cells stimulated through the CD4 surface antigen. Because other serine-threonine kinases are potential substrates of MAP kinases, activation of Src family tyrosine kinases may lead to a cascade of sequentially activated protein kinases.

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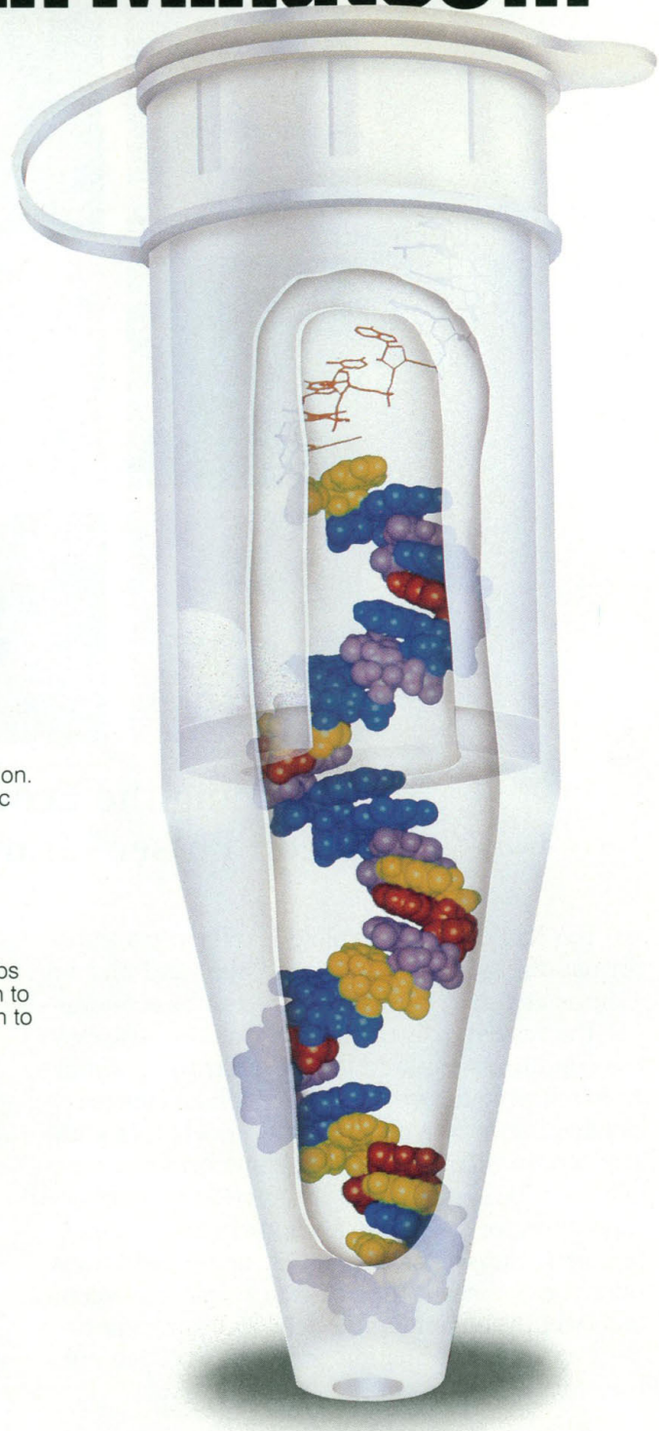

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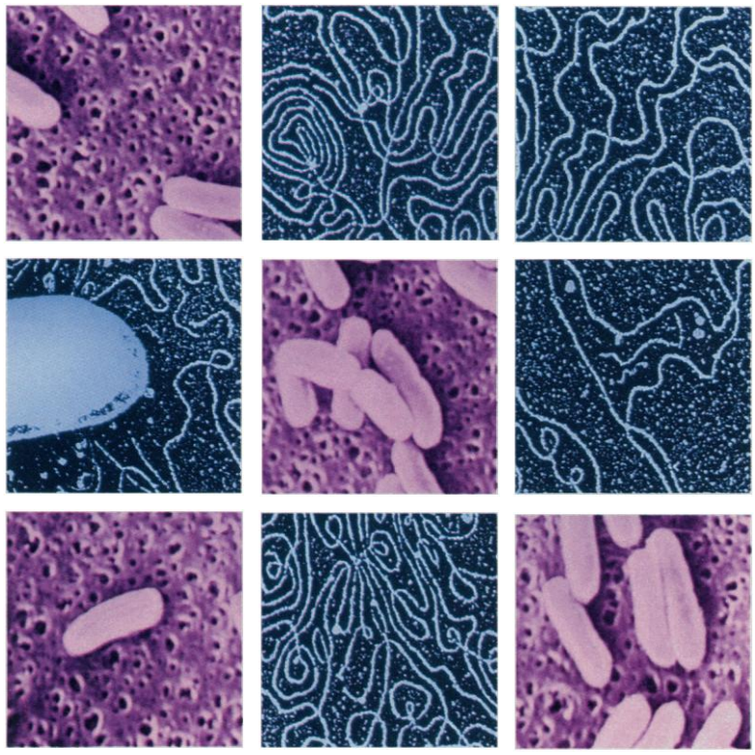

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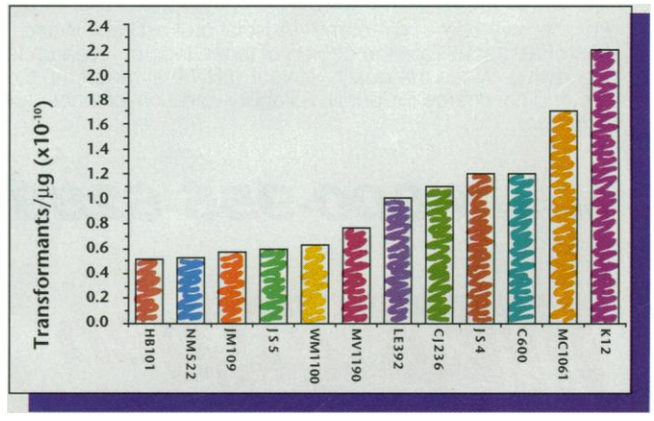

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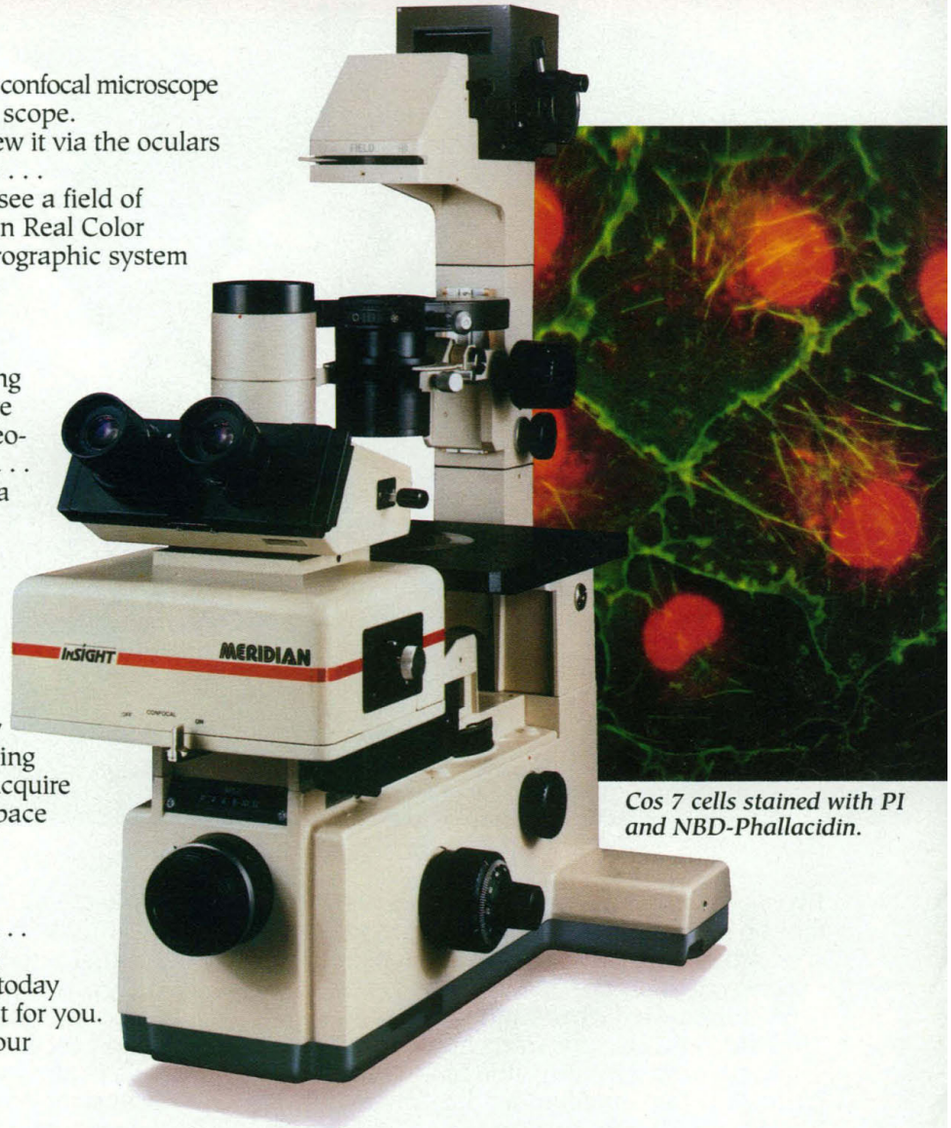

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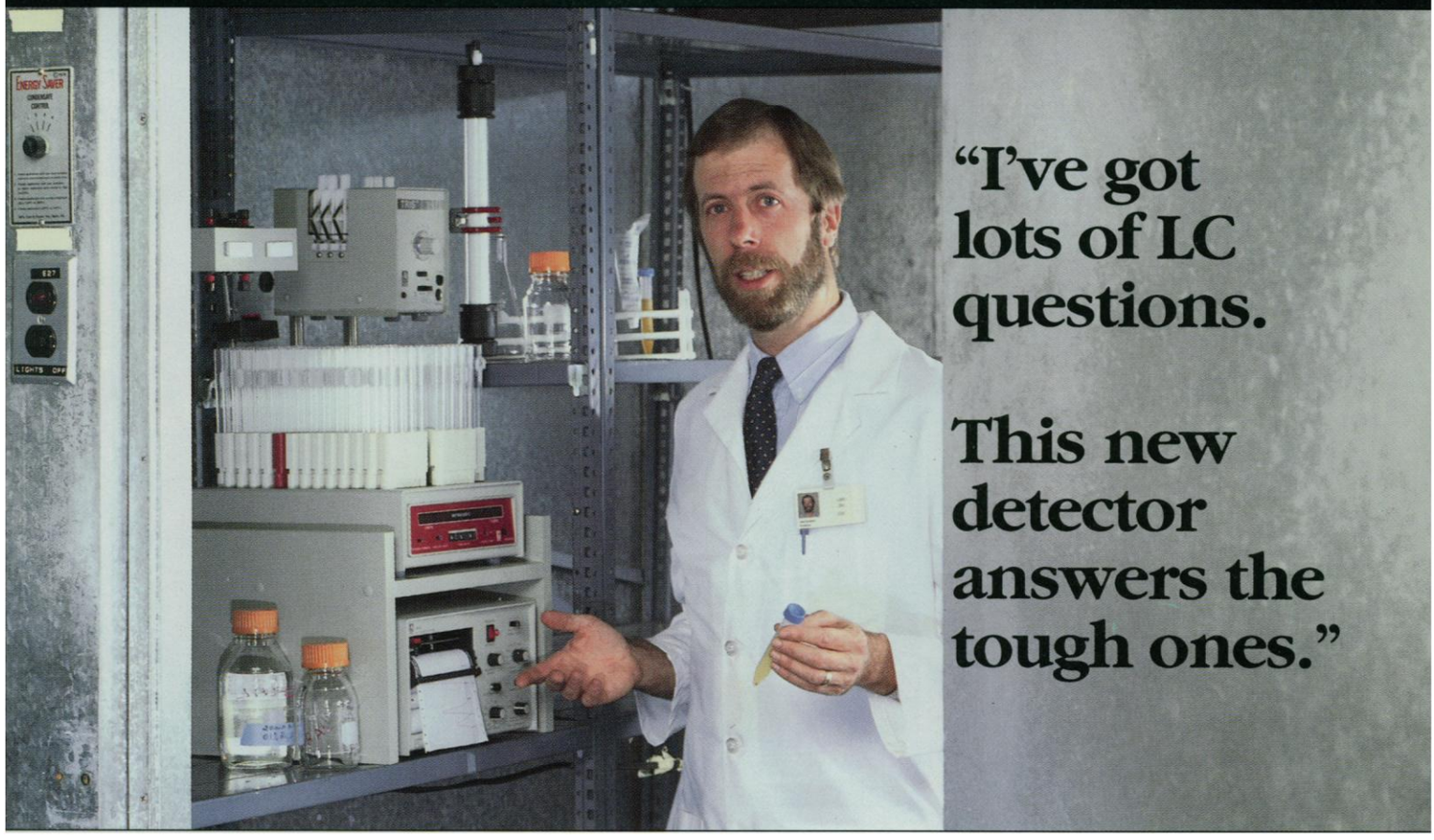

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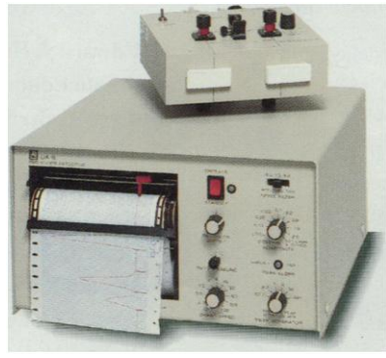

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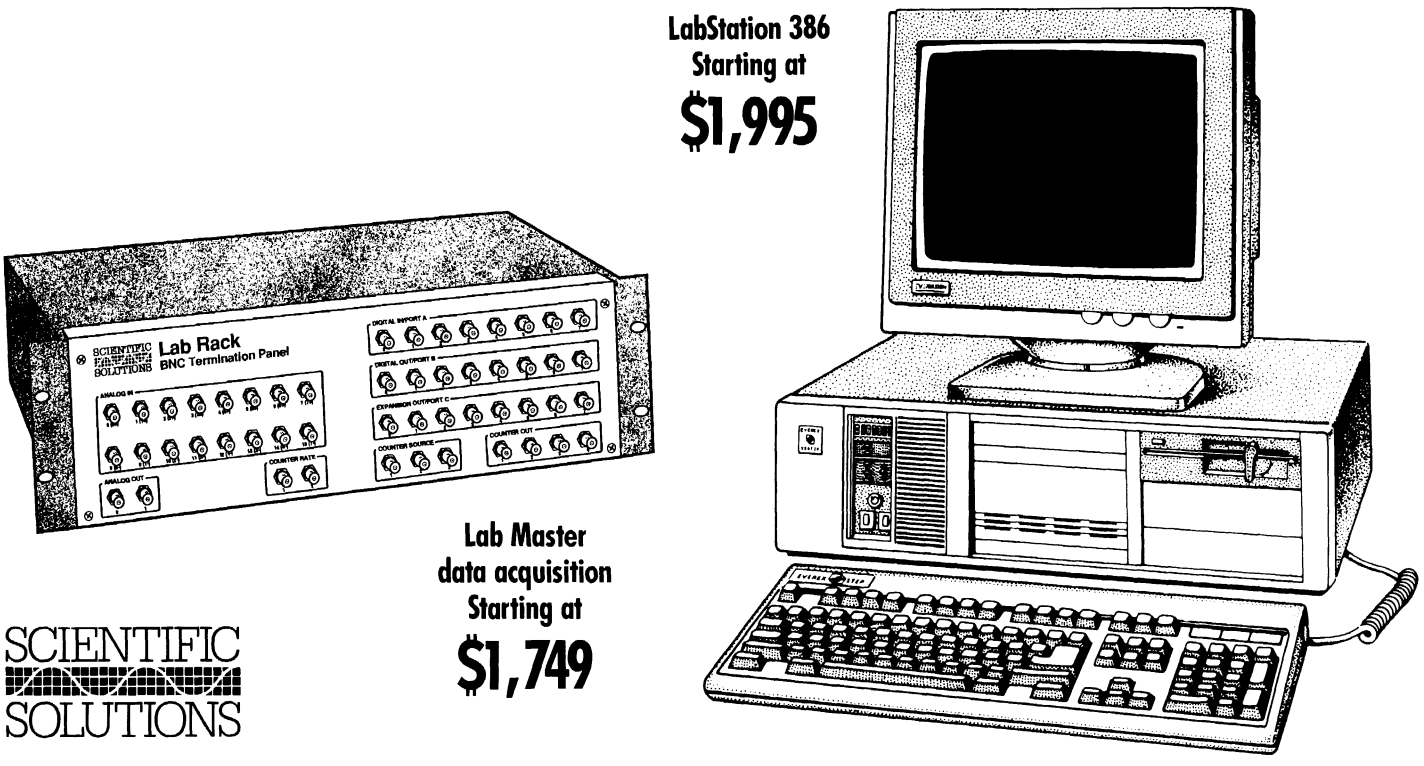

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The conference will be divided into five sessions and will feature invited presentations by noted individuals in the field. A poster session for studies relevant to the conference theme will also be a part of the conference. Individuals interested in presenting a poster should contact the Conference Coordinator. **Poster abstracts must be received by April 3, 1992.**

The session titles are:

SESSION I —HEALTH ASSESSMENT OF HALON REPLACEMENTS
SESSION II —ALTERNATIVES TO ANIMALS IN TOXICOLOGY RESEARCH: POLICY CONSIDERATIONS
SESSION III—APPLICATIONS OF PHARMACOKINETICS IN RISK ASSESSMENT
SESSION IV—SELECTED MECHANISMS IN CARCINOGENICITY
SESSION V —ADVANCES IN THE ASSESSMENT OF TOXICOLOGICAL ENDPOINTS

To obtain further information, contact Ms. Lois Doncaster, Conference Coordinator, ManTech Environmental Technology, Inc., P.O. Box 31009, Dayton, Ohio 45431–0009. Phone: (513) 256-3600, extension 212.

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