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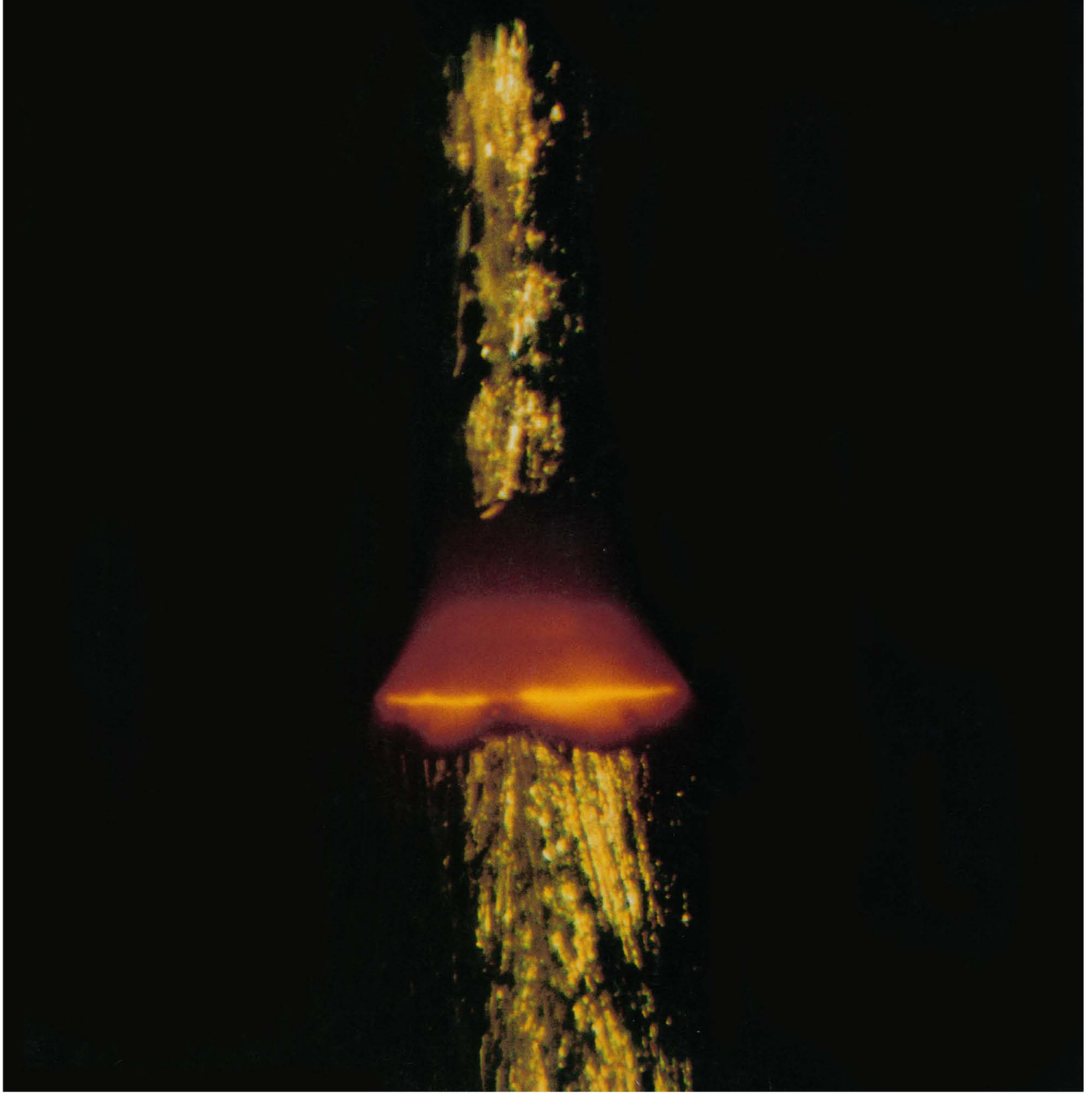

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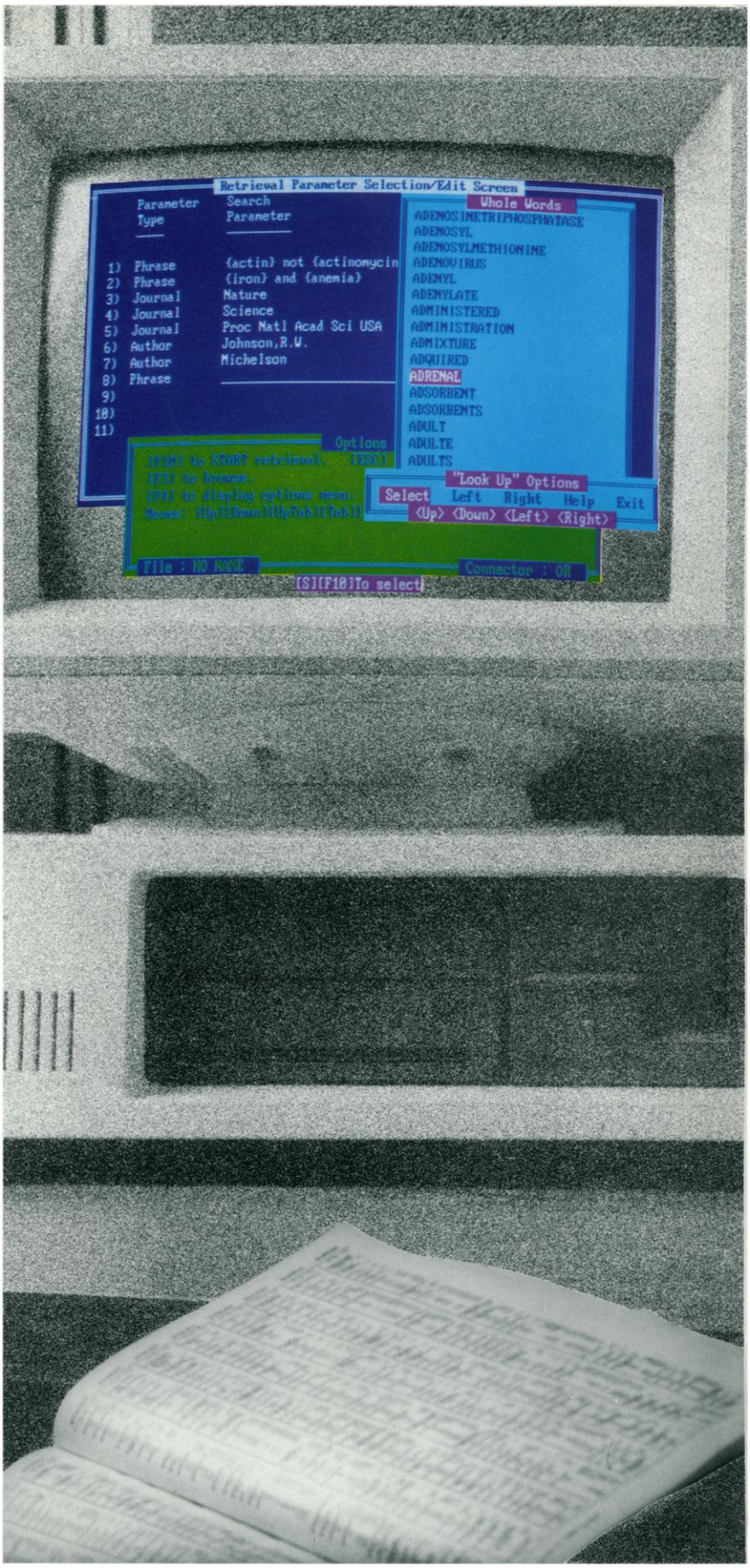

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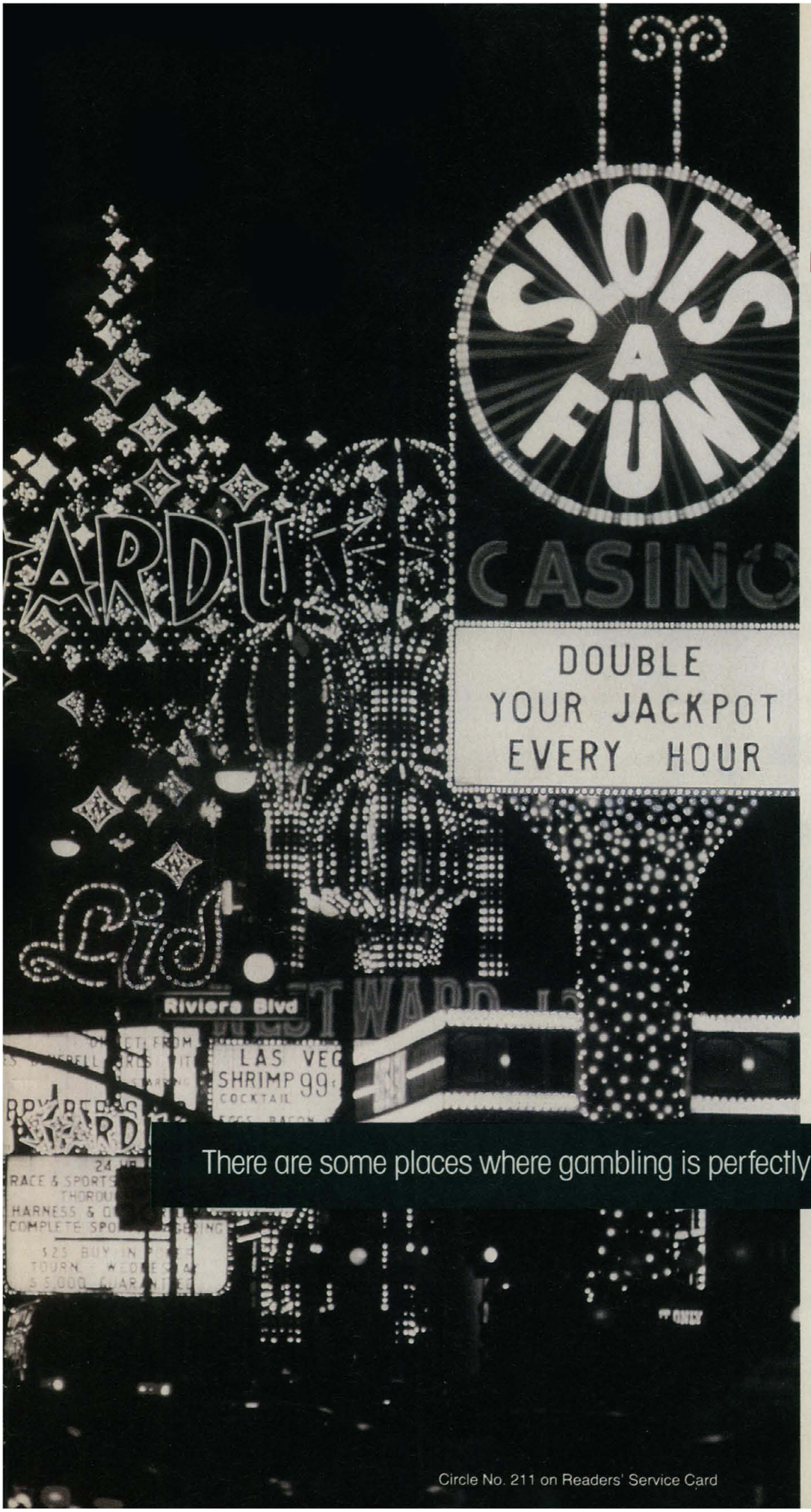

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This Week in SCIENCE

Cracking mental codes

PHYSIOLOGIC and behavioral studies have contributed to an understanding of how brain anatomy and cognitive operations are linked, and they are providing new information about normal and abnormal thinking and learning processes (page 1627). Posner *et al.* describe the use of positron emission tomography (PET) for localizing within specific regions of the brain the various mental operations (codes) that are carried out during simple cognitive tasks; the PET technique measures changes that take place in cerebral blood flow as information is processed, and it illustrates that, for discrete cognitive tasks, signals from a number of areas of the brain get assembled into a composite whole. Structure-function associations of brain anatomy and brain activities have, in addition, been made through comparisons of the "normal" cognition in alert primates (monkeys and people) and the aberrant cognition in brain-injured person.

Protein folding

How do the α helices of proteins form (page 1632)? The α helix is the most common secondary structural feature of proteins: in the typical globular protein, one-fourth of the amino acids are in helices. Presta and Rose propose that the "seeds for folding" may be sown by amino acids that flank the helix boundaries. Within the helix, four amino acids at each end cannot participate in the helical backbone hydrogen-bonding pattern. If the side chains of flanking amino acids could at least temporarily form bonds with these terminal helix amino acids, helix formation could begin and later be terminated. The boundary amino acids thus may provide stereochemical instructions for folding. As a test of the proposal, 54 helices in 13 proteins were evaluated; most helices were flanked by amino acids capable of forming hydrogen bonds with the terminal amino acids. In an independent study of 215 helices in 45 globular proteins, Richardson and Richardson note the strong preferential occurrence of certain kinds of amino acids (hydrophilic, hydrophobic) at certain positions both within helices and flanking them (page 1648). These studies may improve the accuracy of predictions of protein structure from sequence information and might aid in the design of especially stable proteins that could then be produced with genetic engineering techniques.

Lake levels then and now

LAKE Malawi is one of the long narrow lakes in the East African rift zone; 25,000 years ago it was hundreds of meters lower than it is today (page 1645). Scholz and Rosendahl attribute the paleolake's lower stand to the drier climate that prevailed during the late Pleistocene; to a lesser extent, tectonic tilting may also have contributed to the change in the lake's depth. Seismic reflections obtained with airguns on board the research vessel *Nyanja* were used for mapping the paleolake's shorelines and its other geographic features. The data indicate that only one paleolake formed during the low stand. To the north of Lake Malawi, Lake Tanganyika was, during the Pleistocene, about 600 meters lower than it is today, but three paleolakes formed at that time. The higher number of paleolakes and the added richness of habitats in the Lake Tanganyika basin may account for the greater diversity of fish living in Lake Tanganyika (19 families) than in Lake Malawi (9 families) today.

Angiotensin II and ovulation

ANGIOTENSIN II appears to play a direct role in the process of ovulation (page 1660). Follicular cells of the ovaries have receptors for angiotensin II, which is a component of follicular fluid. When receptors for this octapeptide are blocked by the specific inhibitor saralasin, about half the normal number of eggs are released from rat ovarian follicles into the oviducts; injection of supplementary angiotensin II counters the ovulation blockade. Pellicer *et al.* point out that a systemic role for the renin-angiotensin system has long been clear (it stabilizes fluids and electrolytes and helps maintain vascular tone) and that the system is phylogenetically old. Only recently have organ-specific renin-angiotensin systems been identified. An understanding of how angiotensin II, saralasin, and other active substances in this complex figure into normal and abnormal ovulation could lead to their use as contraceptives or fertility-promoting drugs.

Monogamy and altruism

A mathematical model shows that the trait of altruism between siblings can favor the evolution of monogamy within a population (page 1672). The expression "monogamous females" refers in this case to those females who produce all of their offspring from matings with one male, and there are many mammals, birds, fishes, and crustaceans that engage in this type of mating behavior. Peck and Feldman show by analytic and numeric methods and also provide an "intuitive explanation" of how and why interacting genes for these two traits would have favored increased monogamous behavior. They suggest that, in some species where the females acted monogamously, paternal care of and investment in the offspring may have arisen after the monogamous behavior by the females reduced the uncertainty about the parentage of the offspring.

The bottom lines

A step has been taken in the direction of preparing high-temperature superconducting materials in shapes that will be of use in electric devices: thin crystalline superconducting fibers (cover) consisting of bismuth, calcium, strontium, copper, and oxygen have been made with laser-heated pedestal growth technology (page 1642).

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Product Liability in a Litigious Society

Lawsuits related to alleged defective products or to alleged medical malpractice have been increasing rapidly in numbers and in awards. Already the competitiveness of the United States has been lessened and the practice of medicine negatively affected. The game appears to be stacked in favor of plaintiffs and especially their lawyers. Awards in the multimillion dollar area are frequent.

In what follows I will draw on a recently released report of the Conference Board.* Caution in acceptance of the views expressed in the document may be warranted. However, much of the information presented is already in the public domain. For example, the rapidly soaring costs of liability insurance for both products and malpractice are well known.

Two instances of increases in costs of product liability insurance dramatize the impact of successful litigation or threats thereof. In 1984, a pharmaceutical firm paid $72,000 for $100 million in liability coverage (after deductions). In 1985 the company paid $85,496 for $18 million in coverage. By 1986 insurers were asking $1.8 million for $15 million in coverage. Piper Aircraft estimates that insurance costs add $75,000 to the cost of every new plane they build. These costs are greater than their total costs for manufacturing some small aircraft. The chief executive officer of another small aircraft manufacturer states that "the current product liability system has essentially destroyed the piston aircraft industry. From a peak of 18,000 aircraft per year in 1978–79, the total current piston aircraft production has fallen to less than 1,000 units per year."

The costs of defending a product liability suit can be very large both in terms of money and in demands on top executives' time and thought. Frequently, thousands of documents must be produced and eight to ten witnesses deposed. The production of tens of thousands of documents and dozens of witnesses is not rare. Costs to the defendant may amount to millions of dollars. The circumstances make feasible a form of legalized extortion. The plaintiff's lawyers can file suits for amounts that are substantial but less than the costs of defending suits. In one instance, the defendants estimated a 98 percent chance of winning a suit, but at a cost of $3 to $5 million. The plaintiffs were willing to settle for $200,000. The company paid the $200,000, though regarding the matter as pure and simple blackmail.

In contrast to the United States, some foreign countries have severe limits on liability exposure. They accept the theory that when a person uses a power tool there is inherent danger. Thus in some countries costs of liability insurance are only a few percent of those in the United States. Moreover, there is less tendency to sue. The report cites the experience of Dow Chemical, which has foreign sales of about $7 billion and domestic sales of $6 billion. In 1986, the company's legal and insurance expenses in the United States exceeded $100 million. Its comparable foreign expense was less than $20 million. During 1987 Dow was a defendant in the United States in 456 suits, but in only 4 suits outside the United States.

Company executives are especially concerned about punitive damages and liability for products manufactured and sold many decades ago. Some of the huge punitive awards that are made seem to be motivated by a desire to injure the rich or powerful rather than to render justice. Particularly when cases are tried before juries anything in the way of a punitive award can happen. Juries do not realize that in the end the costs are usually borne by the public.

The product liability system imposes a heavy burden on firms that make long-lasting, high-quality products. The longer the usage, the more people using, the greater the liability exposure. An extreme case is the elevator industry. It is not unusual for manufacturers to be sued for equipment that has been in service for more than 70 years. Many suits are related to alleged minor injuries that arise from tripping on unleveled elevators.

Prospects for immediate reform are not very good. Most observers believe that Congress will not pass a reform bill in this session. Action at the state level is moving more quickly, but it leaves much to be desired. Excessive product liability costs will continue to be a drain on society.—PHILIP H. ABELSON

*E. Patrick McGuire, "The Impact of Product Liability" (Report 908, The Conference Board, New York, 1988).

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to chromosome 7. It added up to a difficult and awkward situation as we could not properly reference a rumor and the other group had not put their findings into print.

At no time, however, including our initial discussion with the editor of *Nature*, have we been less than candid and forthcoming in recognizing the precedence of the Lap-Chee Tsui–Collaborative Research group in localizing the cystic fibrosis gene to chromosome 7 (*2*). We were indeed relieved when a proper solution was constructed and much appreciated the clarifying *Nature* editorial (*3*) which accompanied the several manuscripts (*4*).

The experience stresses the importance of timely publication of scientific findings and highlights the risk taken in delaying publication in order to maintain a competitive advantage.

RAYMOND L. WHITE
Department of Human Genetics, University of Utah, Salt Lake City, UT 84132

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2. R. White, *ibid.* **234**, 1054 (1986).
3. P. Newmark, *Nature* **318**, 309 (1985).
4. R. G. Knowlton *et al.*, *ibid.*, p. 380; R. White *et al.*, *ibid.*, p. 382; B. J. Wainwright *et al.*, *ibid.*, p. 384.

Response: Williamson and I apparently agree on the facts. Readers can judge for themselves whether or not the articles are misleading.

I am puzzled, however, by what Williamson means by the press "personalizing" scientific matters. My article recounts the history of the very important work under way to isolate the cystic fibrosis gene—work that is, after all, done by people.

Nor do I understand why Bentley believes that the families of cystic fibrosis patients will be greatly distressed by the articles. On the contrary, they might be interested in learning how the money they raise for research is spent.—LESLIE ROBERTS

Genesis 1:28

Times have changed, and not for the better. A short 21 years ago Lynn White, Jr., argued in the pages of *Science* (10 Mar. 1967, p. 1203) that the roots of the present ecological crisis could be traced to our unquestioning acceptance of the message in Genesis 1:28. White suggested (p. 1207) that we shelve the Old Testament myth once and for all and recognize as the "patron saint for ecologists" the nature-loving St. Francis of Assisi. And in 1971 Ian McHarg, an ecologist, called the message of Genesis 1:28 "the best guarantee of [our] extinction" (*1*). But now we read (22 Apr., p. 375) a letter from Jonathan H. Cilley, Sr., informing us that the "fundament" of biology is to be found not in the biological theory of evolution, which places human beings on a level with other living beings, but in the Old Testament, specifically in Genesis 1:28, where mankind, created separately by divine fiat, is commanded to "be fruitful and multiply, and fill the earth, and subdue; and rule over every living thing." This, he asserts, constitutes our "cultural mandate." *Quantum mutatus ab illo!*, as Aeneas said when the battered face of Hector returned to him in a dream.

L. J. RATHER
Department of Pathology, School of Medicine, Stanford University, Stanford, CA 94305

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1. I. McHarg, "Man: Planetary disease" (B. Y. Morrison Memorial Lecture, U.S. Department of Agriculture, Washington, DC, 1971), pp. 7–8.

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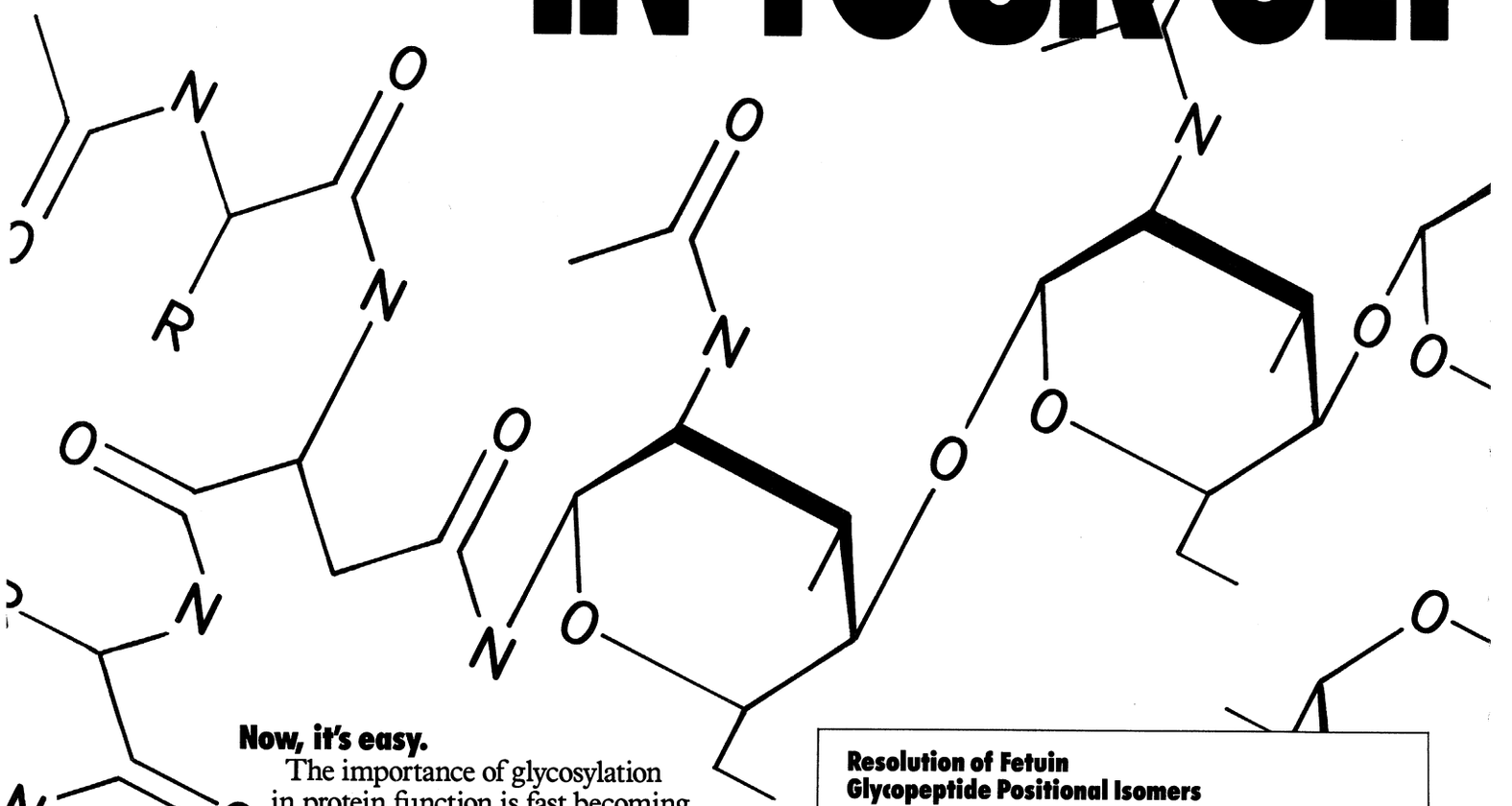

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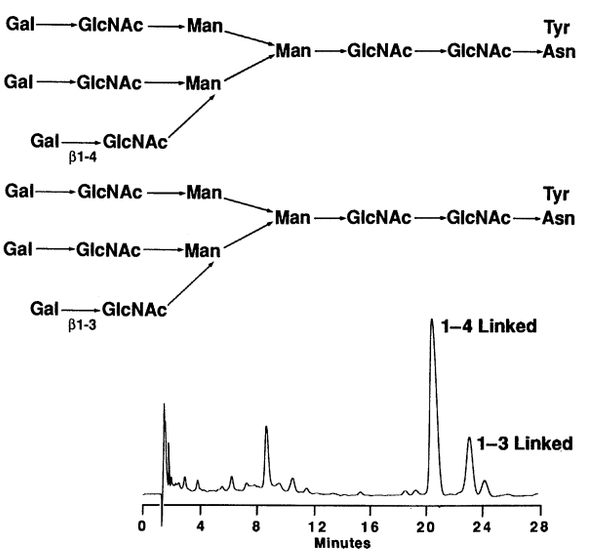

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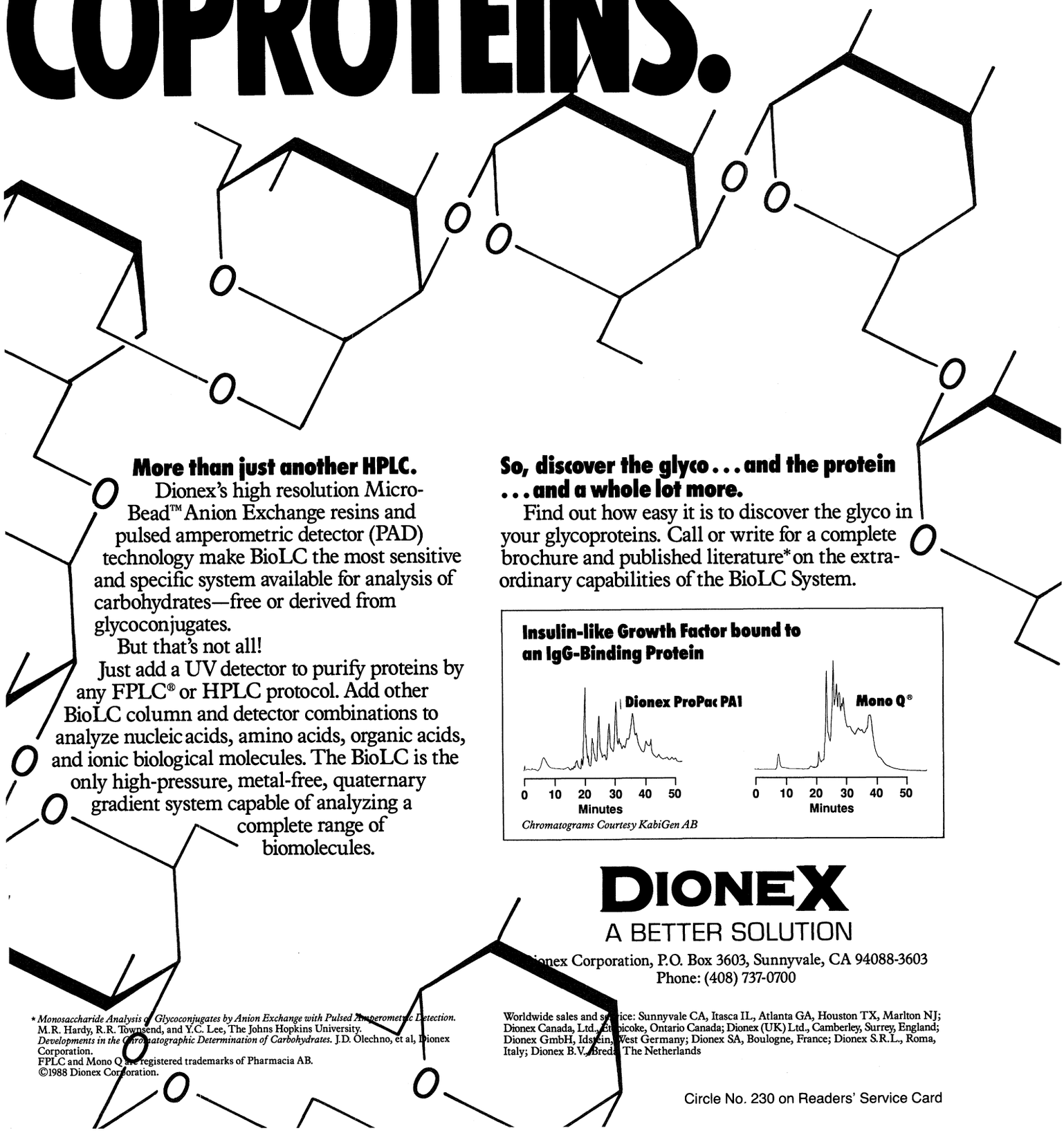

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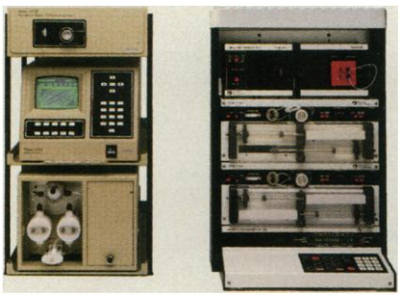

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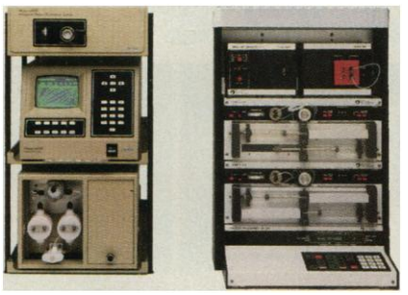

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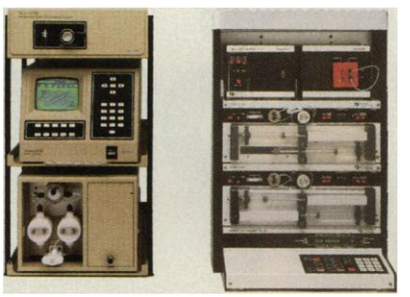

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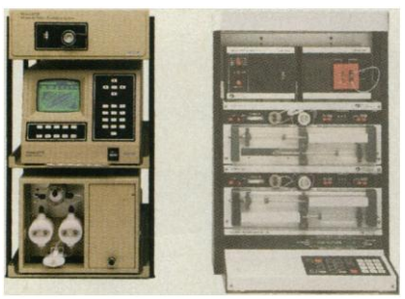

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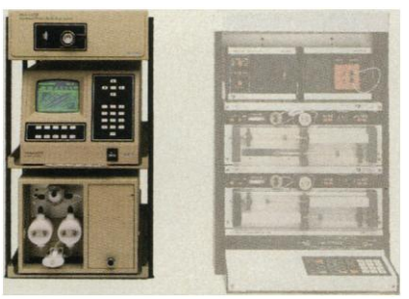

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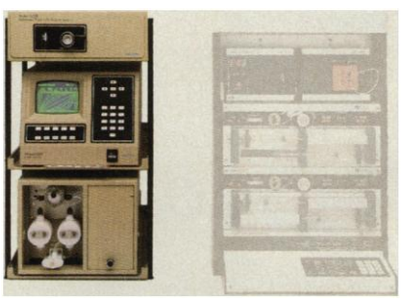

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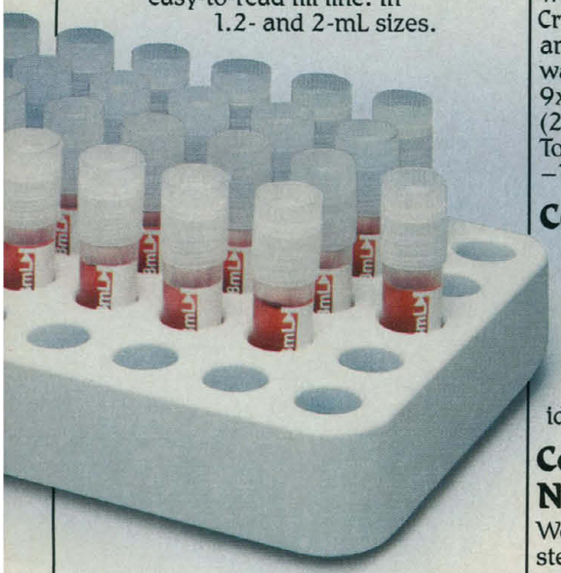

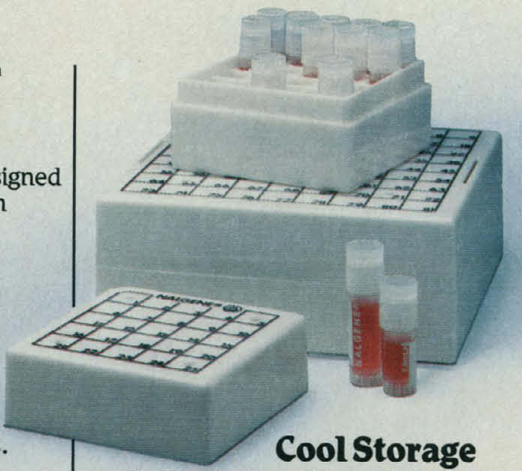

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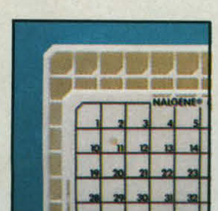

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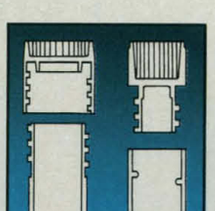

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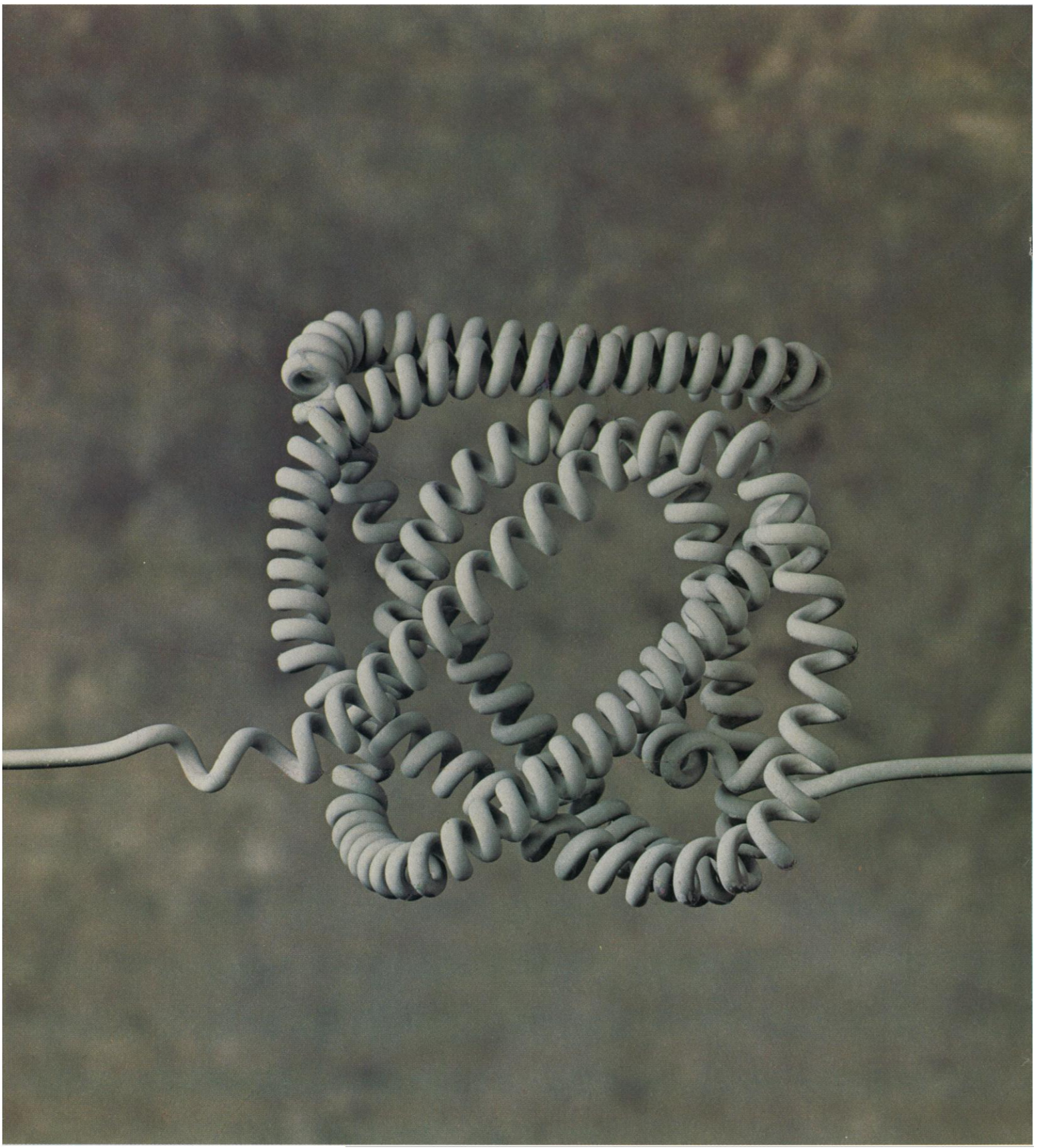

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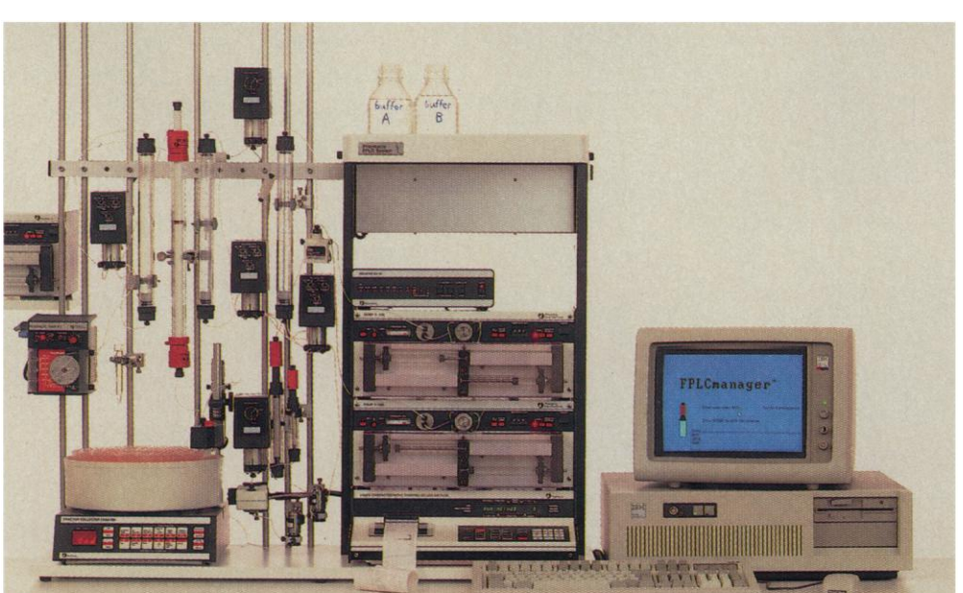

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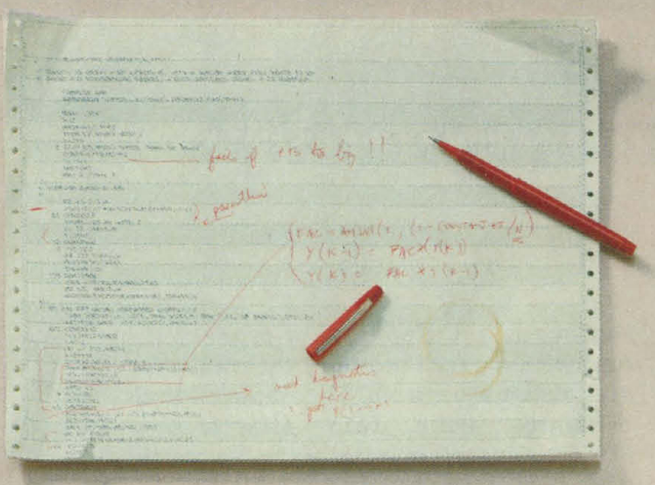

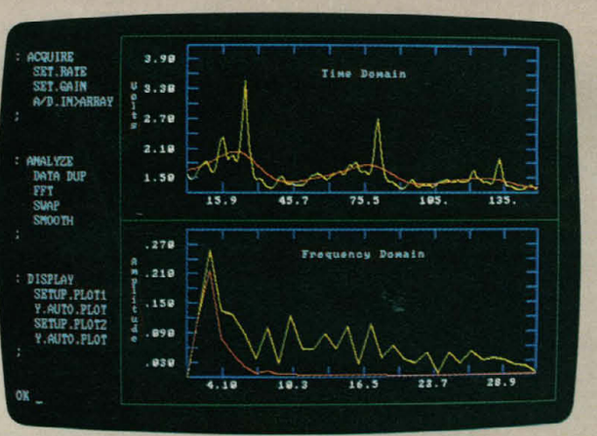

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It is, unfortunately, true that the number of scientists who work on prokaryotes has declined significantly in recent years. There is a danger that prokaryotic biology will suffer and decline if young scientists, in considering research systems, choose the more glamorous newcomers to the biological repertoire. This would be tragic, since there is much important work still to be done with prokaryotes, and they will undoubtedly continue to provide the most accessible entry to many problems of fundamental importance. One hopes that these books will help convince young investigators of the wisdom of studying prokaryotes.

JAMES D. FRIESEN
Research Institute,
Hospital for Sick Children,
Toronto, ON, Canada M5G 1X8

Endocrine Systems

Endocrinology of Selected Invertebrate Types. HANS LAUFER and ROGER G. H. DOWNER, Eds. Liss, New York, 1988. xxii, 500 pp., illus. $195; paper, $75. Invertebrate Endocrinology, vol. 2.

Invertebrate endocrine systems operate largely through neurosecretions and depend relatively less on the epithelial glands characteristic of vertebrates. In recent years the field of invertebrate endocrinology has grown in scope and gained rigor as a result of the application of contemporary technologies for isolation, sequencing, synthesis, and immunodetection of neuropeptides, as well as recombinant DNA technology for identification of peptide gene families.

This volume focuses on invertebrates other than insects, that group having been covered in the first volume. After an introductory account of concepts in comparative endocrinology, there are 19 contributions in five sections that treat different taxonomic groups. Although 60 percent of the volume is devoted, rightly, to crustaceans and mollusks, there are adequate descriptions of endocrine mechanisms in less intensively studied groups such as coelenterates, turbellarians, trematodes, cestodes, nemerteans, nematodes, and echinoderms. Additionally, three arthropod groups (merostomates, myriapods, and arachnids), often neglected in accounts of invertebrate endocrinology, are included.

In invertebrates other than mollusks and arthropods, much remains to be known about the chemistry of implicated hormones. An exception to this is the identification of an undecapeptide neurosecretory product that stimulates head and bud formation in hydra. An identical peptide has been found in mammalian hypothalamic and intestinal tissues, plasma, and tumors and tumor cell lines of neural and endocrine origin. This peptide represents an extraordinary case of structural conservation and widespread distribution. Equally interesting is the apparent role of thyroxine in the regulation of metagenesis, especially initiation of the transformation of polyp to medusa in jellyfish.

One of the best-studied invertebrate peptidergic systems is involved in the regulation of stereotyped behaviors associated with egg-laying in the sea hare *Aplysia* and the pond snail *Lymnaea*. This system is described in an extensive chapter containing excellent accounts of neurophysiological and ultrastructural characteristics of secretory cells; structure of bioactive peptides as well as their precursors and corresponding genes; post-translational processing of egg-laying hormones; and the role of various peptides on neuronal and non-neuronal targets that produce covert and overt behaviors associated with egg-laying.

Another well-studied molluscan peptide system includes FMRFamide and related peptides. This peptide family is known for its myotropic and neurotropic actions, relationship to opioid peptides, and widespread distribution; yet it is not covered in chapters dealing with molluscan endocrinology. The occurrence of FMRFamide-like peptides in arthropods and their role in the regulation of *Limulus* heart and crustacean stomatogastric system are discussed elsewhere in the book.

Crustacean endocrinology is presented in nine chapters, and the documented progress enhances understanding of the comparative organization and function of arthropod endocrine systems. Proctolin (a pentapeptide), first isolated from insects, is found in Crustacea, and in both cases it displays myotropic and neurotropic actions. The red pigment concentrating–adipokinetic hormone family is common to arthropods, but the identified members have distinct functions: chromatophoral pigment concentration in crustaceans and hyperglycemia, hypertrehalosemia, hyperlipemia, or cardioacceleration in insects. More recent work from our laboratory has shown that another neuropeptide family, composed of octadecapeptide pigment-dispersing hormones (which act on chromatophores and also cause light-adaptational eye pigment movements in crustaceans), is common to crustaceans and insects; the function of these peptides in insects remains unknown.

This book clearly shows that ecdysteroids serve as molting hormones in various arthropods. The regulation of ecdysone secretion may vary: crustaceans and chilopods utilize a neurosecretory molt-inhibiting hormone, whereas insects depend on the stimulatory prothoracicotropic hormone. Although the role of juvenile hormones (JH) in insects is well known, their occurrence and role in Crustacea remain unclear. This book presents recent findings of JH-analog, methylfarnesoate, which is secreted by mandibular organs in crustaceans and whose role is being examined.

Even though this is a multiauthored book with chapters that vary in organization and length (9 to 90 pages), it is marked by clarity of figures and text. It is an impressive record of recent progress, and it foreshadows exciting prospects for increased utilization of invertebrate models for endocrine research.

K. RANGA RAO
Department of Biology,
University of West Florida,
Pensacola, FL 32514

Books Received

Interactions of Water in Ionic and Nonionic Hydrates. H. Kleeberg, Ed. Springer-Verlag, New York, 1987. xiv, 311 pp., illus. Paper, $59.40. From a symposium, Marburg, F.R.G., April 1987.

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Statistics in Research. Basic Concepts and Techniques for Research Workers. Bernard Ostle and Linda C. Malone. 4th ed. Iowa State University Press, Ames, IA, 1987. xx, 664 pp., illus. $44.95.

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Synthesis and Chemistry of Agrochemicals. Don R. Baker *et al.*, Eds. American Chemical Society, Washington, DC, 1987. xii, 474 pp., illus. $64.95. ACS Symposium Series, 355. Based on symposia, 1984–1986.

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Techniques for Nuclear and Particle Physics Experiments. A How-To-Approach. William R. Leo. Springer-Verlag, New York, 1987. xvi, 368 pp., illus. $49.50.

Wind as a Geological Process on Earth, Mars, Venus and Titan. Ronald Greeley and James D. Iversen. Cambridge University Press, New York, 1987. xii, 333 pp., illus. Paper, $24.95. Cambridge Planetary Science Series, vol. 4. Reprint, 1985 edition.

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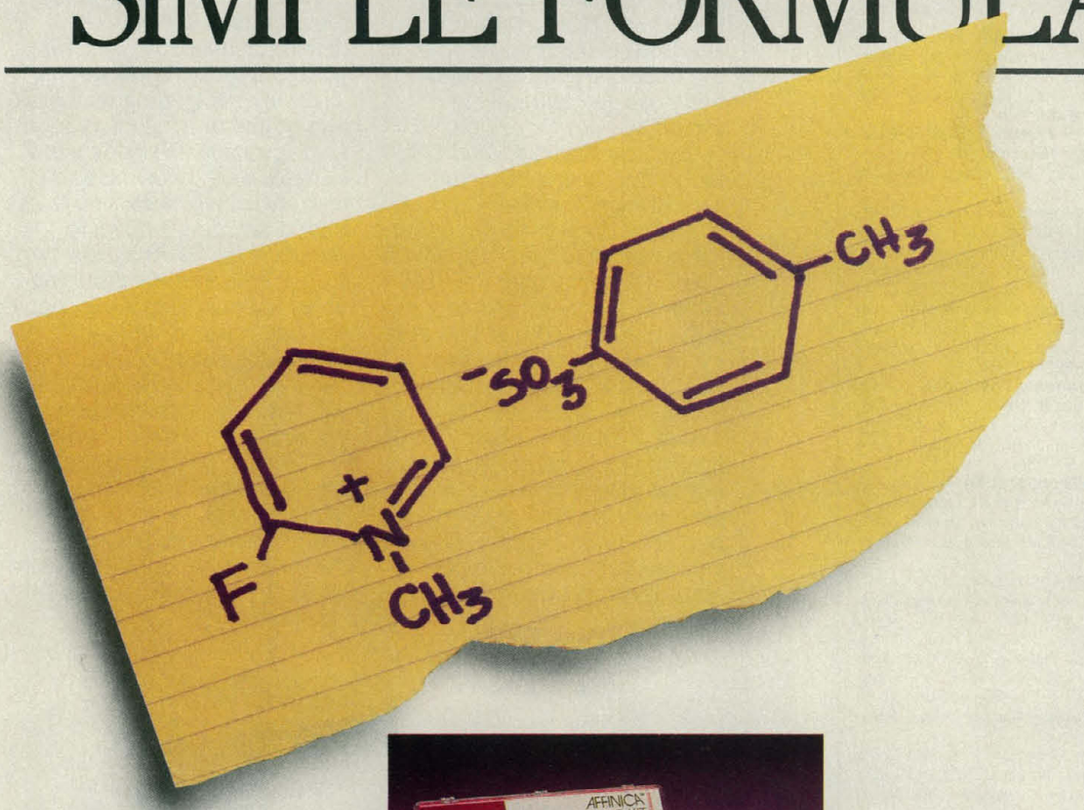

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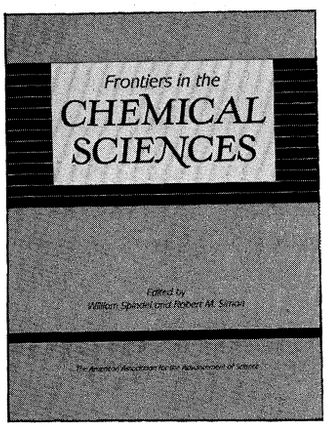

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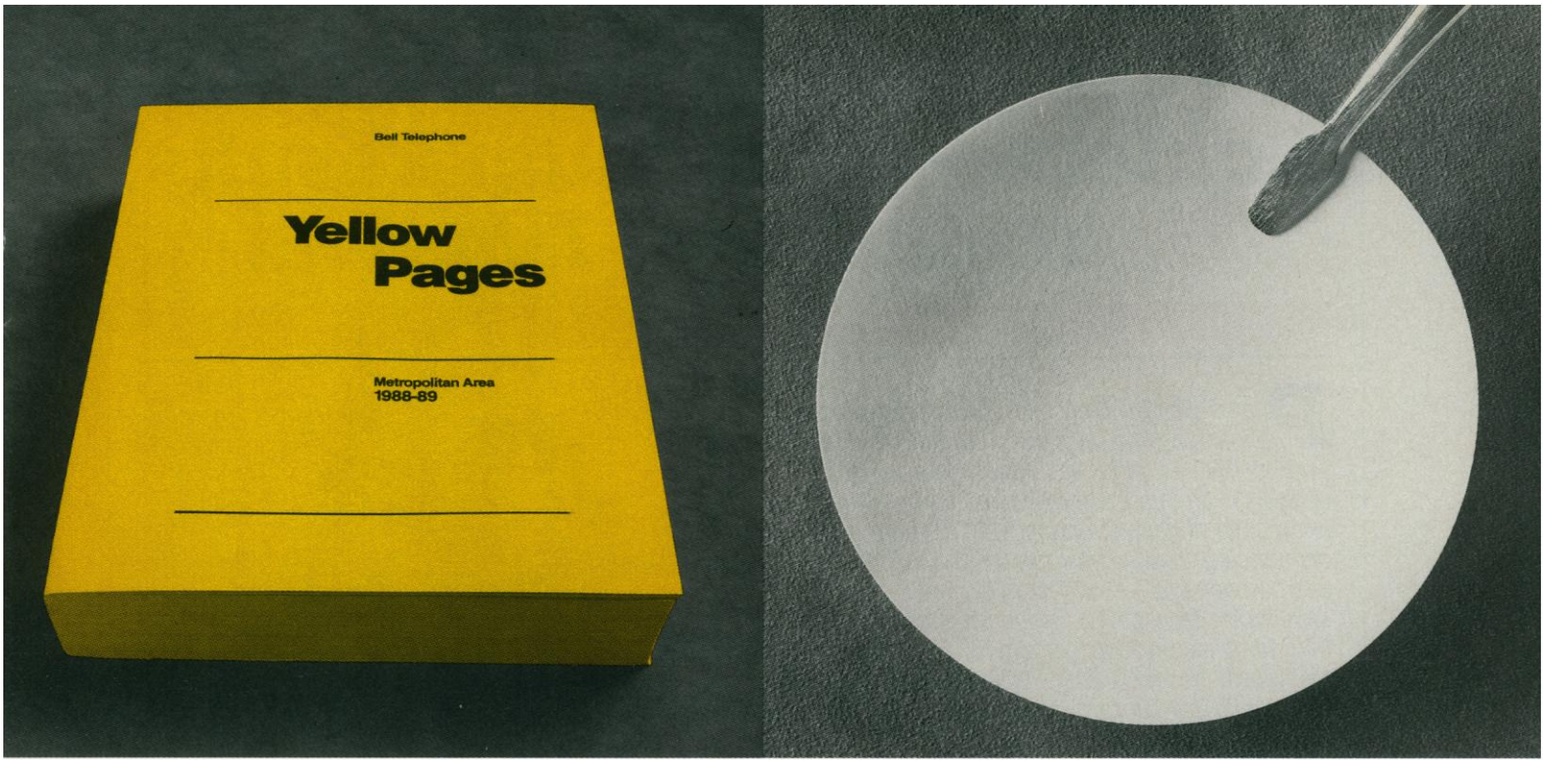

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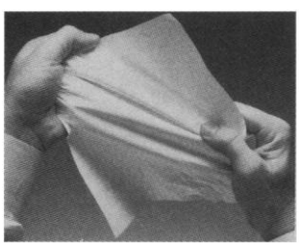

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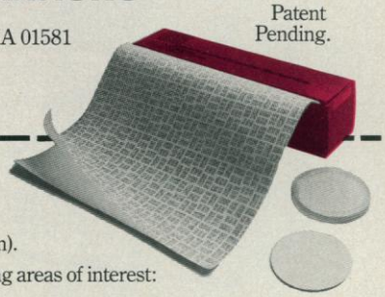

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