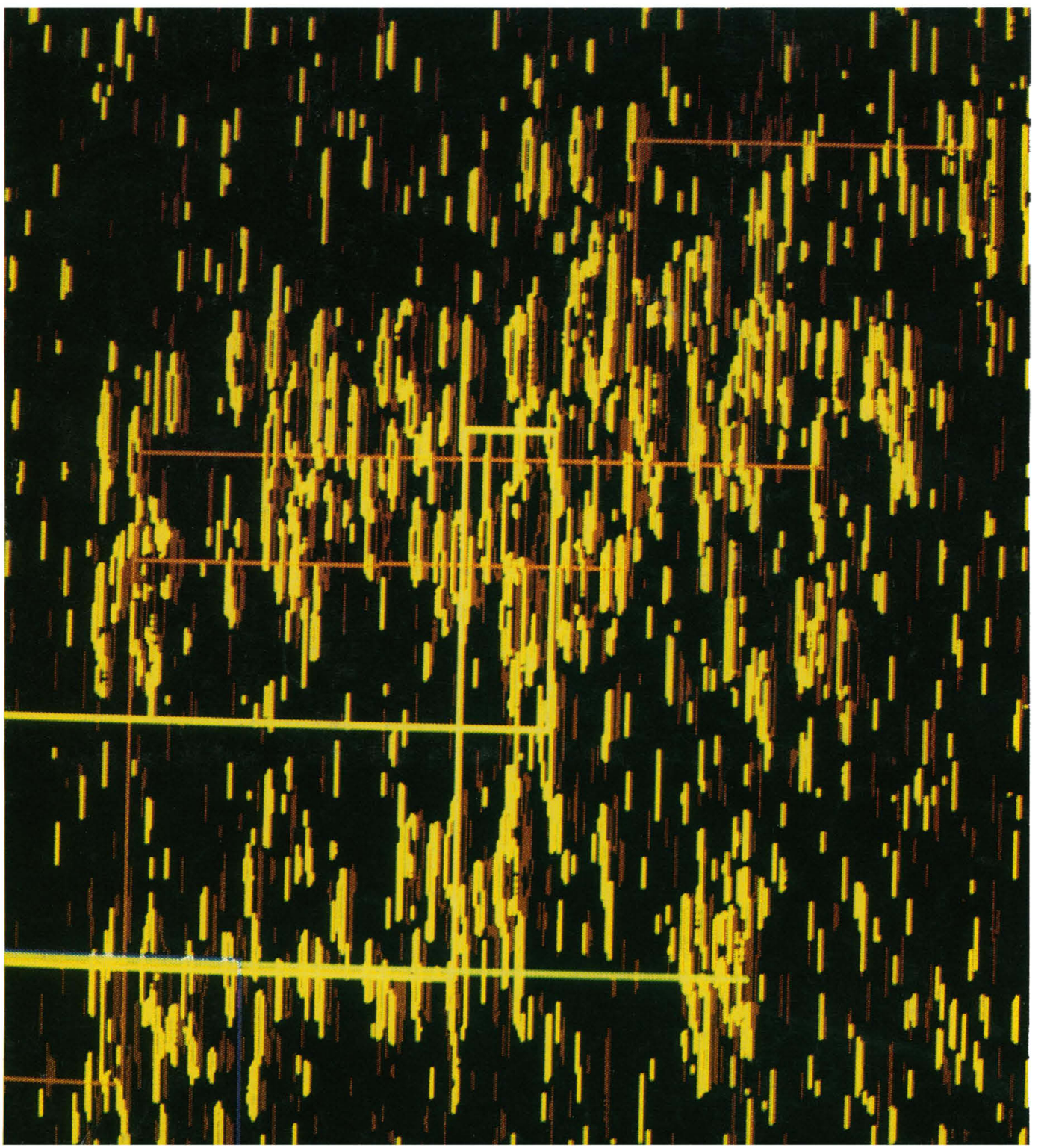
American Association for the Advancement of Science

SCIENCE

13 May 1988 $3.00
Vol. 240 ■ Pages 857–956



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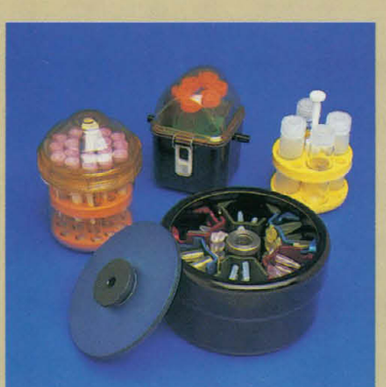

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SCIENCE

ISSN 0036-8075
13 MAY 1988
VOLUME 240
NUMBER 4854

■ **SCIENCE is published weekly on Friday, except the last week in December, and with an extra issue in February 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 at an additional entry. Now combined with **The Scientific Monthly®** Domestic individual membership and subscription (51 issues): $65. Domestic institutional subscription (51 issues): $98. Foreign postage extra: Canada $32, other (surface mail) $27, air-surface via Amsterdam $65. First class, airmail, school-year, and student rates on request. Single copies $3.00 ($3.50 by mail); back issues $4.50 ($5.00 by mail); Biotechnology issue, $5.50 ($6 by mail); classroom rates on request; Guide to Biotechnology Products and Instruments $16 ($17 by mail). **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. The identification code for *Science* is 0036-8075/83 $1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1333 H Street, NW, Washington, DC 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

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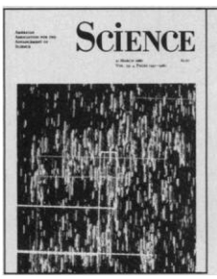

COVER Two-dimensional carbon-carbon double-quantum correlated nuclear magnetic resonance spectrum of a carbon-13 labeled protein, oxidized *Anabaena* 7120 ferredoxin (molecular weight 11,000). The lines represent the tracing of signals from the carbon chains of individual amino acid residues obtained with the "MADNMR" graphics program. See page 908. [B. H. Oh, W. M. Westler, P. Darba, and J. L. Markley, University of Wisconsin, Madison, WI 53706]

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This Week in SCIENCE

Rising sea level

THE last ice age peaked some 18,000 years ago, and, for 12,000 years, large ice sheets melted, adding significant volume to the world's oceans (page 895). Along with the three known major ice sheets (the Laurentian, Fennoscandian, and western Antarctic), there is now strong evidence that a fourth ice sheet existed in the vicinity of the Barents Sea north of Scandinavia. Since that ice age, the global sea level has risen more than 100 meters. In recent time, during the last century, the sea level has risen 10 to 15 centimeters. About half of this modern rise has been attributed to the expansion of the world's oceans through heating and the other half to the melting of small glaciers and ice sheets (perhaps a greenhouse effect). Peltier uses data on the earth's changing rotation patterns and redistributed masses of ice and water, acquired with space-based geodetic techniques, to test and constrain contemporary and long-term sea level rise scenarios.

Cricket circuits

STUDIES of the connections between nerve cells of invertebrates indicate that, as in vertebrate nervous systems, the invertebrate's system is not fully genetically "hard-wired" but can undergo rearrangements and refinements during maturation (page 901). Physiologic studies described by Chiba *et al.* were carried out on the wind-sensitive cercal system of crickets; this system triggers the cricket's escape from approaching predators. Like a number of other invertebrate neural systems, the cercal system is relatively straightforward to study because individual neurons can be identified, manipulated, and blocked. As crickets aged, new connections were made, old ones became disengaged, and thus new sensory circuits were formed. Because invertebrate and vertebrate sensory systems appear not, as dogma has had it, to be fundamentally different, studies in the simpler invertebrate systems may clarify the workings of their vertebrate counterparts.

Solar cycles

THE brightness of the sun is not constant but periodic over an 11-year cycle (page 906). A major role in solar brightness variation has been found to be played by faculae, bright dispersed patches or networks of strong magnetic fields. These fields are thought to reduce local plasma pressure and opacity and permit the escape of radiation from deeper and hotter layers of the sun. Sunspots (dark compact patches) also affect, but negatively, the sun's total brightness. A model of the relations of these active region phenomena to solar output of radiation is presented by Lean and Foukal. Model predictions of the variations in the sun's brightness over several months match well actual solar irradiance data collected between 1981 and 1984 by satellite radiometers; the model was also used for calculating variations in solar brightness during the past three solar cycles when no satellite measurements of irradiance were available. An understanding of the changes in the sun's brightness has both inherent interest and a practical side because, if the sun grows brighter or dimmer for extended periods of time, the earth's climate may be affected.

DNA movement in gels

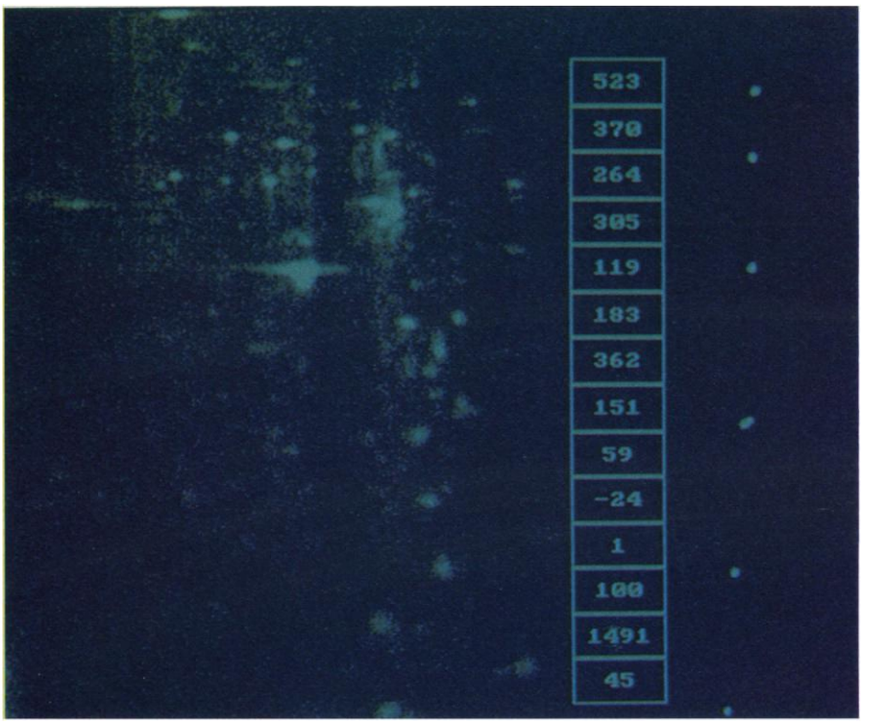
GEL electrophoresis has been widely used for separating molecules according to size (page 922). Molecules of DNA beyond a certain length do not, however, get positioned in the gel solely on the basis of size when the gels are subjected to a constant electric field; recently developed pulsed field methods work better for separating these larger molecules. How DNA moves through gels was originally explained by a "reptation" model in which DNA is depicted snaking through "tubes" (figurative representations of the resistance of the gel to the DNA). Although suitable for constant field electrophoresis, the reptation model does not explain DNA movement in pulsed field electrophoresis. In a numerical simulation, Deutsch has now examined DNA motion and finds that it cannot be described simply as movement through "tubes." The new model makes predictions that appear in better agreement with pulsed field experimental results.

Iron-responsive elements

FERRITIN and the transferrin receptor are two proteins that participate in iron metabolism within cells and whose synthesis is regulated by iron availability (page 924). When iron is abundant, synthesis of the transferrin receptor (which takes iron into the cell) is reduced but synthesis of ferritin (which sequesters iron in the cytoplasm) is enhanced. Both responses to iron availability, though contrasting, appear to be mediated by common elements—the iron-responsive elements (IRE)—that have similar sequences and predicted stem-loop structures. Casey *et al.* report that there are five IRE sequences in the 3′ untranslated end of the transferrin receptor's transcript and show that regulation involves alteration of messenger RNA levels; only a single IRE situated in the 5′ end is associated with the ferritin transcript, and regulation is at the level of translation and does not involve a change in the amount of messenger RNA. The IRE's context is crucial: a synthetic transferrin receptor-like IRE put into the 5′ region of an unrelated gene regulates in ferritin-like fashion. The authors suggest that "regulatory molecules" may bind the IREs and lessen translation when in a 5′ context but protect the gene transcript from degradation in a 3′ context.

The bottom lines

The amino acids of heavily (carbon-13) labeled proteins (in the prototype experiment, an 11,000 dalton molecule) can be distinguished on the basis of nuclear magnetic resonance signals given off by pairs of connected carbon atoms (cover). The technique will have spin-offs for proteins labeled also in their hydrogen and nitrogen atoms (page 908).



AMBIS screen image of 2-D gel analysis of ^{35}S-labeled whole cell proteins from murine Swiss 3T3 fibroblasts. Number in second box from bottom of screen, 1491, indicates quantitation of radioactivity in calmodulin. Courtesy of Herbert L. Cooper, National Cancer Institute.

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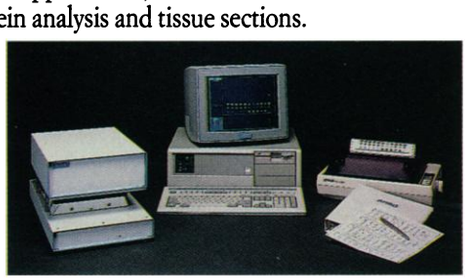

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Competitiveness: A Long-Enduring Problem

A gradual decay of our position of world leadership in manufacturing technology was apparent more than two decades ago when our annual rate of increase of labor productivity fell far behind those of Japan and West Germany. By 1980 these two countries were already competitive with the United States in many areas of manufacturing. When a team of Xerox engineers visited Japan in 1979, they discovered that competitors were manufacturing copiers at half of Xerox's production costs and with parts whose freedom from defects was better by a factor of 30.

Thus the United States was already in a weak position when the Federal Reserve initiated tight money policies to fight inflation. By early 1985 the value of the dollar had doubled against the deutsche mark. There was also a major increase against the yen. Between 1979 and 1985, unit labor costs in manufacturing in dollars increased 24 percent in the United States while decreasing 14 percent in Japan and 27 percent in West Germany. Between 1980 and 1985, U.S. exports of manufactures declined 19 percent, while those of Japan, Europe, and less developed countries increased 42 percent, 22 percent, and 88 percent, respectively. Simultaneously, U.S. imports increased, with a consequent manufactures trade deficit.

Since February 1985, the dollar has declined against the deutsche mark and the yen. Its value relative to those currencies in early 1988 was somewhat less than it was in 1980. However, the trade balance that existed in 1980 has not been restored. Among the reasons cited are the emergence of newly industrialized nations as competitors. In many items their technology and labor productivity is comparable to that of the United States, while wage rates are 10 to 20 percent of those here. Also, in 1980 the Latin American countries were borrowing in the United States and importing from it. Now they are trying to expand exports chiefly in U.S. markets to pay interest on their debts. A further drop in the dollar is widely considered to be inevitable, but that may not be enough.

There are indications that necessity awakened some companies to the desirability of learning lessons from the Japanese. For example, in 1981 Xerox announced a people-oriented strategy that included emphasis on quality, employee involvement, and decentralization of decision-making. By 1986 Xerox had achieved a great improvement in quality and had cut costs by a factor of 2. Using a similar approach and the just-in-time technique for parts, Harley-Davidson achieved a 45 percent increase in productivity, a reduction in inventory, lower absenteeism, and a 50 percent increase in market share.

Ralph Gomory, a senior vice president of IBM has written*

> Our most effective foreign competition to date has been characterized by
> - Tight ties between manufacturing and development;
> - An emphasis on quality;
> - The rapid introduction of incremental improvements . . . of a preexisting product; and
> - A tremendous effort, by those actually in the product cycle, to be educated on the relevant technologies, on the competition's products, and on what is going on in the world.

IBM has implemented those principles and has managed to be among the leaders in a series of cyclic incremental improvements that include going from memories of one bit per chip to a million bits per chip in 20 years. That kind of dramatic improvement is not potentially available in many industries. However, if the competitiveness of the United States is to increase in the near and intermediate term, there must be a never-ending search for incremental improvements in the procedures for producing existing products.

The federal government cannot successfully order industry to be more competitive. On the other hand, the government has long operated in a confrontational mode, with spotty exceptions. As the report of the National Academy of Engineering† has conveyed: ". . . government policies [should] be constantly reviewed to ensure that they not only achieve the desired social, political, and national security purposes, but also support—or at least not impair—our international competitiveness."—PHILIP H. ABELSON

*R. E. Gomory, *Bridge* **18**, 13 (Spring 1988). †"The technological dimensions of international competitiveness," a report to the Council of the National Academy of Engineering (Washington, DC, 1988), p. 8.

hill course of the illness firsthand, which could be a more effective influence than a cross-sectional classroom contact. In addition, a student volunteer program would enrich the supply of community volunteers who will be increasingly needed as the epidemic progresses.

Adolescents are a group at increasing risk for exposure to the human immunodeficiency virus (HIV), and society must exert every possible effort to motivate and influence their behavior toward a lower risk profile. If personal contacts with people with AIDS do have such an influence, then we need to study programs that facilitate such interactions to evaluate their potential importance in the educational approach to preventing AIDS.

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2. S. Staver, *Am. Med. News*, 23/30 October 1987, p. 3; A. Trachtenberg and S. B. Hulley, *J. Am. Med. Assoc.* **259**, 1015 (1988).

Fineberg's simple model of HIV acquisition correctly highlights the *individual* risks of unsafe sex; however, it is important that his results not be misinterpreted. For example, in evaluating a "safe sex" educational program, the discovery that active gay men have, on average, reduced their numbers of partners by a factor of 2 might be viewed as inconsequential according to Fineberg's model. In fact, such a change could have a dramatic impact on the prevalence of HIV among gay men. Similarly, consistent condom use over the long term would also have a large impact. Fineberg's model ignores the role risky behavior plays in *determining* the prevalence of HIV infection. Thus, although I agree with the general tone of his remarks, it is important not to understate the effects that reduction in (as opposed to erasure of) risky behavior can have on the AIDS epidemic.

EDWARD H. KAPLAN
Operations Research and Public Management, Yale School of Organization and Management, Box 1A, New Haven, CT 06520

Erratum: In the second paragraph of the News & Comment briefing "Duesberg gets his day in court" by William Booth (15 April, p. 279), William Haseltine's name was misspelled.

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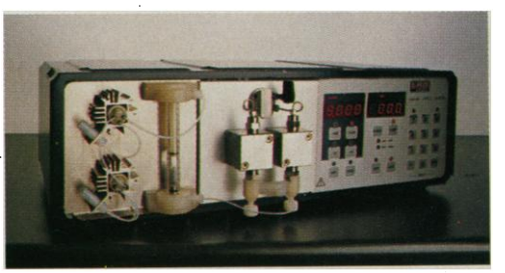

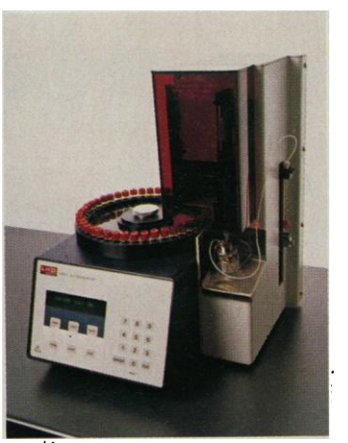

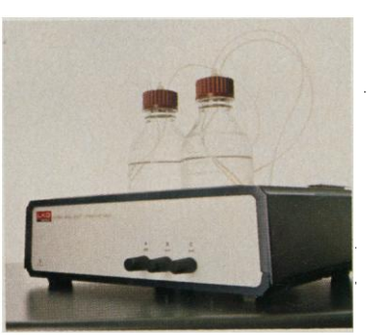

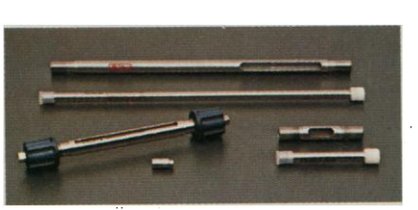

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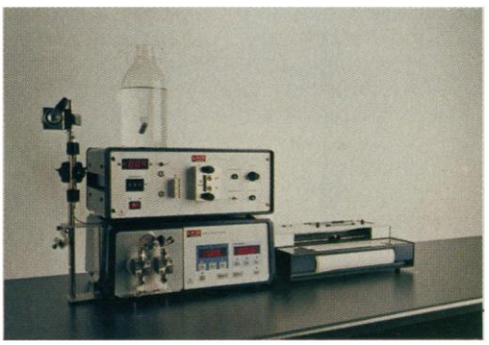

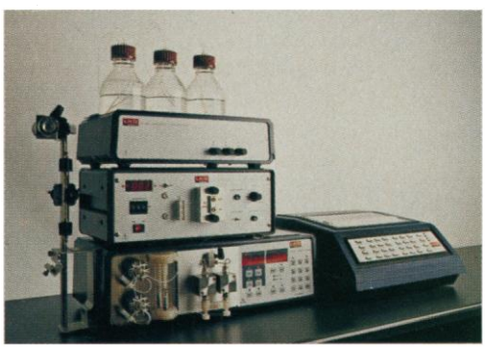

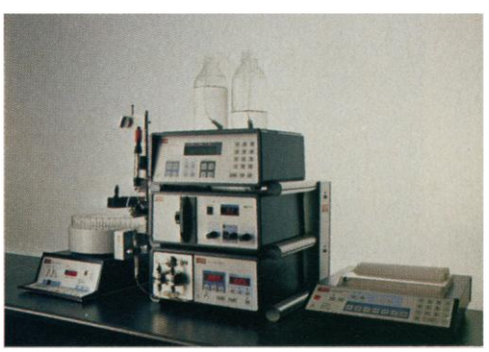

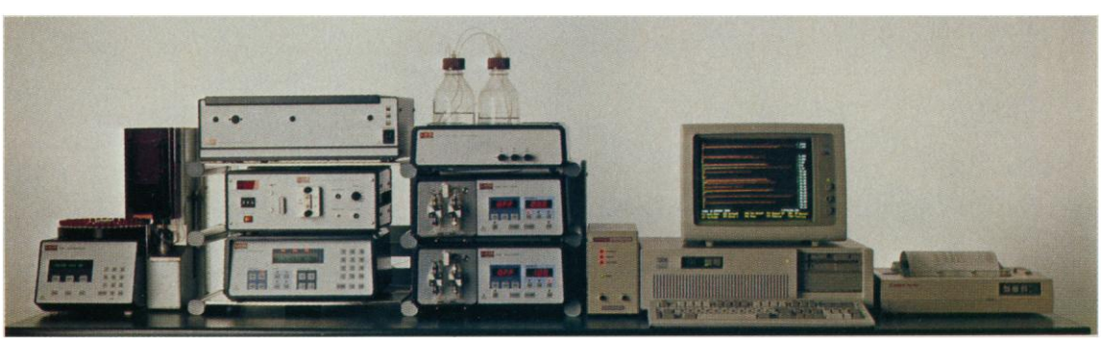

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Japanese Medicine

Health, Illness, and Medical Care in Japan. Cultural and Social Dimensions. EDWARD NORBECK and MARGARET LOCK, Eds. University of Hawaii Press, Honolulu, 1987. xiv, 202 pp. $21. Based on a symposium, Chicago, IL, Nov. 1983.

This slim volume offers a surprisingly broad introduction to the cultural aspects of medical care in contemporary Japan. Lock's introduction sets the tone by reminding us that medical practice everywhere is a rich amalgam of both esoteric and popular medical knowledge, since in addition to social and political factors, "in most parts of the world today societies have been exposed to at least one and often two major, literate medical traditions, the ideas of which have been superimposed, often over the course of hundreds of years, upon an indigenous nonliterate medical tradition" (p. 2). Japan is a good case in point, as Lock demonstrated in her 1980 book on the use of Asian medical traditions by Japanese physicians trained in modern Western biomedicine (*East Asian Medicine in Urban Japan*, University of California Press, 1980).

The essays here all deal with cultural and social aspects of medicine in a highly developed modern society where sophisticated medical care is widely available. Hence the subject is not the traditional cultural alternatives to modern medical care offered by nonmedical practitioners, but rather the ways in which cultural preferences and beliefs are expressed within and through modern medical care. As Lock puts it, "These studies in health and illness reveal from a unique vantage point the way in which the process of modernization has become encoded into and expressed through the body" (p. 4). The topic is explored with regard to such matters as the health care complex, the process of medicalization, the cultural construction of health and illness, changing symptom patterns and the epidemiology of illness, and the social and political uses of illness states.

William Steslicke's opening paper offers a wealth of useful statistics and a cogent description of the overall state of health and medical care in Japan. It is the best brief treatment of the subject available and will probably become the standard reference. The reader can quickly grasp the basic form of Japanese medical care: a system of private-sector providers paid both through national health insurance and through private health plans, within which physicians dispense both medical care and pharmaceutical products—a system that has produced high life expectancy, low infant mortality, and a pattern of mortality and morbidity rates similar to that of other advanced industrial societies.

Japan is a very healthy society, but when people do get sick they spend a long time in the hospital, largely because of traditional cultural beliefs about nurturance and the importance of bed rest. Steslicke guides us through the statistics not just to specifically cultural phenomena of this order, but more broadly to the political economy of contemporary Japanese medical care and the problems that the society is still struggling with.

Some of these problems are taken up in two subsequent short pieces. Susan Orpett Long examines the growing professionalism and technological orientation of Japanese health care providers, and Christie Kiefer assesses how Japan is coming to terms with health care for its rapidly aging population. Both papers carefully note cultural preferences along with the political, social, and economic pressures that shape the changing situation. Taken together, these three papers offer an impressive overview of the Japanese medical care system.

David Reynolds's paper on Japanese models of psychotherapy contains useful new material but is a bit of a disappointment to those who know his work. This piece seems but a pale shadow of the powerful analyses of cultural aspects of Japanese psychotherapy that he has presented in rich detail elsewhere.

The final two papers in the book are much narrower case studies of specifically female aspects of medical care in Japan. Lock's piece on the medicalization of distress is an intriguing analysis of how women express their personal needs, and their resistance to social arrangements, through medical means. It is a wide-ranging and suggestive treatment but perhaps tries to bring in more tantalizing thoughts than can be subjected to solid analysis in the compass of one short paper.

It also seems to overlap occasionally with Nancy Rosenberger's essay on menopause, which argues that Japanese women focus on menopausal problems to the extent that other important aspects of their gender role