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VOL. 237 ■ PAGES 1273–1388

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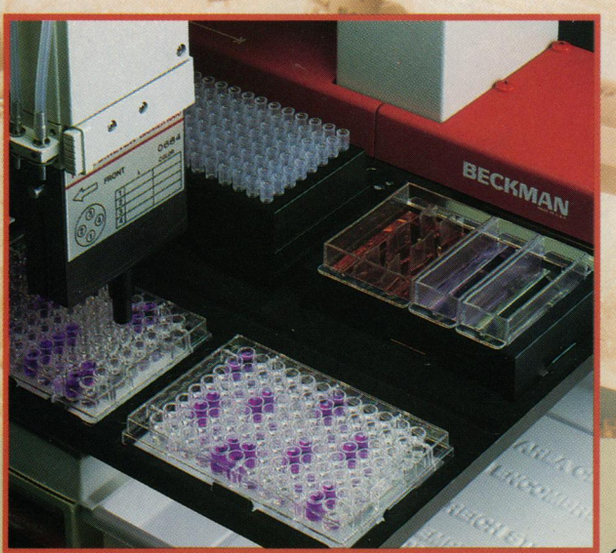

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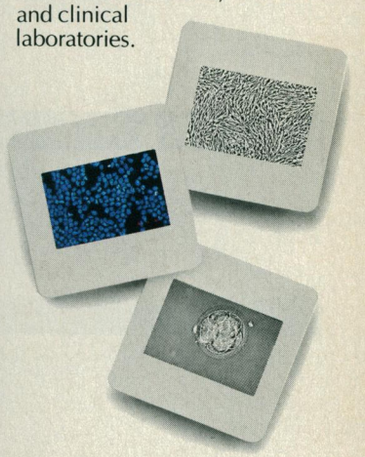

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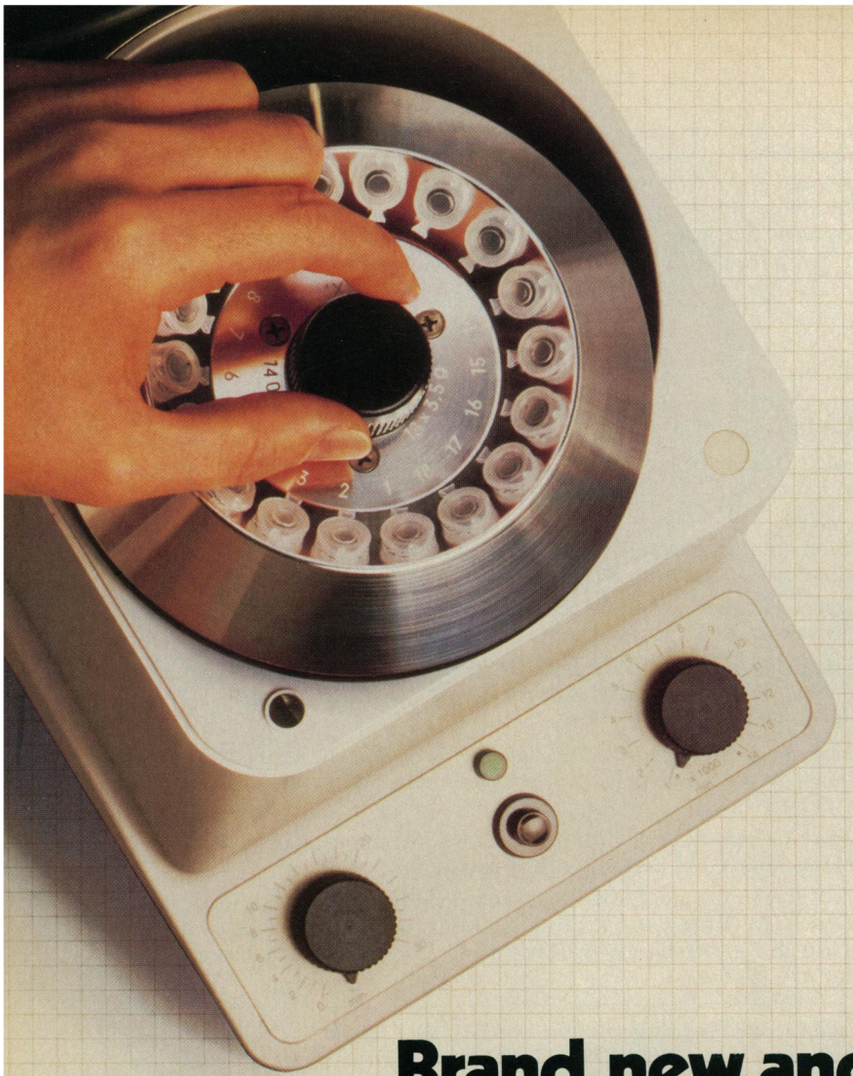
COVER A false-color thermal image of Pluto-Charon and its surrounding field, constructed from scans made by the Infrared Astronomical Satellite at wavelengths of 12, 60, and 100 micrometers. Blue and red indicate thermal emission from warm and cold sources, respectively. Pluto-Charon is the brightest source in the field, but is unresolved. See page 1336. [Steward Observatory, University of Arizona, Tucson, AZ 85721]

Reports

Book Reviews

Products & Materials



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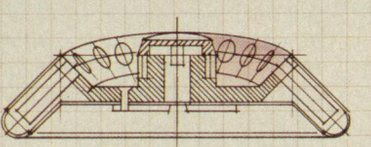

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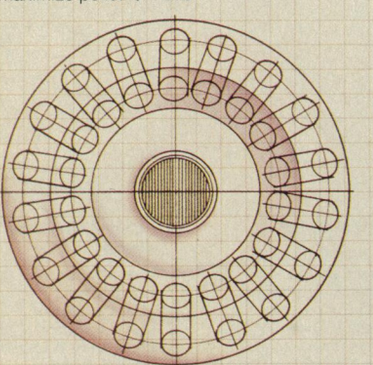

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Animal model for HTLV-1 infection

WHETHER the human T-lymphotropic virus HTLV-1 is both necessary and sufficient for the development of any human disease has remained difficult to establish, even though this virus has been isolated from patients with a variety of diseases affecting the lymphoid system (leukemias, lymphomas) and the nervous system (tropical spastic paraparesis) (pages 1324 and 1340). Thus, an animal model of HTLV-1 infection was sought in which the actions of the viral genes and the pathologies that are induced could be studied. Nerenberg *et al.* describe construction of a transgene that includes the *tat* gene from human HTLV-1, production of mice in whose cells the gene is expressed, procedures for screening for transgenic offspring, and some consequences of *tat* gene expression. Disease symptoms differed depending on what tissues were expressing *tat*. One group of transgenic mice was slow growing and died of infections at 3 to 6 weeks of age; their thymuses had atrophied. A second group developed soft tumors, and several generations of their progeny developed the same tumors. All the mouse tumors were shown by Hinrichs *et al.* to be neurofibromas of nerve sheath origin; they were similar morphologically and biologically to (and thus may be a valid model for) tumors that develop in von Recklinghausen's disease, the most common form of neurofibromatosis in humans. Because the spread of this virus in North America continues to accelerate, more associations with human disease are expected.

Lignin structure

LIGNINS are major constituents of plant cell walls; they are complex polymers associated with polysaccharides (page 1344). It has been difficult to study their structures both because they are fairly insoluble materials and because extraction procedures necessarily disrupt bonds and change bonding patterns. A new strategy for directly studying lignin bonding within plant tissue has been devised by Lewis *et al.*; it should also be applicable to studies of bond arrangements of suberins, the abundant cell-wall constituents that block moisture loss in plants and defend against the introduction of pathogens. Feland wheat (of which the root tissue is 10% lignin) was exposed for long periods (weeks or months) to a lignin precursor labeled with carbon-13; as a result, the nuclear magnetic resonance signals from those bonds that had newly formed were enhanced. In this way, the major drawback to solid-state nuclear magnetic resonance—that carbohydrate resonances mask signals from linkages in lignins and between lignins, suberins, and related molecules—was overcome, and bonds between individual carbon atoms could be identified. The results obtained with the new technique indicate that structures of synthetic lignins used in earlier studies do not closely approximate the wheat lignins' true natural structures.

Tests for AIDS viruses

FOR some purposes, such as screening blood, it is sufficient and desirable to lump together sera showing signs of exposure to any human immunodeficiency virus (HIV); for other purposes, such as tracing epidemiologic patterns of transmission and pathogenesis and for identifying additional variant viruses, it is crucial to be able to distinguish among the HIVs (page 1346). Gnann *et al.* describe methods for the development of sensitive immunoassays for infected sera that can lump or sort HIV strains. From the transmembrane glycoproteins, a partially conserved sequence has been identified consisting of 12 amino acids (of which 5 are common to HIV-1, the prototype AIDS virus, and HIV-2, another immunodeficiency virus that causes clinically indistinguishable infection); various synthetic peptides, patterned on the sequences of different HIV-1 and HIV-2 isolates, were evaluated for reactivity with sera from HIV-infected patients and uninfected individuals from Zaire, West Africa, and the United States. Increases in reagent specificities were effected with single amino acid substitutions in the peptide, making complete correspondence between reactivity and infection possible. With these techniques, it will be feasible to characterize, distinguish, and relate taxonomically HIV-1, HIV-2, SIV (the simian immunodeficiency virus), HTLV-IV (another human isolate), and their relatives.

Water ice and methane on Pluto and Charon

ONLY recently, as a result of a series of eclipses, has it been possible to study Pluto (the tiniest and usually most distant planet known in the solar system) separately from its rotationally locked satellite Charon. Marcialis *et al.* found that planet and satellite have radically different near-infrared spectra (page 1349). Charon's spectral signature suggests that its surface is rich in water ice and that certain other ices (methane, carbon dioxide, ammonia, and others) could be ruled out as major constituents. The exclusion of methane is particularly important because early ground-based spectroscopic observations identified methane as the dominant absorber in the system. Sykes *et al.* describe additional features of the combined Pluto-Charon system (cover) drawn from data that had been collected by the orbiting Infrared Astronomical Satellite (page 1336). The wavelengths probed were in the thermal infrared range that cannot be studied from the earth because of interference from background atmospheric radiation and absorption of radiation by atmospheric water vapor. Pluto's atmosphere is not as thick as has been thought and not thick enough to keep the surface at a uniform temperature. Methane ice appears to concentrate at the polar ice caps, and a methane-depleted band girdles the equator; in this region, water ice may be a significant component. Surface temperature differences (Pluto is colder) may account for the different compositions of the atmospheres and surfaces of Pluto and Charon.

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Scientists: Their Rewards and Humanity

As a rule, the accomplishments of outstanding agricultural scientists are rewarded primarily by such things as peer recognition, plaques, and honorary degrees, not prizes convertible into dollars. The first, and until now only, exception to this generality was Norman Borlaug, wheat breeder at the International Maize and Wheat Improvement Center in Mexico, 1970 winner of the Nobel Peace Prize. His contribution to the advancement of science came through breeding short, stiff-strawed, fertilizer-responsive wheat varieties and developing the production agronomy that permitted them to express their high genetic yield potential. His scientific contribution was significantly complemented by his leadership in gaining rapid adaptation and adoption of the new wheats and accompanying technology, particularly in Mexico, India, and Pakistan.

A key scientist in that technology-adaptation and -adoption process in India—M. S. Swaminathan, now director general of the International Rice Research Institute (IRRI) in the Philippines—was recently named the first winner of the $200,000 General Foods World Food Prize, to be awarded during ceremonies at the Smithsonian Institution on 6 October 1987. For over a quarter century, Swaminathan has been a major force in shaping India's policies in agriculture on an ecologically and economically sustainable basis. As a geneticist, he worked on the development of strains of wheat, rice, and coarse grains that would grow well in the ecological settings of India. His untiring work and dedication to prevent famine and ameliorate hunger in his homeland and the Third World have helped to generate self-confidence in the agricultural capabilities of the Third World. Just as Borlaug is regarded as the father of the Green Revolution worldwide, Swaminathan has been called the father of India's Green Revolution.

Establishment of the World Food Prize did not just happen. Following his worldwide recognition as a Nobel laureate, Borlaug worked diligently to get appropriate monetary recognition for other scientists working in the field of food and agriculture. He first tried the Nobel governing group but found that, after establishing the Nobel Prize in Economics, the group resisted awarding further specialized prizes. Undeterred, Borlaug continued to seek support for a major prize that would recognize other food and agricultural scientists and was rewarded by the initiation of the World Food Prize by the General Foods Fund, Inc. The purpose of the prize is twofold: (i) to give recognition to scientists for outstanding contributions to the quantity, quality, or availability of food and (ii) to stimulate talented young women and men to seek careers in some link of the food chain.

Swaminathan has effectively championed causes beyond the realm of science. For example, he has recognized the important role of women in agriculture in developing countries. "In the ultimate analysis," he wrote, "the goal of scientific research is to enhance human happiness. This is why IRRI accords importance to equity issues in technology generation and transfer. An important initiative in this field is greater attention to the problems of women farmers as well as women laborers in rice farming areas. Evidence suggests that when women have independent access to income, child nutrition is improved. The poorer the household, the greater the need to increase total family income by enhancing the earning capacity of women."

Swaminathan followed up his words, establishing the Asian Rice Farming Network, which has examined the effects on women of technological change in rice-based farming systems; designed, tested, and adapted technologies to reduce drudgery and increase women's incomes by creating more opportunities for them to earn money; and identified gaps in input-delivery systems and government policies that hamper women's full participation in developing and adapting technology.

With establishment of the World Food Prize, exceptional scientists such as Borlaug and Swaminathan can be properly recognized for their achievements and for extending their influence for the benefit of humanity.—ROBERT D. HAVENER, *President, Winrock International Institute for Agricultural Development, Morrilton, AR 72110*

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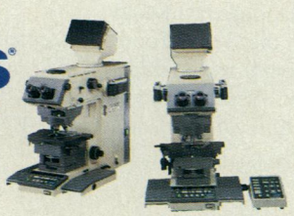

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We stress that it is important to view the possible hazard of aflatoxin from the perspective of the many everyday possible hazards of life and with the knowledge that there are a great many uncertainties in the use of animal bioassay data in extrapolation to humans. As we discussed at length, the promotional aspects of cancer are also critical, and it is likely that the hazard from aflatoxin will be much lower in the absence of some toxicity in the liver such as from hepatitis virus, alcoholic cirrhosis, or the maximum tolerated dose in rodents. Since the HERP values for synthetic pollutants, including pesticides, are usually an order of magnitude less than that from aflatoxin, concern over them should be even less.

BRUCE N. AMES
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LOIS SWIRSKY GOLD
Lawrence Berkeley Laboratory, Berkeley, CA 94720

REFERENCES

1. H. Autrop, T. Seremet, J. Wakhisi, A. Wasunna, *Cancer Res.* **47**, 3430 (1987); S. V. Thomson *et al.*, *J. Appl. Environ. Microbiol.* **35**, 1150 (1978); S. J. Cheng *et al.*, *Carcinogenesis* **6**, 903 (1985).

Response: We generally agree both with Stoloff's letter and the response of Ames *et al.* However, we *were* aware that the reliability of the connection between human cancers and exposure to aflatoxin B1 has been called into question by the realization that a more important risk factor is infection with hepatitis B virus, which inevitably confounds the data. Nonetheless, we believe that the certainty for human carcinogenesis is high, although not absolute; it is certainly superior to the evidence for cancers caused by dioxin. The 20 parts-per-billion action level for aflatoxin in peanut butter may indeed have been set at a detection limit (although we do not like this practice). However, as Stoloff himself points out, it has *not* been reduced, although a modest, in our view inadequate, proposal to reduce it to 15 ppb was made in 1977 long after more sensitive detection equipment was available. The proposal was abandoned.

RICHARD WILSON
E. A. C. CROUCH
Department of Physics and *Energy and Environmental Policy Center, Harvard University, Cambridge, MA 02138*

Erratum: In table 1 of the article "Changes in the distribution of American family incomes, 1947 to 1984" by Frank Levy (22 May, p. 923), the first quintile (%) for 1949 was inadvertently omitted. It should have been 4.5.

Concurrent congresses...

CONGRESS ON CYTOKINE RESEARCH
and
CONGRESS ON GROWTH FACTORS

October 25-28, 1987/The Wyndham Franklin Plaza Hotel, Philadelphia

CONGRESS ON CYTOKINE RESEARCH

Chairmen: Stanley Cohen, M.D., *Hahnemann University School of Medicine*
Jan Vilcek, M.D., *New York University School of Medicine*

This meeting* will focus primarily on interleukin, interferons, and cytotoxic cytokines, highlighting their potential importance in human disease. An attempt will be made to integrate studies of the mechanism of action of these agents and their application in the treatment of disease. Discussion groups based on the information presented at the poster sessions will be held Monday and Tuesday evenings.

**A portion of the funding for the scientific sessions has come from a generous grant from Immunex Corp.*

CONGRESS ON GROWTH FACTORS

Chairman: Renato Baserga, M.D., *Temple University School of Medicine*

This Congress will focus on growth factors and the biology of cell reproduction; two sessions will be shared with the Congress on Cytokines (Monday's program). This meeting will bring up-to-date knowledge of the environmental signals that control cell reproduction and of the genes and gene products that interact with and respond to these signals.

Sunday evening, October 25

Welcoming addresses: Doctors Cohen, Vilcek, and Baserga
Keynote address: EPIDERMAL GROWTH FACTOR, Stanley Cohen, Ph.D.
Vanderbilt University

Monday, October 26

JOINT SESSION

Morning

CYTOKINES AND GROWTH FACTORS
Chairman, *Graham Carpenter*
- Biology of Epidermal Growth Factor, *Graham Carpenter*
- Role of Platelet-Derived Growth Factor in Cell Proliferation and Transformation, *Bengt Westermark*
- Endothelial Cells and Fibroblast Growth Factor, *Thomas Maciag*
- Growth Modulation and Signal Transduction of Tumor Necrosis Factor, *Jan Vilcek*
- Intracytoplasmic Inhibitors and Activators of Cell Growth, *Stanley Cohen*

Afternoon

CYTOKINE AND GROWTH FACTOR RECEPTORS
Chairman, *Warren J. Leonard*
- Tyrosine Kinase Family of Growth Factor Receptors, *Joseph Schlessinger*
- Protein Kinase C and Transduction Pathway, *Ora M. Rosen*
- Transforming Growth Factor-Beta Receptors, *Joan Massague*
- Receptors for Gamma Interferon and Tumor Necrosis Factor, *Klaus Pfizenmaier*
- Interleukin-2 Receptor, *Warren J. Leonard*

Tuesday, October 27

CYTOKINE RESEARCH

Morning

REGULATION OF B CELL GROWTH AND DIFFERENTIATION
Chairman, *William E. Paul*
- Interleukin-2 in B Cell Differentiation, *Marian E. Koshland*
- Interferon-Beta$_2$: Molecular Biology and Function, *Michel Revel*
- Interferon-Beta$_2$: Regulation of Expression, Pravinkumar B. Sehgal
- Hybridoma/Plasmacytoma Growth Factor and BSF$_2$, *A. Billiau*

Afternoon

CELL-MEDIATED EFFECTOR FUNCTIONS
Chairman, *Ronald B. Herberman*
- Molecular Mechanisms of Lymphocyte-Mediated Cell Lysis, *Eckhard R. Podack*
- Interactions of NK Cells with Cytokines, *Bice Perussia*
- The LAK Cell: Mechanism of Action, *Ronald B. Herberman*
- Molecular Mechanisms Regulating Macrophage Functions, *Dolph O. Adams*
- Macrophage Activation by Lymphokines, *Carol A. Nacy*

GROWTH FACTORS

Morning

REGULATION OF GENE EXPRESSION IN DEVELOPMENT AND GROWTH
Chairman, *Renato Baserga*
- Regulation of @-Feto Protein and Albumin Genes during Development, *Shirley Tilghman*
- Regulation of c-mcy Oncogene, *Kenneth Marcu*
- Role of Oncogenes in Hemopioetic Cell Differentiation, *E. Preem Reddy*
- Modulation of Growth Regulated Genes, *Renato Baserga*
- Regulation and Function of c-fos Gene, *Edward Ziff*

Afternoon

THE G_1 PHASE AND S PHASE OF THE CELL CYCLE
Chairman, *Arthur B. Pardee*
- The G_1 Phase of the Cell Cycle, *W. Jack Pledger*
- Biochemistry of Interferon System, *Peter Lengyel*
- Signals for Onset of DNA Synthesis, *Arthur B. Pardee*
- Regulation and Localization of IGF Biosynthesis, *Kay Lund*
- Growth Factors and Oncogenes in G_1 Progression, *Judith Campisi*

Wednesday, October 28

CYTOKINE RESEARCH

Morning

CYTOKINES: MEDICAL ASPECTS
Chairman, *Steven Gillis*
- Activation of Vascular Endothelium by Tumor Necrosis Factor and Other Cytokines, *Jordan S. Pober*
- Colony Stimulating Factors, *Peter Ralph*
- Interleukin 1 and its Receptor: Role in Hematopoiesis and Immunity, *Steven Gillis*
- Cytokine Activation of Lesional Lymphocytes, *James T. Krunick*
- Proteins Controlling Angiogenesis, *Daniel B. Rifkin*

Concluding Remarks, Stanley Cohen and *Jan Vilcek*

GROWTH FACTORS

Morning

TOPICS ON CELL PROLIFERATION
Chairman, *Vincent Cristofalo*
- Relationship of Thyroid Hormone Factor to Oncogenesis, *Cary Weinberger*
- Growth Factor Regulation of Human Diploid Cell Proliferation, *Vincent Cristofalo*
- Optimal Conditions for Growth of Cells in Serum Free Media, *Wallace McKeehan*
- Growth Factor-Dependent Proliferation and Differentiation of Myelomonocytic Cells, *Giovanni Rovera*
- Regulation of Thymidine Kinase Gene, *Prescott L. Deininger*

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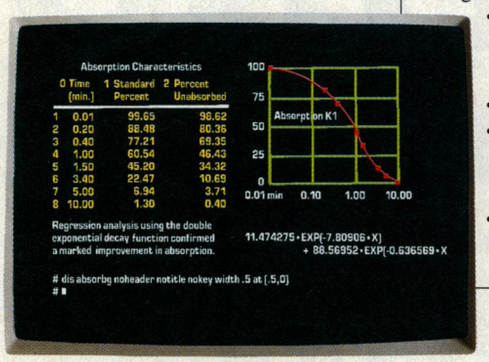

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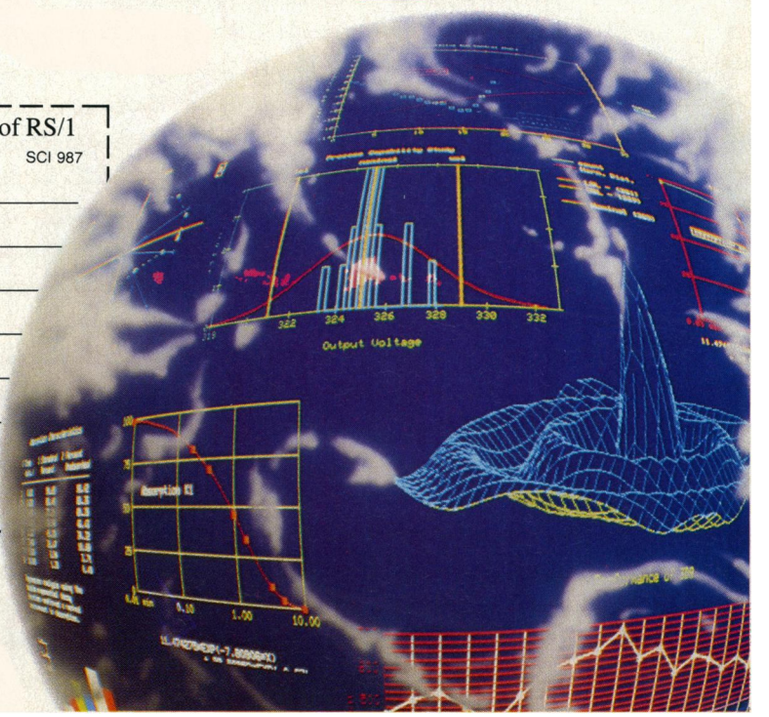

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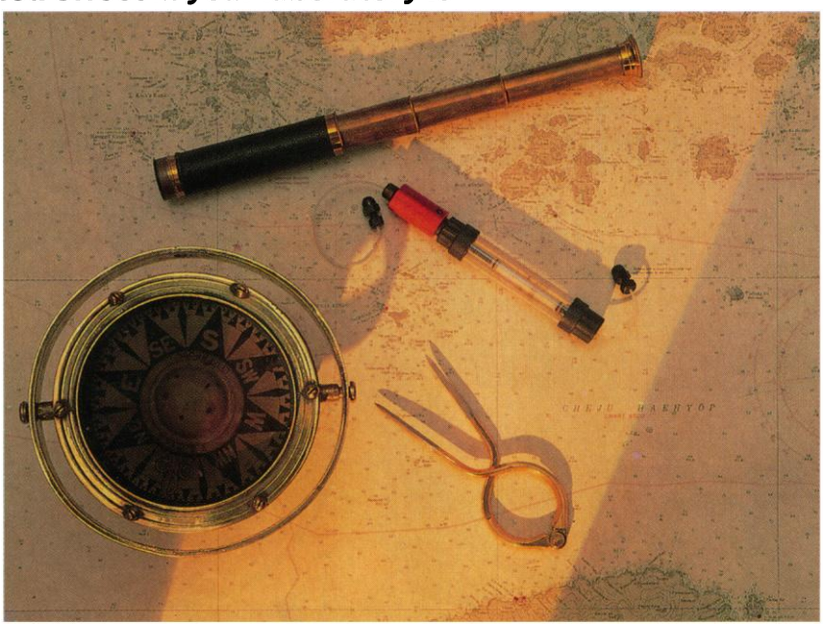

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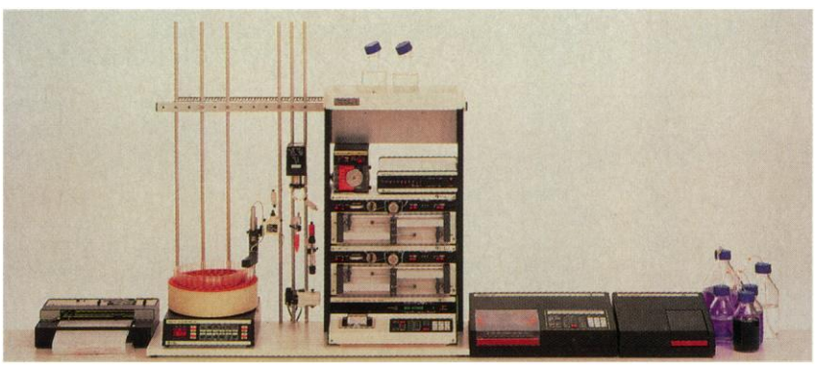

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about the test during the war. As James Reed's essay indicates, Yerkes wanted to determine the role of consciousness in the evolution of human and other species and therefore considered critical the questions Terman disregarded; if the psychologist's object was analysis of his subjects' capacity to learn and judge, he could not evaluate their test responses in ignorance of the experiences that shaped them—experiences derived from socioeconomic circumstances—and he would regard the scores of subjects tested only once as meaningless, since he could plot their learning curves only from repeated trials.

Does Yerkes's willingness to compromise his theoretical rigor while he was working as an applied psychologist illustrate a generic distinction between academic and applied research? The practical career of Walter Dill Scott also seems to demonstrate this distinction. As Richard von Mayrhauser makes clear, Scott was not concerned to determine whether those qualities termed "intelligence" represented a single trait or diverse characters or whether his vocational tests measured inherited aptitude or learned skill, for resolution of these issues was irrelevant to his goal of constructing predictive measures. Nevertheless, as Leila Zenderland and Hamilton Cravens show in their essays on Henry Herbert Goddard, the applied psychologist may be an agent of intellectual innovation, and his workplace may serve as a laboratory in which theories are tested and dismissed. Goddard was to become an academic, but he introduced the IQ test developed in France by Alfred Binet to America while he was working with children institutionalized because they were judged ineducable or delinquent. His charges presented a bewildering array of symptoms, and Goddard initially believed that he had effected diagnostic order by tracing all pathologies to hereditary mental defect; experience convinced him that intellectual weakness was not necessary to the etiology of moral disorder and, moreover, that delinquency was the product of heredity and environment.

The book gives less attention to public debates over psychologists' work than to disagreements within psychology. We do learn, to give some examples, that such prominent laymen as Walter Lippman opposed the IQ test because it measured privilege, not heredity (as did such psychologists as William Bagley), that many classroom teachers considered multiple-choice tests to preclude meaningful education, that the old-guard administrators of institutions for wayward youths judged the rule of psychologists excessively permissive, and that psychologists frequently clashed with physicians when they made policy prescriptions. More detailed evidence of this sort might give us a better appreciation of the impact of psychology on society, for we can assume that those who objected to it were often (if not always) those who felt their interests threatened. It would be unfair, however, to hold this book to a standard no other history of psychology has achieved.

In sum, this is a fine book, whose authors illuminate both the social context of ideas and the process of intellectual discovery. Furthermore, it represents a triumph of editorial organization, a collection of essays by diverse hands that in the aggregate constitute a sustained narrative and a consistent argument.

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