American Association for the Advancement of Science

SCIENCE

27 JUNE 1986 $2.50
VOL. 232 ■ PAGES 1577–1672

Big News for the TL-100 Benchtop Ultracentrifuge

The Beckman TL-100 Ultracentrifuge—with a choice of fixed angle, swinging bucket and vertical tube rotors—has become the preferred way to separate small sample volumes, typically taking only one-fifth the time required by floor-model ultracentrifuges.

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Big NEWS! For the complete story on the TL-100 benchtop ultracentrifuge, its rotors, tubes, accessories and applications, write Beckman Instruments, Inc., Spinco Division, 1050 Page Mill Road, Palo Alto, CA 94304. Offices worldwide.

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- cell surgery
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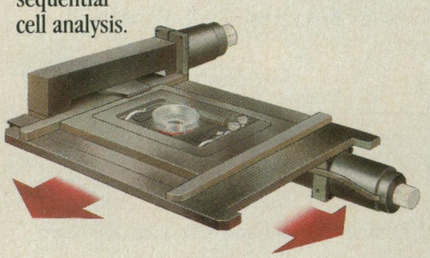

By integrating computer-controlled laser illumination and stage movement, the ACAS 470 lets you explore new frontiers in cell research. Now you can automatically isolate

- subpopulations of cells
- mutant cells
- transfected cells

for propagation or analysis.

Now you can use fluorescence to quantitatively measure

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- cell-cell interactions
- fluorescence redistribution after photobleaching (FRAP)
- cell subpopulations

and much more.

Isolate cells for propagation or analysis

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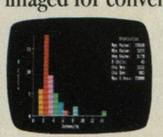
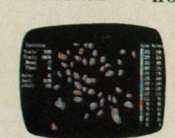


Perform quantitative fluorescence analysis on large numbers of cells



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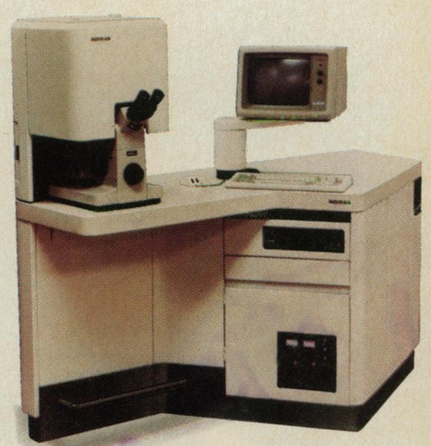

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American Association for the Advancement of Science

SCIENCE

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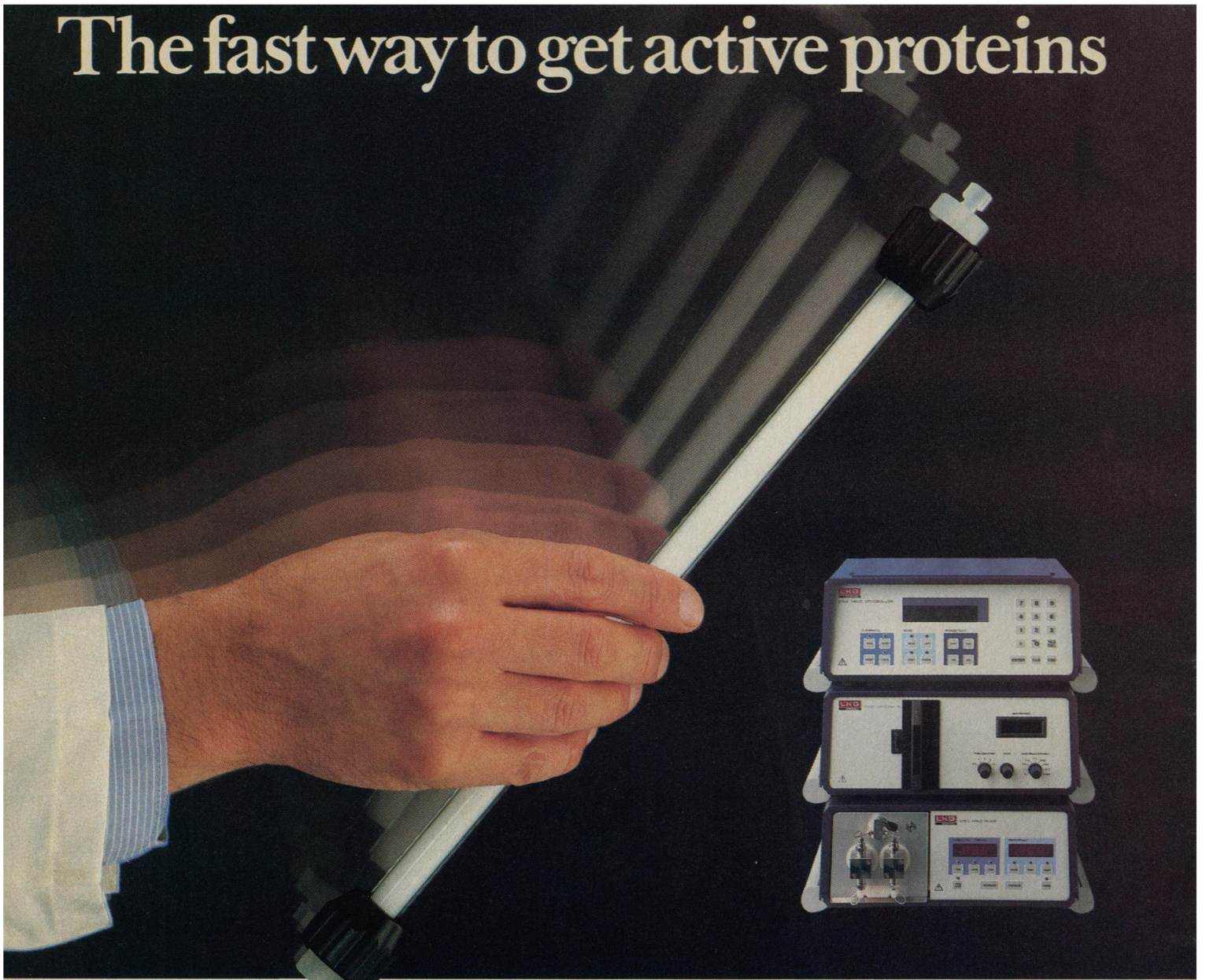
COVER Natural populations of wild radish (*Raphanus raphanistrum*) frequently contain a genetic polymorphism for flower color. The recessive yellow morphs are more attractive to pollinators than are the white morphs. The increased attractiveness results in more pollen from yellow-flowered individuals being spread among other plants in the population. Consequently, the fitness of the yellow plants is enhanced. See page 1625. [Allison A. Snow, Department of Botany, University of California, Davis, CA 95616]

The fast way to get active proteins



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Mixed sea-salt aerosol

In remote oceanic regions, most particles of the atmospheric aerosol that contain silicate dust of continental origin are internally mixed with sea salt (page 1620). Andreae *et al.* have used scanning electron microscopy and electron microprobe analysis to study the characteristics of individual particles of silicate dust and found that most of the silicate particles were in physical contact with sea-salt aerosol that is generated at the ocean surface. The mixing of particles of different origins is attributed to coalescence processes that take place within clouds. Such processes would also lead to coalescence of sea-salt particles with atmospheric sulfate aerosol, whose origin is either natural or from human-generated combustion, enriching the cloud droplets with sulfate and making it available for scavenging from the atmosphere. The measurements of sulfate in particles are consistent with this scenario. A more complete picture is emerging of the dynamic processes that control the lifetimes of aerosol particles in the atmosphere, and this will enhance the ability to make satisfactory predictions of atmospheric residence times of substances involved in acid rain and radioactive fallout.

Trace gases in the atmosphere

The buildup of trace gases in the atmosphere may be as effective in warming the earth as the increase in carbon dioxide. The halocarbons CCl_3F (F-11), CCl_2F_2 (F-12), CCl_4, and CH_3CCl_3 as well as methane and nitrous oxide continue to increase, but the rate of increase appears to have slowed down (page 1623). Rasmussen and Khalil have analyzed 10-year gas measurement data for sites at the South Pole and in the Pacific Northwest. The concentrations of the refrigerants and propellants F-11 and F-12 and of CH_3CCl_3 are now about twice those of a decade ago, and the other gases have increased at a slower rate. All the gases increased more rapidly earlier in the decade than in the last 5 years. It is likely that these gases will continue to increase as world population grows, and they have the potential to change the global environment.

Flowers and pollen dispersion

The evolution of angiosperm flowers may be driven primarily by the process of pollen donation rather than by successful maturation of seeds (page 1625). Wild radish plants (*Raphanus raphanistrum*) were studied by Stanton *et al.* to determine whether floral attractiveness has the same effect on both male and female fitness. Wild radish is self-incompatible, and natural populations often contain both white- and yellow-flowered individuals; pollinators strongly prefer yellow flowers. Petal color is controlled at a single genetic locus, with white dominant to yellow. An artificial population of wild radish was created, with plants homozygous for either white or yellow petals, and the plants were then allowed to be pollinated by natural pollinators in the field. The genetic makeup of the population allowed determination of the color of the male plant. In spite of the strong preference by pollinators for yellow flowers, white and yellow plants were equally successful as females. Male performance, or pollen donation, was strongly correlated with pollinator discrimination, and yellow plants were more successful pollen donors than were white plants. Angiosperm flowers may have evolved primarily as structures to disperse pollen rather than as female organs.

Neuronal acetylcholine receptors

Information from the retina of the eye is transmitted to the central nervous system by way of retinal fibers and synapses to the optic tectum. Previous studies have suggested that acetylcholine receptors play a role in transmission from the retinal ganglion cells to tectal neurons. Henley *et al.* used monoclonal antibodies to acetylcholine receptors in goldfish eye and brain to localize to the retina the site of synthesis of a pool of these receptors (page 1627). After synthesis the receptors are transported by rapid axonal transport to the optic tectum to participate as receptors on presynaptic retinal terminals. Retinal fibers are thus not cholinergic but cholinceptive and modulate retinotectal communication. Acetylcholine may not be a neurotransmitter in this system but may modulate synaptic transmission. The modulation of these receptors may be important for the plasticity of synaptic connections in the goldfish visual system.

Banding mouse chromosomes

A new high-resolution banding technique has been applied to mouse chromosomes to visualize more than 500 bands in late prophase, twice as many as can be seen with conventional metaphase techniques (page 1632). Sawyer and Hozier exposed premitotic cells to actinomycin D and the dye acridine orange to yield highly elongated banded chromosomes held in an extended state by intercalation of the dye between DNA base pairs. Banding procedures allow identification of individual chromosomes and provide information on the localization of genes. When mouse and human chromosomes were compared, segments of human chromosome 1 and mouse chromosome 4 had nearly identical banding patterns. Extensive homology was found at regions spanning the gene positions for phosphoglucomutase-1 and phosphogluconate dehydrogenase. Other homologies were seen in the vicinity of the major histocompatibility loci, the galactokinase and soluble thymidine kinase genes, and the loci for immunoglobulin heavy chain and the α-1-antitrypsin gene. The technique can be used in comparative cytogenetics and gene mapping and for analyses of chromosome aberration associated with cancer and other disorders.

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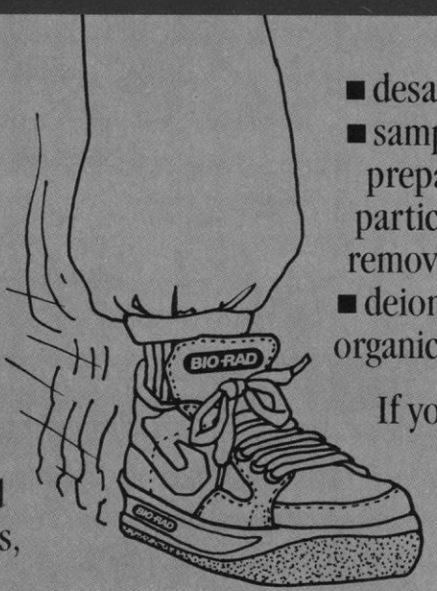

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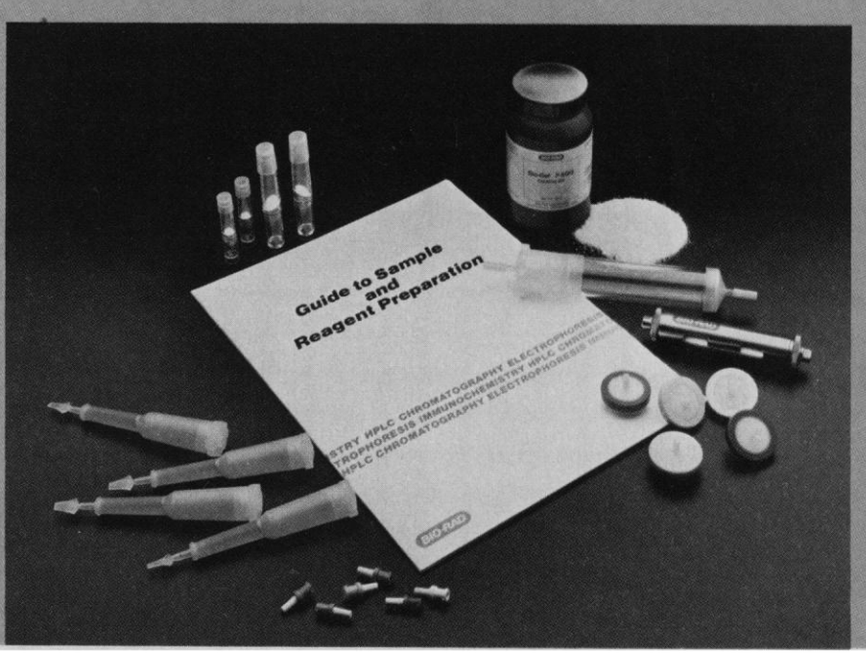

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Answers.

SCIENCE

27 JUNE 1986
VOLUME 232
NUMBER 4758

Dealing in Hot Property

The Department of Energy announcement on potential sites for radioactive waste repositories has been greeted with the predictable outcries of protest. Congressmen and governors of western states have denounced the decision to eliminate eastern sites and are declaring that their own localities shall not be the "garbage dumps" of the country. It seems to me that this entire process and possibly similar emotional decisions should be reexamined. In our age of the "official leak" and the "pork barrel" bonus, these two techniques together might solve the nuclear waste problem expeditiously and painlessly.

The first step would be to classify all reports on nuclear waste. The facts of nuclear waste disposal are straightforward. There have been no major accidents involving transport of high-level nuclear waste. The so-called caskets for transporting waste have been tested—trucks loaded with them have been run into brick walls at 60 miles an hour, railroad trains have run into trucks with containers, and there have been many other insults of dramatic proportions. No leakage has occurred. The storage containers are designed to last 300 to 1000 years. Even if they then decompose, the geology of the waste site is selected to limit any further significant spread of radioactive material. A more expensive but technically feasible design could put the containers in shafts that would be accessible so that modifications could be made at some future time. New materials might be available 1000 years from now. By then most of the fission products would have decayed to a much lower level.

The American plan for burial is to use a combination of borosilicate glass and spent-fuel devices placed in corrosive-resistant ferritic containers; the Swedish plan is to put spent-fuel devices inside copper containers. Remote possibilities, such as that copper might be a highly valuable metal in 1000 years enticing grave robbers to steal the containers and so distribute radioactive material around the planet, are considered. While such possibilities are being debated, the radioactive material is being stored above ground in cooling pools, a potentially less safe procedure. Yet no major accident has occurred.

Facts are not believed when they are delivered in pious statements by public officials who lack the credentials of rock stars or television anchors. The National Academy of Sciences' verification of public statements is tainted, too, since it is part of "the establishment." The only way it is possible to convince the public is to classify all this material and then leak it sequentially over time. The revelation of a secret creates instant truth. This leaky-faucet approach is slower than official news bulletins but, obviously, it will lead to much higher credibility.

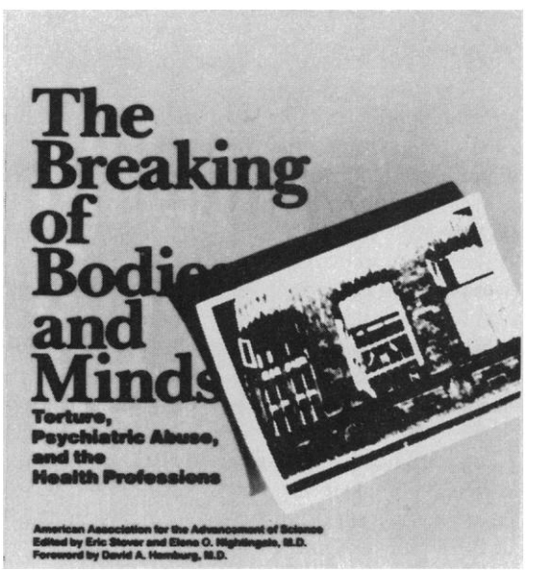
The second step employs the "pork barrel" technique. A sum of several hundred million dollars should be allocated to the locality that obtains a waste site. Moreover, a careful summary should be compiled of the boost to the local economy from new construction and the added personnel on payrolls to administer the facility, to say nothing of the elimination of local crime due to the large number of special police. These economic advantages should be presented in a manner so as to insinuate that the federal official was deliberately tilting the selection of this attractive economic plum and prime tourist attraction to favor local political cronies. An appropriate congressional committee would then investigate and demand that site selection be made available to all regions.

If these two methods were used, the Department of Energy would be flooded by offers from states and localities with deserted mines, barren hills, and decaying ghost towns as appropriate sites for radioactive repositories. A museum lit by Čerenkov radiation would be pushed by chambers of commerce; committees entitled "Waste Makes Haste" would be sending lobbyists to Washington to bring home the hot atom before other communities get into the act. Since it is apparent that leaking secrets and pork barrel politics are impossible to prevent, it is time to use them productively to solve some of our most serious problems. This method of finding an abundance of sites for nuclear waste may be helpful in the future for locating prisons, petroleum refineries, and other underprivileged institutions that have acquired bad public images. This editor is planning to organize a venture capital group to buy some abandoned lead mines in order to capitalize on such a sensible approach to a better environment.—DANIEL E. KOSHLAND, JR.

The Breaking of Bodies and Minds

Torture, Psychiatric Abuse, and the Health Professions

A documentation of systematic use and effects of physical and mental torture throughout the world



Edited by Eric Stover and Elena O. Nightingale

With a Foreword by David A. Hamburg

This eye-opening book brings together for the first time writings on the role of medical personnel in cases of torture and psychiatric abuse. Through analyses and case histories, psychiatrists and other health care professionals, political scientists, ethicists, and other writers discuss the systematic use and effects of physical and mental torture in the Soviet Union, Latin America, and other parts of the world.

The book also details the complicity of an alarming number of medical personnel in torture and psychiatric abuse and examines the ways in which governments use a medical rationale to seek legitimacy for human destruction. Finally, it describes efforts by medical and other associations both to combat offensive practices and treat victims.

Contents

The Breaking of Bodies and Minds is important reading for anyone concerned with the preservation of basic human rights.

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absorbed into this field. With the government involved in regulation, this field may become less cyclical.

GERALD M. FRIEDMAN
Department of Geology, Brooklyn College, and *Graduate School, City University of New York, Brooklyn, NY 11210,* and *Rensselaer Center of Applied Geology, affiliated with Brooklyn College, Post Office Box 746, Troy, NY 12181*

REFERENCES

1. G. M. Friedman, *Science* **201**, 215 (1978).

Geometry Problem

We physics (failed mathematics) professors also have done no plain geometry for years. We find that the solution given by our good neighbor Jonathan Baron to the problem of constructing a line of length $A/\sqrt{2}$ which halves a triangle's area (Book Reviews, 23 May, p. 1038) is true for only one particular set of triangles—those in which the altitude A equals the base B. A solution good for any garden variety of triangle is that the base of the half-area triangle should be $B/\sqrt{2}$ (and its altitude $A/\sqrt{2}$). We have confirmed this by (i) integral calculus, (ii) Monte Carlo simulations, (iii) dimensional analysis, (iv) Runge-Kutta integration schemes, (v) drawing lots of triangles, and (vi) asking the nearest grade-school kid. (Detailed autographed solutions are available from the authors.) We suspect that this is an example of the psychology of physics and mathematics: "There's all too often another solution lurking out there waiting ta get ya." We suggest that in the future, *Science* reviewers give examples that are so imposingly complicated that we readers would never dream of solving them while reading *Science* in bed.

LEONARD X. FINEGOLD
SOM D. TYAGI
Department of Physics and Atmospheric Science, Drexel University, Philadelphia, PA 19104

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Since we bind *Science* by the bibliographic volume, we are binding it every 3 months. The question of issue number for older citations becomes moot, as it is volume and page numbers that call the day in bound format.

While it is always nice to have all pertinent identifiers on the cover of the journal itself, we have found in this case that entering by date of issue works just fine, and seems to be more user-friendly than the whole number. It also looks cleaner on our records than the lengthy four-digit number, which we were always trying to cram into those little boxes on our cards.

Things could be worse: we subscribe to several journals that do not even put the *title* on the cover in a legible form!

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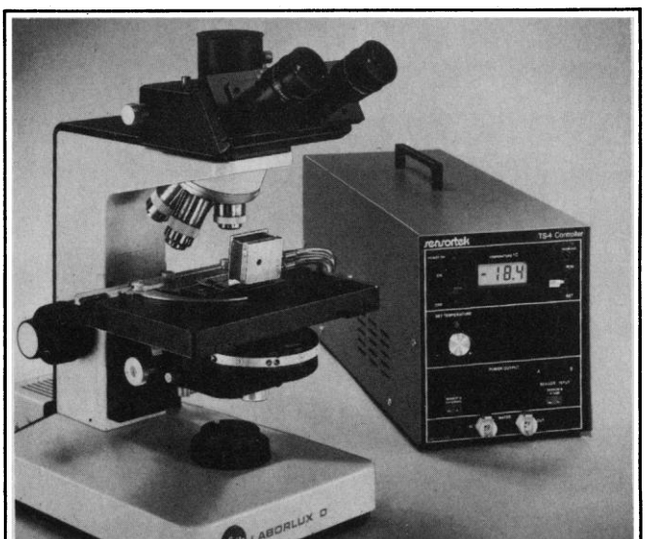

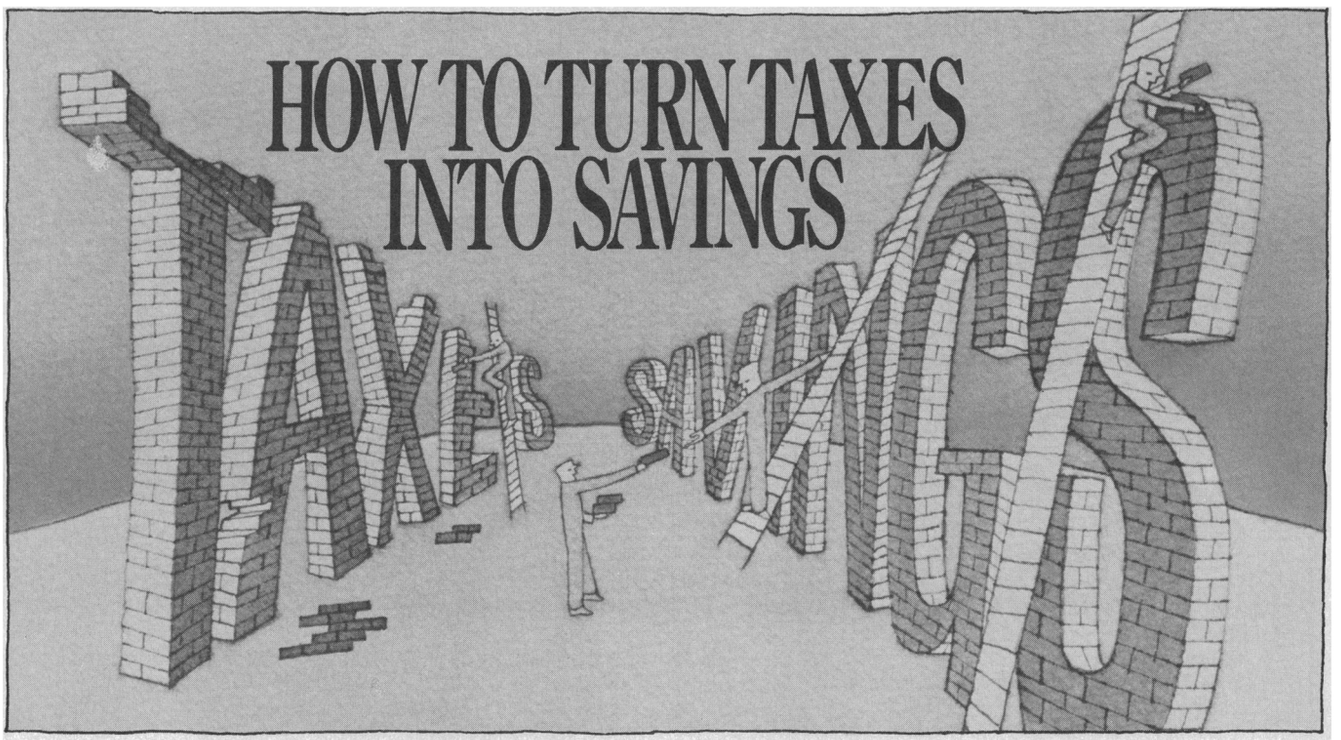

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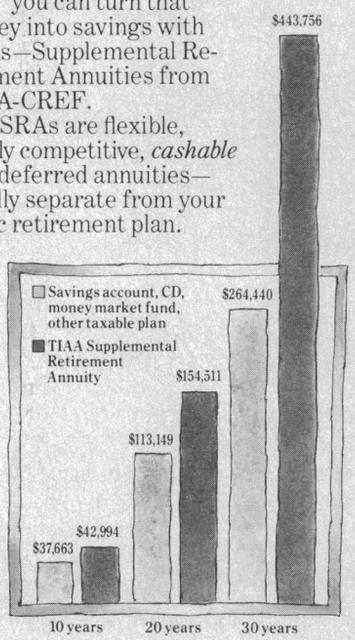

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The symposium will take place Monday and Tuesday from 8:30 am – 6:00 pm and Wednesday until 12 noon. Discussion groups based on poster sessions will be held Monday and Tuesday evenings. Table top exhibits will also be presented.

CO-CHAIRMEN

Stanley Cohen, Professor of Pathology, University of Connecticut Health Center, Farmington
Jan T. Vilcek, Professor of Microbiology, New York University Medical Center, New York

TENTATIVE PROGRAM

SUNDAY EVENING, AUGUST 10

KEYNOTE ADDRESS: MECHANISMS OF CELL PROLIFERATION

Speaker: *Renato Baserga*

MONDAY, AUGUST 11

TUMOR NECROSIS FACTOR AND OTHER CYTOTOXIC MEDIATORS

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Comparison of TNF and Lymphotoxin: *B.B. Aggarwal*
Cachetin: *B. Beutler*
Interplay of TNF, IL 1, and Interferons in Monocyte Cytotoxicity: *Lois B. Epstein, M.D.*
Soluble Factors in Cell-Mediated Cytotoxicity: *P. Henkart*
Regulation of Hematopoietic Cells by Cytotoxins: *G. Trinchieri*

INTERFERONS AS REGULATORY AGENTS

Chairman: *M. Revel*
Regulation of Interferon Gene Expression: *John D. Stobo, M.D.,*
Regulation of Data Interferon: *T. Maniatis*
Beta$_2$ Interferon: *M. Revel*
Interferon Receptors: *S. Pestka*
Regulations of Oncogenes Expression by Interferons: *R.M. Friedman*

TUESDAY, AUGUST 12

INTERLEUKIN 2 AND OTHER GROWTH FACTORS

Chairman: *T.A. Waldmann*
The Nature of IL 2 Receptor: *T.A. Waldmann*
IL 2 Ligand-Receptor Interactions: *K.A. Smith*
Intracellular Transduction Pathways in IL 2 Stimulation: *S. Cohen*
Protein Kinase C in IL 2 Action: *W.L. Farrar*
B Cell Growth Factor: *A.L. Maizel*

INTERLEUKIN 1, COLONY STIMULATING FACTORS

Chairman: *C.A. Dinarello*
Structural Studies of IL 1: *C.A. Dinarello*
The Role of IL 1 in the Central Nervous System: *L.B. Lachman*
IL 1 and Rheumatoid Arthritis: *E. Amento*
Biologic Effects of Colony Stimulating Factors: *M. Moore*
Growth Factors as Interferon Inducers: *J. Vilcek*

WEDNESDAY, AUGUST 13

POTENTIAL CLINICAL APPLICATIONS

Chairman: *C.F. Nathan*
LAK and IL 2 in Cancer Therapy: *M.T. Lotze*
Adoptive Transfer of Interferon-Activated Macrophages: *H.C. Stevenson*
Interferon in Malaria: *Victor Nussenzweig, M.D.,*
Inhibition of Intracellular Micro-organism by Cytokines: *Christine W. Czarniecki*
Gamma Interferon in Leprosy and AIDS: *C.F. Nathan*

SUMMARY AND OVERVIEW

Nancy H. Ruddle, Ph.D.
B. Sehgal, M.D., Ph.D.
K. Welte, M.D.
F.E. Wheelock, M.D., Ph.D.

CONCLUDING REMARKS: *S. Cohen, J. Vilcek*

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