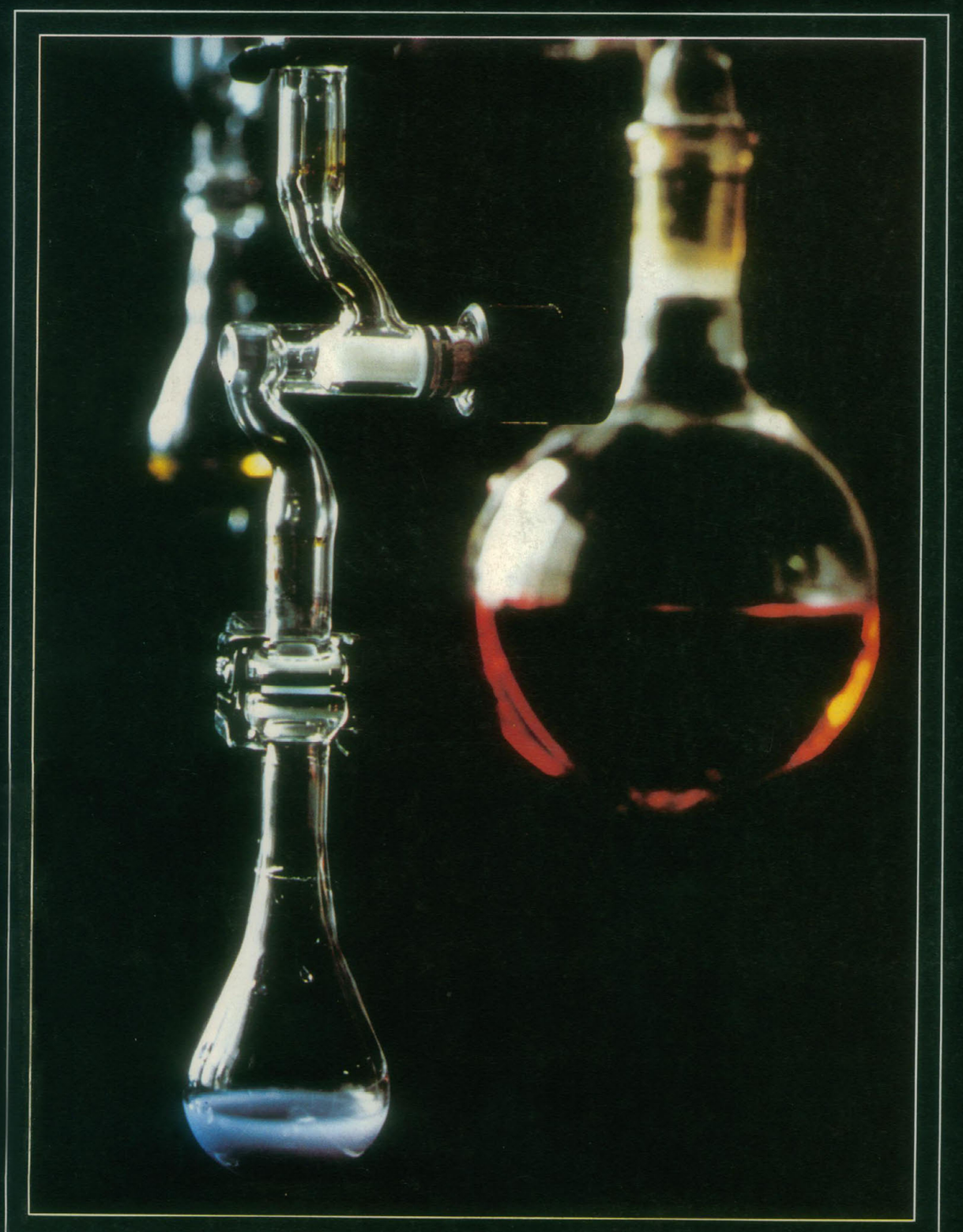
10 SEPTEMBER 1982 · VOL. 217 · NO.4564

$2.50

# SCIENCE



BREAKTHROUGH:

# The J-6M: The Ultra-Dependable High Tech Centrifuge with a mind all your own.


Beckman again leads the way. With the rugged J-6M, the world's first programmable, 6000-rpm, large capacity, refrigerated centrifuge. After you load the rotor and close the door, the J-6M's microprocessor is ready for *your* command.

You can store 10 programs in memory, so there's no chance for error on the runs you do most often. Or you can manually select run conditions with speed accurate to 10 rpm, time to 1/10 minute and temperature to 1°C. That's precision. And that's what the J-6M's digital logic gives you.

It also gives you an audible end-of-run signal, and a diagnostics readout that signals power failure, rotor imbalance, over-speed and over-temperature.

But all this electronic technology and ease of operation is only part of the story. *The J-6M is inexpensive to maintain.*

The secret is Beckman quality and the Ultra-Smooth, ultra-quiet induction drive—with three year motor warranty! There are no brushes to change. Positive frequency control gets rotors to speed smoothly and fast. And with 10 acceleration/deceleration rates from which to choose, you can reduce run times to a minimum and still be confident of getting high quality separations every time.

The J-6M (and the analog J-6B version) can spin a total of 17 Beckman rotors, including six and four liter rotors and the new JS-2.9 rotor which holds up to 12 blood bags or 12 250-mL bottles. There's


an elutriator rotor, too, for living cell separations.

The J-6M. With 35 years of Beckman centrifuge expertise behind it. For full details, write: Beckman Instruments, Inc., Spinco Division, P.O. Box 10200, Palo Alto, CA 94304.

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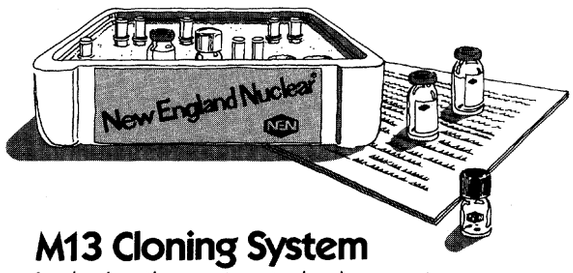
**BECKMAN**

# The systems way is the trouble-free way

We've assembled all the reagents for these three new systems and tested them for compatibility. We've optimized overall performance and subjected the components to a complete assay before shipment. We even include the controls so you can confirm system function in your laboratory.

Think of the time and trouble these pre-assembled, pretested systems will save you!




## M13 Cloning System

Includes the newest cloning vectors — M13mp8 and M13mp9 — for superior performance. System manual includes the entire text of "New M13 Vectors for Cloning" by Dr. Joachim Messing (to be published in Methods in Enzymology). This system is especially designed for compatibility with the Sanger method sequencing system described below.

## DNA Sequencing System [$^{32}$P] (Sanger Method)

Offers all necessary reagents optimized for sequencing the single-stranded DNA molecule produced by the M13 System. Uses a universal, 15-mer, single stranded primer which has been shown to prime only at the primary sequencing site, providing more exact sequence reading.

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## Reverse Transcriptase System [$^{32}$P]

Provides all the reagents you'll need to synthesize double-stranded DNA, including reverse transcriptase manufactured to our own exacting standards. Eleven reagents you won't have to procure, in a system pretested to screen out uncertainties.

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## Other Pretested NEN Systems for Biotechnology

### Transcription Systems
UTP, [$\alpha$-$^{32}$P]- and GTP, [$\alpha$-$^{32}$P]-

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### Translation Systems
Met, [$^{35}$S]-, Leu, [$^{3}$H]-, and Pro, [$^{3}$H]-

### Nick Translation Systems
dCTP, [$^{32}$P]- and dTTP, [$^{3}$H]-

### End Labeling Systems
3′: 3′-dATP, [$\alpha$-$^{32}$P]-
5′: ATP, [$\gamma$-$^{32}$P]-

### DNA Sequencing System
Maxam and Gilbert method

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Not for use in humans or clinical diagnosis

---

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# SCIENCE





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# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



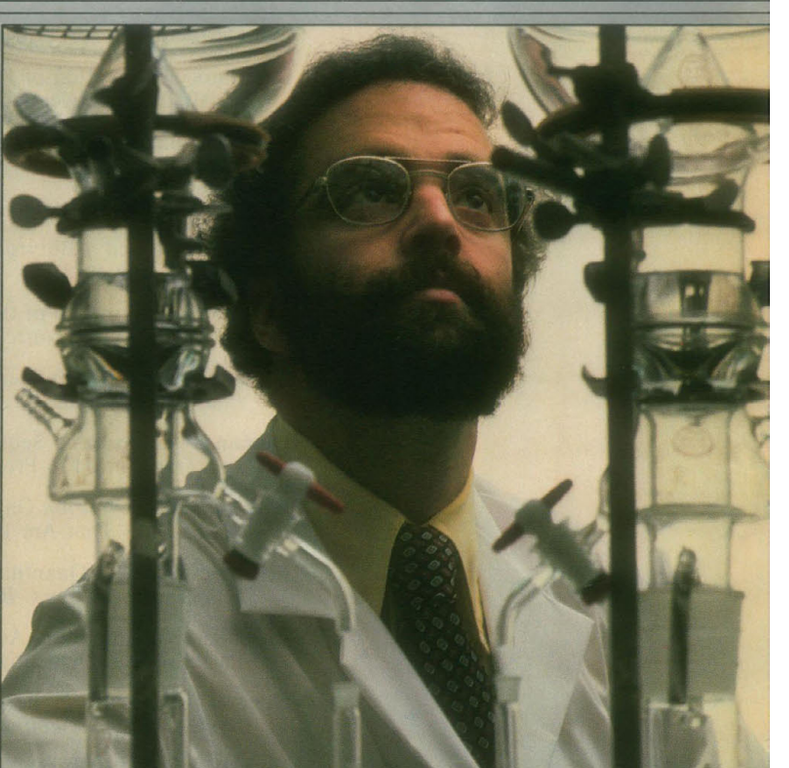


**COVER**

Inert atmosphere apparatus used for the synthesis of thorium and uranium organometallic compounds. See page 989. [Jackie Kalmes, Department of Chemistry, Northwestern University, Evanston, Illinois 60201]

# SmithKline

SmithKline Beckman Corporation/World Headquarters



**Therapeutics.** Combating disease more effectively is, for SmithKline Beckman, a primary commitment. On the heels of our pioneering success against ulcers, a novel anti-arthritis compound will soon be marketed in several countries. Above (left) a scientist tests new cardiovascular agents.

**Detection and Measurement.** Monitoring ionized substances with great precision is essential for advancements in DNA recombination, diagnostics, energy, food processing and for other technological applications. For that reason, SmithKline Beckman produces sophisticated electrochemical instrumentation for laboratory and plant.

## Converging

# Beckman

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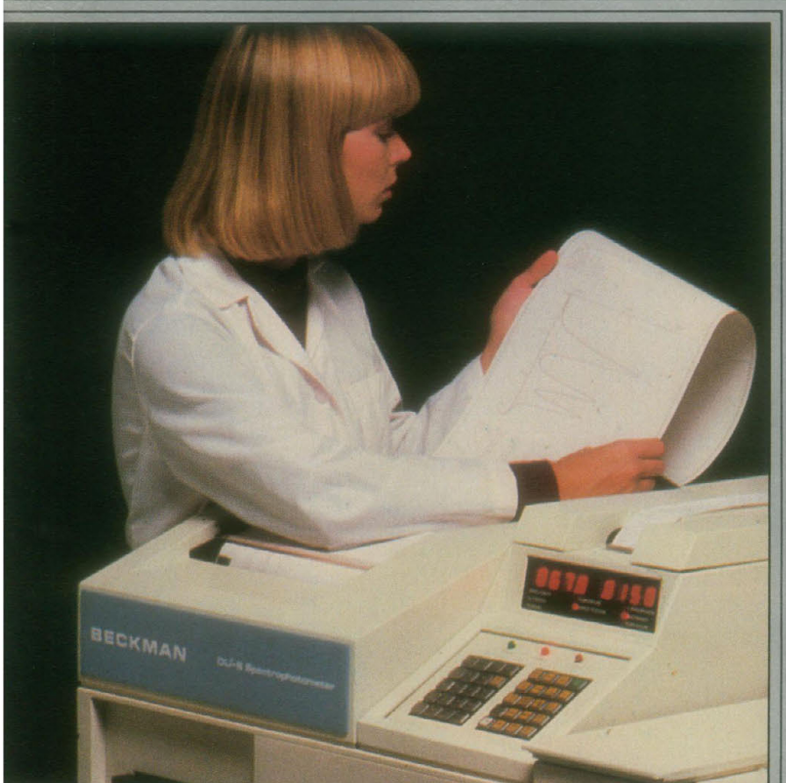



**Scientific Analysis.** Through ingenuity in applying microprocessor and microcomputer technologies, SmithKline Beckman frees researchers, clinicians and engineers from tedious programming so they can spend more time thinking. One of our many Beckman scientific instruments is the computing spectrophotometer above.

**Discovery.** Advances in health care and human well-being today demand broad capabilities, so Beckman Instruments and SmithKline have now united. With complementary technologies and scientific skills, we are converging on key discoveries about life processes.

Look into SmithKline Beckman. And look into the future.

## Technologies

# The new MICRO-ISOLATOR™ System:

## A remarkably simple caging system that has the microbiological integrity of a complex isolator...

## without its high cost or the awkward limitations on the movement of people and animals.

### What's different about the MICRO-ISOLATOR System?

At first glance, it looks as though we've just put a polycarbonate cage on top of a standard mouse cage with the "roof" of the top cage vented. Right... but there's more. The recessed roof functions as a static filter by virtue of a special filter material that's protected by a perforated aluminum sheet. And, most importantly, the top cage overlaps the bottom cage and effectively forms a giant Petri dish-like structure. Result: There is a substantial interchange of gases *and* an effective microbiological barrier.

### How effective is all this?

This system, when incorporated into most existing facilities (with only minor facility modification), can maintain axenic mice in the gnotobiotic state. The static filter and the cage overlapping effectively keep dust particles—which are the "microbiological taxis"—out of the system. Accordingly, this is really a miniature isolator, an "island," a protected microenvironment within any macroenvironment.

Does it really work? Even immune-suppressed mice have been successfully maintained in this system *adjacent* to mice contaminated with *Pseudomonas, Pasteurella, Citrobacter, Aerobacter, Klebsiella*, and *Staphylococcus aureus without any transfer of organisms.*

### What are the applications of the MICRO-ISOLATOR System?

It's ideal for the maintenance of a stable limited defined-flora mouse colony... for either animal production or research. It is also a first-rate quarantine housing system because animals from different sources with differing microbiological profiles can be quarantined in the same room without cross-contamination. (The barrier works in both directions: keeps contaminants in or out.)

### What are the other advantages?

This caging system is rigid, durable, easy to handle, uses minimal rack space, is easy to sterilize, and because the top fits snugly on a standard 29.2 x 19 x 12.7 cm mouse cage, it doesn't dislodge when cages are pushed together (the way other filter caps sometimes do).

The system eliminates the expense and inconvenience of starting or maintaining a complex SPF barrier type facility. Simple, inexpensive, and no time-consuming "entry" procedures.

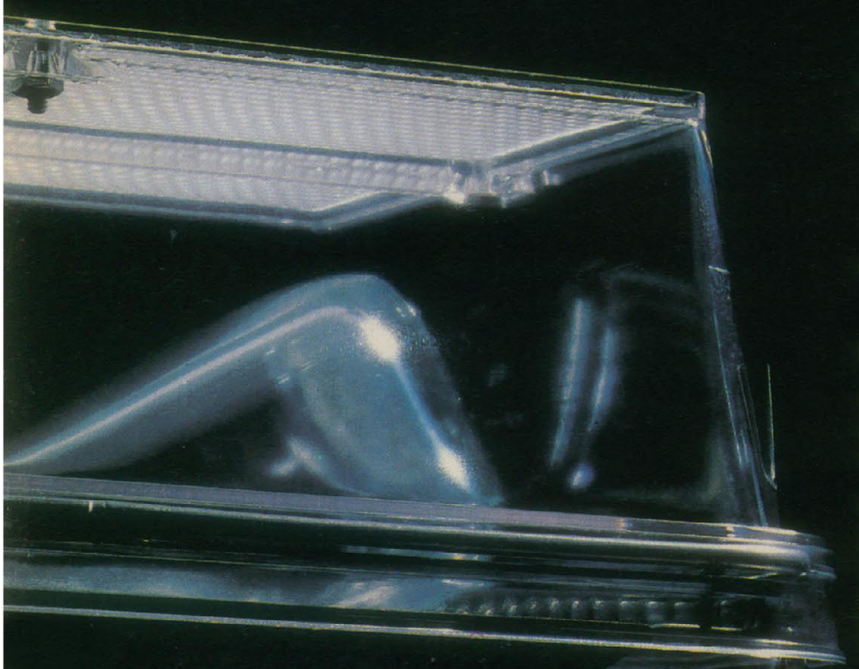
Finally, the colony odor is significantly minimized; allergic responses are substantially reduced through containment of animal dander.

## But is the air interchange really adequate?

Institutions now using this system report that hypoxia is not a problem. Additionally, ammonia level is not a problem if the population density per cage is kept at three to four mice and bedding changed every three or four days . . . especially when relative humidity can not be well controlled. (Ammonia can be totally eliminated from the colony if defined-flora mice without urease-positive aerobic bacteria are used.)

## What else do I need to make the MICRO-ISOLATOR System work?

To effectively maintain the isolation of the animals at *all* times, cages must be opened and serviced within a Class II Biohazard Hood and aseptically supplied with sterile feed, bedding, and water. (For additional guidance on the use of this system, please consult the references below.)



## From Lab Products, Inc.—the leader in environmental control products

Lab Products now offers the widest selection of systems for environmental protection: the new MICRO-ISOLATOR System; the VR-1 Ventilated Animal Rack; five Stay-Clean™ laminar flow systems; Isosystem™ housing system consisting of a disposable filter cap, cage cover, and plastic cage; Enviro-Gard™ filter system with permanent filter bonnets; and See-Through™ suspended cage systems with a special filtering system. We are now likely to have at hand solutions to virtually all of your environmental problems.

## Ordering Information

To order the new MICRO-ISOLATOR System, please refer to the following catalog number:

10209—Complete MICRO-ISOLATOR System consisting of:
- 10272—Polycarbonate cage 29.2 x 19 x 12.7 cm
- 10227—Stainless steel wire bar cover
- 10204—Polycarbonate MICRO-ISOLATOR filter bonnet

Above items may be ordered individually.

Other components and accessories also available:
- 10206—Replacement filter sheet
- 30160—16 oz. glass water bottle
- 30008— # 8 rubber stopper
- 30135—Stainless steel sipper tube

Call Customer Service toll free 1-800-526-0469.

## For more information

Write or call Lab Products, Inc., 255 West Spring Valley Avenue, Maywood, New Jersey 07607 or complete the coupon. (Phone 201/843-4600)

References

R. S. Sedlacek, H. D. Suit, K. A. Mason, and E. R. Rose; 7th ICLAS Symp.; Utrecht, 1979; Gustav Fischer Verlag, Stuttgart, Germany, 1980; New York, 1980.

See also: abstracts of papers Nos. 32 and 35 of papers presented by R. S. Sedlacek and R. P. Orcutt at 32nd Annual Session AALAS, Salt Lake City, Sept. 20–25, 1981.

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a bioMedic company

MICRO-ISOLATOR is a trademark of Lab Products, Inc.

LP81-1708

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Maywood, New Jersey 07607

I would appreciate:

- ☐ Additional information on your new MICRO-ISOLATOR System.
- ☐ Information on your other environmental control products.
- ☐ Your 68-page catalog of animal housing and care systems and accessories.
- ☐ Seeing your local representative. Please call and set up an appointment.

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ABC

# SIXTH ANNUAL BRISTOL-MYERS AWARD FOR DISTINGUISHED ACHIEVEMENT IN CANCER RESEARCH

The Bristol-Myers Company presents an annual award to a scientist making an outstanding contribution in cancer research. The candidates for the award are to be nominated by medical schools, free-standing hospitals and cancer research centers. Only one nomination from each institution is permitted.

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THE GRAPHICS STANDARD

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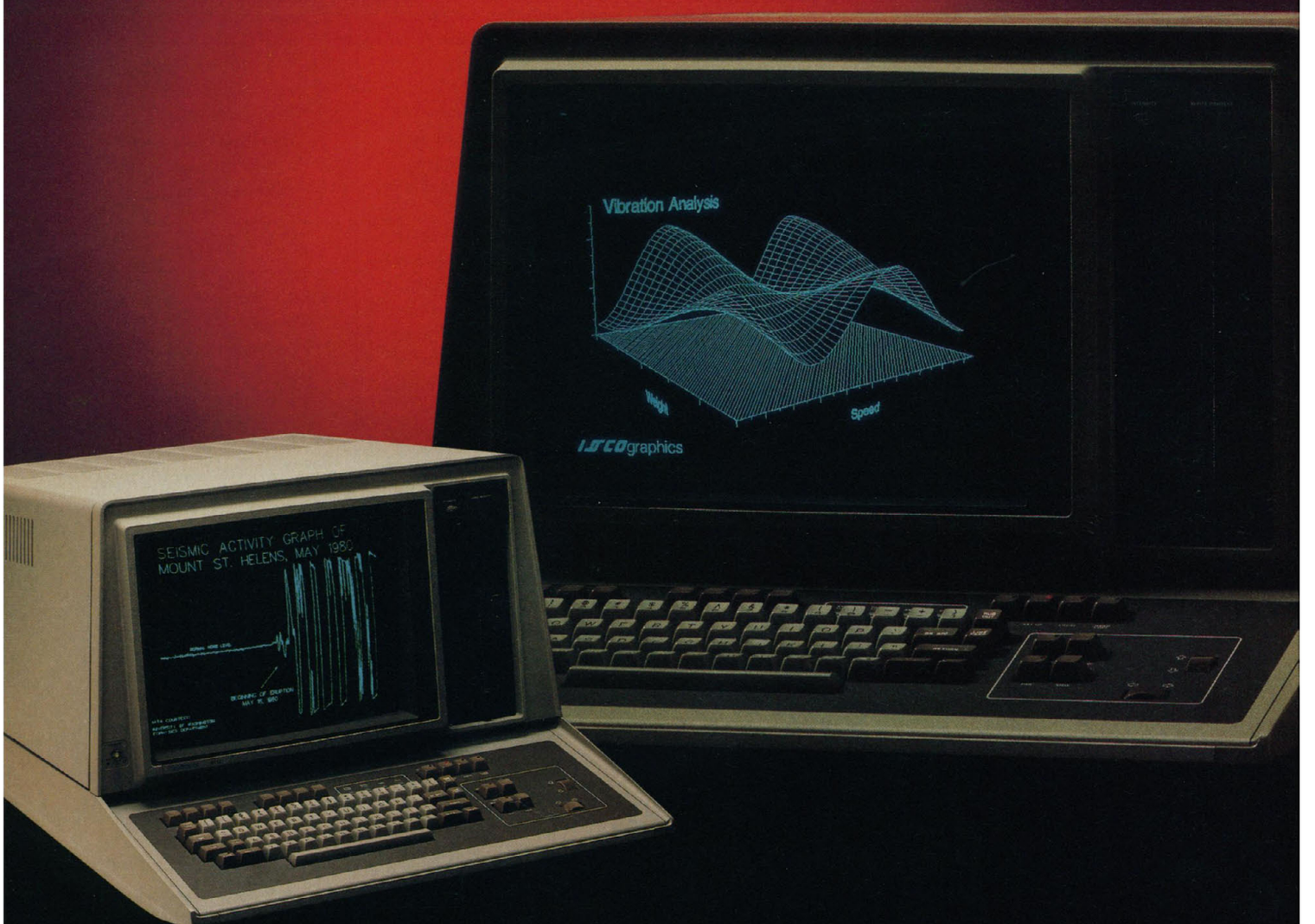


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# ANNOUNCING THE AAAS
# *SCIENCE PHOTOGRAPHY CONTEST*

Rarely do we perceive reality, as presented on the printed page, more effectively than when we view a well-made photograph. It is only natural, then, that the art of photography should figure prominently in science. The American Association for the Advancement of Science, publishers of *Science* and *Science 82*, is proud to announce its first annual science photography contest.

Readers are invited to submit photos that help the viewer to better see how the world works. Or that stimulate curiosity about those workings. We're looking for pictures that are not only artful but informative or inquisitive. The subject matter may be as broad as that of science itself—plants and animals, rocks and rivers, planets and people, molecules and machines—everything and anything that scientists study or do. The view may be microscopic, telescopic, or normal. The main thing is that the photograph catch the eye and engage the mind.

First prize in each category will be $1,000 for color and $500 for black and white. The winning entries and those awarded honorable mention will be exhibited at the annual meeting of the AAAS in Detroit in May 1983. Winning entries may also be published in the July/August issue of *Science 83*.

*Entries will be judged in three categories:*

1. Life sciences
2. Physical sciences
3. Technology

*Rules:*

- Competition is open to everyone except employees of the AAAS and their relatives.
- Competitors may submit no more than five entries. A sequence will be considered one entry.
- Entries may be either black-and-white prints (no larger than eight by ten inches) or color transparencies. Each entry must bear the photographer's name and address. Do not submit glass-mounted entries.
- Complete and enclose the official entry form printed here or a photocopy.
- Include a self-addressed, stamped envelope for the return of your entries.
- Entries must be postmarked no later than January 15, 1983. Late entries will be returned unopened.
- AAAS assumes no responsibility for photographs entered.
- AAAS reserves the right to publish, exhibit, and use for promotional purposes any winning photographs.

*Send all entries to:*

AAAS Science
Photography Contest
1101 Vermont Ave. N.W.
10th floor
Washington, D.C. 20005

OFFICIAL ENTRY

*Name* _____

*Address* _____

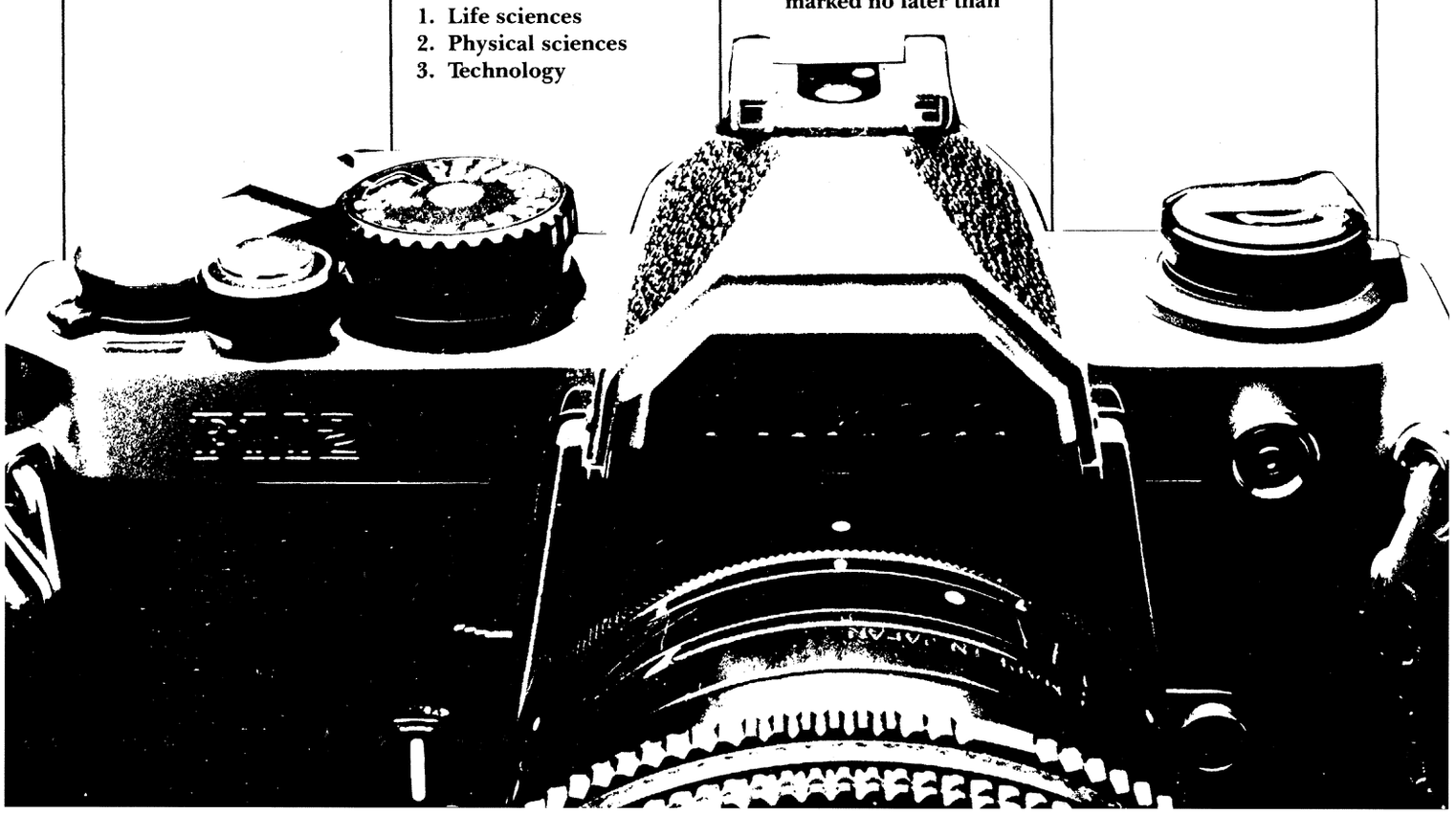
_____

*City, State, Zip* _____

_____

*Phone* _____

*Category* _____



## ADENOSINE

Adenosine, [2,8,5′-$^3$H]-
15-(4′-aminobenzyl)-1-carazolol, [$^{125}$I]-
15-(4′-azidobenzyl)-1-carazolol, [$^{125}$I]-
Cyclohexyladenosine, $N^6$-[*adenine*-2,8-$^3$H-
Diethyl-8-phenylxanthine, 1,3-[*phenyl*-4-$^3$H]-
Methyl-2-phenylethyladenosine, L-$N^6$-1-[*adenine*-2,8-$^3$H, *ethyl*-2-$^3$H]- (Phenylisopropyladenosine)

## α-ADRENERGIC

Aminoclonidine, *p*-[3,5-$^3$H]-
Clonidine · HCl, [4-$^3$H]-
Dihydro-α-ergocryptine, 9,10-[9,10-$^3$H(N)]-
WB-4101 (2,6-Dimethoxyphenoxyethyl) aminomethyl-1, 4-benzodioxane, 2-[*phenoxy*-3-$^3$H(N)]-
Epinephrine, *levo*-[*N-methyl*-$^3$H]- or [*N-methyl, ring*-2,5,6-$^3$H]-
2-[β-(4-Hydroxy-3-iodophenyl) ethylaminomethyl] tetralone, [$^{125}$I]-
Norepinephrine, *levo*-[7,8-$^3$H(N)]- or [*ring*-2,5,6-$^3$H]-
Phenoxybenzamine · HCl, [*phenoxy*-$^3$H]-
Prazosin, [*furoyl*-5-$^3$H]-
Rauwolscine, [*methyl*-$^3$H]-
Yohimbine, [*methyl*-$^3$H]-

## β-ADRENERGIC

Azidobenzylcarazolol, L-*para*-[*benzyl*-3,5-$^3$H]-
Carazolol, DL-[3,6-$^3$H(N)]-
Dihydroalprenolol · HCl, *levo*-[*propyl*-1,2,3-$^3$H]- or [*propyl, ring*-$^3$H]-
Epinephrine, *levo*-[*N-methyl*-$^3$H]- or [*N-methyl, ring*-2,5,6-$^3$H]-
Hydroxybenzylisoproterenol, *p*-[7-$^3$H]-
Iodocyanopindolol, [$^{125}$I]-
Iodohydroxybenzylpindolol, [$^{125}$I]-
Isoproterenol, DL-[7-$^3$H(N)]-
Norepinephrine, *levo*-[7,8-$^3$H(N)]- or [*ring*-2,5,6-$^3$H]-
Propranolol, L-[4-$^3$H]-

## ALANINE

Alanine, β-[3-$^3$H(N)]-

## ASPARTATE

Aspartic acid, D-[2,3-$^3$H]-
Aspartic acid, L-[2,3-$^3$H]-

## BENZODIAZEPINE

Diazepam, [*methyl*-$^3$H]-
Ethyl β-carboline-3-carboxylate, [*ethyl*-2-$^3$H]-
Flunitrazepam, [*methyl*-$^3$H]-
Flurazepam, [*ethylene*-$^3$H]-
Methyl β-carboline-3-carboxylate, [*methyl*-$^3$H]-
Propyl β-carboline-3-carboxylate, [*propyl*-2,3-$^3$H]-
RO5-4864, [*N-methyl*-$^3$H]-
RO15-1788, [*N-methyl*-$^3$H]-

## CALCIUM

Nitrendipine, [5-*methyl*-$^3$H]-

## CHOLINERGIC

Acetycholine iodide, [*N-methyl*-$^3$H]-

**Muscarinic**

Choline chloride, [*methyl*-$^3$H]-
Dioxolane, L(+)-*cis*-[2-*methyl*-$^3$H]-
Oxotremorine-M acetate, [*methyl*-$^3$H]-
Propylbenzilylcholine mustard, [*propyl*-2,3-$^3$H]-
Quinuclidinyl benzilate, L-[*benzilic*-4,4′-$^3$H(N)]-
Scopolamine methyl chloride, [*N-methyl*-$^3$H]-

**Nicotinic**

Amino-4-guanidobutane, 1-[1,2-$^3$H(N)]- (Agmatine)
Bungarotoxin, α-[$^{125}$I]-
Choline chloride, [*methyl*-$^3$H]-
Nicotine, DL-[*N-methyl*-$^3$H]-
Tubocurarine chloride, *dextro*-[13′-$^3$H(N)]-
Maleimidobenzyltrimethylammonium iodide, 4-*N*-[*methyl*-$^3$H]- (MBTA)

## DOPAMINERGIC

ADTN (Amino-6,7-dihydroxy-1,2,3,4-tetrahydronaphthalene, 2-), [5,8-$^3$H]-
Apomorphine, L-(−)-[8,9-$^3$H]-
Dihydro-α-ergocryptine, 9,10-[9,10-$^3$H]-
Dihydroxyphenylethylamine, 3,4-[*ring*-2,5,6-$^3$H]-
Domperidone, [*benzene ring*-$^3$H]-
Flupenthixol, *cis*-[*ring*-$^3$H]-
Haloperidol, [$^3$H(G)]-
Propylnorapomorphine, L-(−)-[*N-propyl*-$^3$H(N)]-
Spiperone, [*benzene ring*-$^3$H]-
Sulpiride, (−)-[*methoxy*-$^3$H]-

## GABA

Aminobutyric acid, γ-[2,3-$^3$H(N)]-
Baclofen, DL-[*butyl*-4-$^3$H(N)]-
Dihydropicrotoxinin, α-[8,10-$^3$H]-
DMBB, (+)-[*butyl*-2,3,4-$^3$H]-
DMBB, (−)-[*butyl*-2,3,4-$^3$H]-
Muscimol, [*methylene*-$^3$H(N)]- or [4-$^3$H]-
Nipecotic acid, [*ring*-$^3$H]-
Piperidine-4-sulfonic acid, [*ring*-$^3$H]-
Tetrahydroisoxazolo (5,4-c) pyridin-3-ol,4,5,6,7-[5,7-$^3$H]- (THIP)

## GLUTAMATE

Glutamic acid, L-[3,4-$^3$H]-
Methyl-D-aspartic acid, *N*-[*methyl*-$^3$H]-

## GLYCINE

Dihydrostrychnine, [21,22-$^3$H]-
Glycine, [2-$^3$H]-
Strychnine, [*benzene ring*-$^3$H]-

## HISTAMINE

**$H_1$**

Doxepin, [*methyl*-$^3$H]-
Histamine · 2HCl, [*ring, methylenes*-$^3$H(N)]-
Mianserin · HCl, [*N-methyl*-$^3$H]-
Pyrilamine, [*pyridinyl*-5-$^3$H]- (Mepyramine)

**$H_2$**

Histamine · 2HCl, [*ring, methylenes*-$^3$H(N)]-
Tiotidine, [*methyl*-$^3$H]- (ICI 125, 211)

## OPIATE

Dihydromorphine, [*N-methyl*-$^3$H]-
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-$^3$H(N)]-
Enkephalin (5-L-methionine), [*tyrosyl*-3,5-$^3$H(N)]-
Enkephalin-(2-D-alanine-5-L-methionine), [*tyrosyl*-3,5-$^3$H]-
Enkephalin (5-L-leucine), [*tyrosyl*-$^{125}$I]-
Enkephalin (5-L-methionine), [*tyrosyl*-$^{125}$I]-
Enkephalinamide (2-D-alanine-5-L-methionine), [*tyrosyl*-3,5-$^3$H]-
Ethylketocyclazocine, [9-$^3$H]-
Morphine, [*N-methyl*-$^3$H]-
Naloxone, [*N-allyl*-2,3-$^3$H]-
Phencyclidine, [*piperidyl*-3,4-$^3$H(N)]-
SKF-10,047, [*N-allyl*-2,3-$^3$H]-

## SEROTONIN

Dihydro-α-ergocryptine, 9,10-[9,10-$^3$H(N)]-
Hydroxytryptamine binoxalate, 5-[1,2-$^3$H(N)]-
Hydroxytryptamine creatinine sulfate, 5-[1,2-$^3$H(N)]-
Lysergic acid diethylamide, [*N-methyl*-$^3$H]-
Mianserin · HCl, [*N-methyl*-$^3$H]-
Spiperone, [*benzene ring*-$^3$H]-

## PEPTIDE LIGANDS

Angiotensin II (5-L-isoleucine), [*tyrosyl*-3,5-$^3$H(N)]- or [*tyrosyl*-$^{125}$I]-
Bradykinin, [2,3-*prolyl*-3,4-$^3$H(N)]- or (8-tyrosine)-triacetate, [8-*tyrosyl*-$^{125}$I]-
Formyl-methionyl-L-leucyl-L-phenylalanine, *N*-[*phenylalanine-ring*-2,6-$^3$H(N)]-
Formyl-L-norleucyl-L-leucyl-L-phenylalanine, *N*-[*phenylalanine-ring*-2,6-$^3$H(N)]-
Luteinizing hormone, [$^{125}$I]-
Melanotropin release inhibiting hormone, [L-*prolyl*-2,3,4,5-$^3$H(N)]-
Substance P, [2-*prolyl*-3,4-$^3$H(N)]- or (8-tyrosine), [$^{125}$I]-
Thyrotropin releasing hormone [L-*prolyl*-2,3,4,5-$^3$H(N)]- or [$^{125}$I]-
Thyrotropin releasing hormone (3-methyl-histidine$^2$), [L-*histidyl*-4-$^3$H(N), L-*prolyl*-3,4-$^3$H(N)]-

## RELEASE-UPTAKE AGENTS

Amino-4-guanidobutane, 1-[1,2-$^3$H(N)]- (Agmatine)
Amphetamine sulfate, D-[$^3$H(G)]-
Chlorpromazine hydrochloride, [*benzene ring*-$^3$H]-
Desmethylimipramine hydrochloride, [2,4,6,8-$^3$H]-
Dihydrocapsaicin, [*nonanamide*-6,7,9-$^3$H(N)]-
Imipramine hydrochloride, [*N-methyl*-$^3$H]-
Nitroimipramine hydrochloride, 2-[*N-methyl*-$^3$H]-
Reserpine, [*benzoyl*-$^3$H(G)]-

## STEROID

**Androgen**

Dihydrotestosterone, [1,2,4,5,6,7,16,17-$^3$H(N)]-
Hydroxyandrost-4-ene-3, 17-dione, 19-[6,7-$^3$H(N)]-
Methyltrienolone, [17α-*methyl*-$^3$H]-
Testosterone, [1,2,6,7,16,17-$^3$H(N)]-
Testosterone, $\Delta^6$-[$^3$H]-

**Estrogen**

Estradiol, [2,4,6,7,16,17-$^3$H(N)]-
Iodo-3, 17β-estradiol, 16α-[$^{125}$I]-
Moxestrol, [11β-*methoxy*-$^3$H]-
Tamoxifen, [*N-methyl*-$^3$H]-

**Glucocorticoid**

Dexamethasone, [6,7-$^3$H(N)]-
Dexamethasone mesylate, [6,7-$^3$H]- and unlabeled
Hydrocortisone, [1,2,6,7-$^3$H]-
Triamcinolone acetonide, [6,7-$^3$H(N)]-

**Mineralocorticoid**

Aldosterone, D-[1,2,6,7-$^3$H(N)]-

**Progesterone**

Dihydroprogesterone, [1,2-$^3$H(N)]-
Nor-17α-ethynyltestosterone, 19-[6,7-$^3$H(N)]-
Progesterone, [1,2,6,7-$^3$H(N)]-
Promegestone, [17α-*methyl*-$^3$H]-

## VITAMIN $D_3$

Dihydroxyvitamin $D_3$, 1α,25-[26,27-$^3$H]-
Hydroxyvitamin $D_3$, 25-[26,27-$^3$H]-
Vitamin $D_3$, [1,2-$^3$H(N)]-

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## LETTERS

### Information Services

In his letter (13 Aug., p. 586), Robert S. Willard of the Information Industry Association describes Philip H. Abelson's editorial "Essential federal information services" (28 May, p. 937) as being one-sided. Willard alleges that the National Library of Medicine (NLM) does not recover full costs of its online MEDLINE system and that NLM has in fact subsidized commercial organizations by $1 million over the period from January 1980 to June 1981. My purpose is to provide correct information on the pricing practices of NLM.

First, a General Accounting Office (GAO) audit of NLM charges released on 14 May 1982 found that NLM was recovering 96 percent of the costs of access to MEDLINE in its current price structure and that it was in conformance with guidelines in the Office of Management and Budget circular A-25 for charges to both profit and nonprofit organizations.

With respect to the allegation of a $1-million subsidy of commercial users by NLM, the list of 20 commercial users includes two who have been under contract with federal agencies that ultimately pay the bill. A third has established a special free information service for research investigators and clinicians among its clients and accounts for about 90 percent of the use by that company. If these "commercial" users are excluded, it reduces by one-third the commercial use referred to by Willard as being subsidized.

Also, it appears that Willard has not used the current pricing structure of NLM, which has been in effect since October 1981. The data he refers to go back 2½ years.

The so-called private sector charges which he uses for comparison are based on a hypothetical average of the maximum charges without considering discounts of up to 50 percent that could and would accrue to these users. If the lowest (rather than the highest) charge for obtaining similar services from the private sector were used, charges would be reduced by a factor of 4 and the difference between charges made by NLM and those made by the private sector would be only a small fraction of those alleged.

Regarding subsidizing charges for MEDLINE searches to foreign users, NLM does not provide these services. They are provided by foreign agencies, selected by their respective governments, or by U.S. commercial vendors. These organizations pay for use of NLM tapes or for access to our computers. The fee schedule for users is set by the agencies providing the service. A search for which the NLM domestic charge would be $7.28 exclusive of telecommunication charges would translate to a charge for foreign users that could range from $9 to $25. This does not support Willard's allegation that NLM is also subsidizing information services to private foreign health professionals.

Willard's complaints are similar to those raised by a foreign commercial company that is seeking to force higher NLM charges. Physicians and scientists may legitimately ask whether NLM charges are too low or whether the charges of some commercial information services are too high.

JOSEPH LEITER
*National Library of Medicine, Bethesda, Maryland 20209*

### Solar Gel Ponds

We read with interest Thomas H. Maugh II's article "Solar with a grain of salt" (Research News, 11 June, p. 1213). Solar ponds have the potential for providing domestic and low-grade process heat and electric power in a remarkably cost-effective manner.

As Maugh indicates, salt gradient ponds and the more recent concepts involving liquid layers of any kind suffer from a number of disadvantages. These include (but are not limited to) loss of stratification because of diffusion and convective mixing; the large environmental hazard posed to many locations by the tons of salt required; the need to maintain the gradient (requiring external processing of saline); and the development of turbidity, color, and optical opacity due to suspended dirt, debris, and occasionally algal and fungal growth. Mixing can also result from boiling, encroachment of the bottom (convective) zone onto the top (nonconvective) zone, withdrawal (surface evaporation) and injection of fluids, and even large falling bodies.

The gel pond concept was recently developed (*1*) at the University of New Mexico in an attempt to negate many of these difficulties. The gel solar pond consists basically of two zones. The bottom (convective) zone is homogeneous and nearly saturated saline. The top (nonconvective) zone consists of a very viscous

or even solid, elastic, optically transparent polymer gel, with density less than the saline. This top gel layer acts as thermal insulation yet passes solar radiation to be trapped in the underlying saline. It prevents any dirt or debris from entering, providing control of opacity, turbidity, and other related factors. Loss of stratification due to mixing is no longer a consideration, and no external saline processing is required to maintain the salt gradient. A layer of a few inches of fresh water is circulated over the top of the gel to prevent drying and to flush off surface dust and debris.

Selection of the appropriate polymer gel was a major problem. A suitable gel must satisfy many stringent requirements: it must be highly transparent to solar radiation, stable under ultraviolet light and in the operating temperature range, nonbiodegradable and nontoxic, less dense than saline, viscous enough to prevent convection, and easily preparable from readily available components at low cost. During development of the gel pond at the University of New Mexico, hundreds of polymer materials were evaluated, and a few dozen of those were tested. We have developed a low-cost polymer that meets or exceeds all the stringent requirements. Our experimental gel pond has been in operation for a year, and stability of the polymer has been demonstrated for this time period. Work to date has focused on preliminary efficiency determinations and optional gel thickness. We are beginning heat extraction and plan to demonstrate electric power generation contingent on further funding. The gel pond is adjacent to Bryant's salt gradient ponds, so we can compare performance of the two approaches at one location (for example, the gel pond has shown itself to be roughly twice as efficient on a unit area basis as the salt pond as a collector of solar radiation). The exact composition and manufacture of the polymer gel is proprietary at present, as a patent has been filed. The patent covers not only the specific polymer we use but also the concept of the gel pond in some generality. An industrial gel pond of some 70 square meters is being constructed near Las Cruces, New Mexico, to provide process heat for animal feed manufacture.

As Maugh points out, solar ponds are site-specific, and much remains to be discovered. For example, scaling rules and correlations useful for practical designs are lacking. Construction of a heavily instrumented, larger gel pond (perhaps 50 feet in diameter and 8 feet

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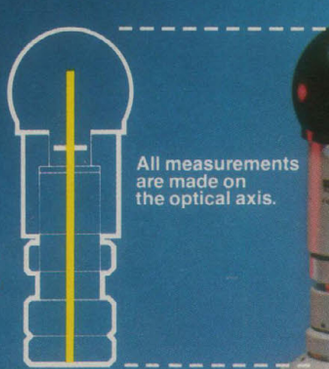


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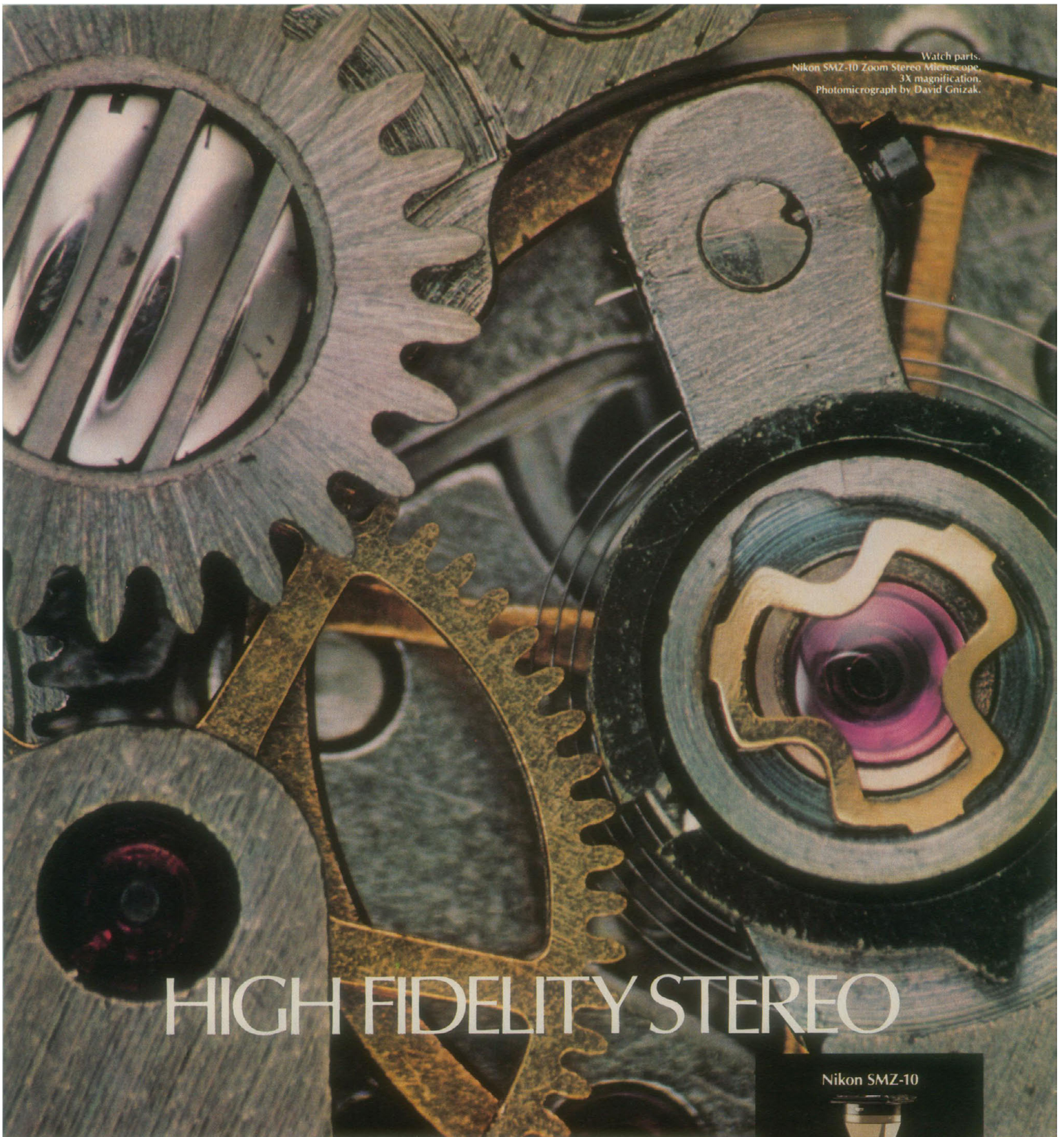

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# Policy Research in an International Setting

The International Institute for Applied Systems Analysis (IIASA), only 10 years old, is in trouble. Several months ago the United States gave notice of withdrawal, and now Britain is following suit. The United States and the Soviet Union had founded the Institute, each underwriting a quarter of the budget and providing leadership: the director, until recently, was American, and the chairman of the council is a high-ranking Soviet science policy official. Most East and West European countries, as well as Japan and Canada, joined the institute and shared the other half of the cost. Even if IIASA survives, possibly with the help of private funding, the original design will not. At a time when another international experiment in policy research—a "European Brookings Institution," to be located in Brussels and funded, in large part, by the Ford Foundation—is getting under way, the reasons for IIASA's precarious condition should be spelled out.

IIASA was created by politicians eager to advance détente and by scientists bent on demonstrating the usefulness of new methods in policy analysis. An international research center came into being where scientists from industrialized countries in the East and West studied common policy issues. Three purposes were to be served simultaneously: cooperation among scientists from different political systems, advances in systems analysis, and usable policy research.

Given enough time and a supportive environment, the experiment could have succeeded. However, renewed tensions between Washington and Moscow deprived IIASA of its political support. An espionage incident, involving a Soviet administrator, did much damage, although it was not related to research at the institute. When the National Science Foundation's budget for international activities was cut, IIASA lost out against bilateral cooperative agreements. The White House and its science policy office gladly endorsed the decision.

Nor did the scientists overseeing American participation in IIASA lend much support. The National Science Board had often voiced concerns about the quality and cost of the work done at IIASA. The National Academy of Sciences, representing the United States in the IIASA council, was mostly interested in the scientific aspects of the work. The Royal Society, too, explained its decision to withdraw on the grounds of questionable scientific quality.

Several evaluations, however, found that IIASA's work held real promise. Having participated in one, I submit that the scientists overseeing the institute failed to understand the nature and requirements of policy research. Such research must take into account the legal, social, and economic dimensions of policy issues. It also must operate under conditions of uncertainty and time constraints. The IIASA directors—Howard Raiffa, Roger Levien, and C. S. Holling—pioneered approaches to policy research that were relevant to the needs of decision-makers, scientifically responsible, and doable in a sensitive international setting. But they found it difficult to convince their various constituencies of the validity of, and the need for, this kind of work.

There are many international scientific institutions, but IIASA is the only one devoted to policy analysis. If IIASA survives, new forms for American participation should be sought. Should it go down, and with it much American leadership, the lesson will be that the design was too complex and the goals too ambitious. In the difficult international environment, a Brookings-like approach to policy research may have a better chance—with less cumbersome arrangements for administrative and scientific oversight, interactions with policy-makers that enrich the work without threatening its independence, and a better mix between social and natural scientists. Whatever IIASA's future, its unique role in East-West relations will be lost once its American and British members pull out—on the eve of 1984.—JURGEN SCHMANDT, *Lyndon B. Johnson School of Public Affairs, University of Texas, Austin 78712*

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