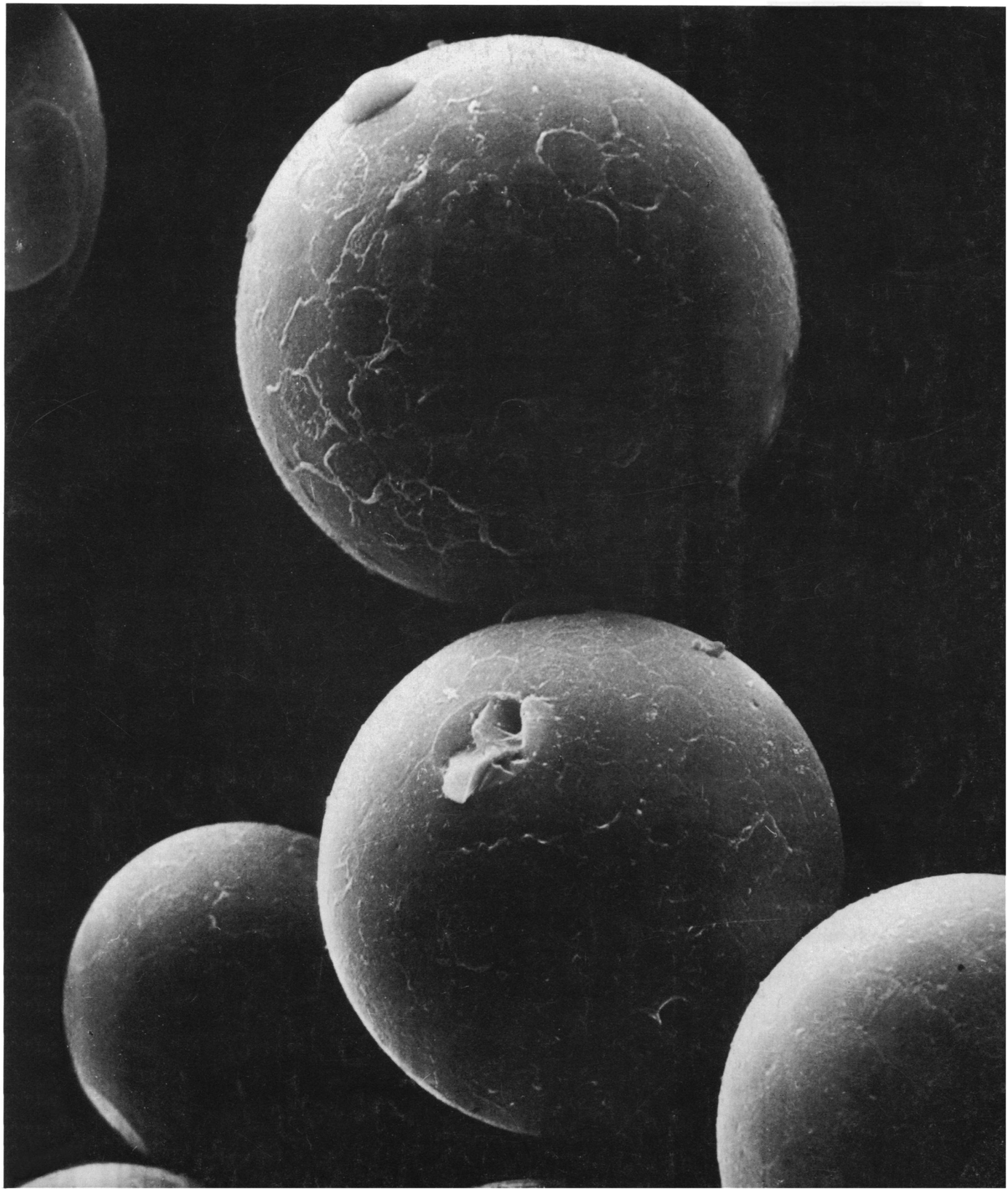
SCIENCE

21 January 1977

Volume 195, No. 4275

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



LKB RediRac

A new economy-priced fraction collector with the quality you have come to expect

Fill in the coupon and we will tell you why. If the coupon has already been used, write or phone for immediate information to the address below.

YES! Send to: LKB Instruments Inc., 12221 Parklawn Drive, Rockville MD. 20852

I'm interested in information about

- ☐ RediRac Fraction Collector
- ☐ VarioPerpex II Pump
- ☐ LKB Instrument Catalogue and poster on Preparative Separation Principles in Biochemistry.

Title Name

Address

Telephone Ext

Every lab should have one, and can afford to have several

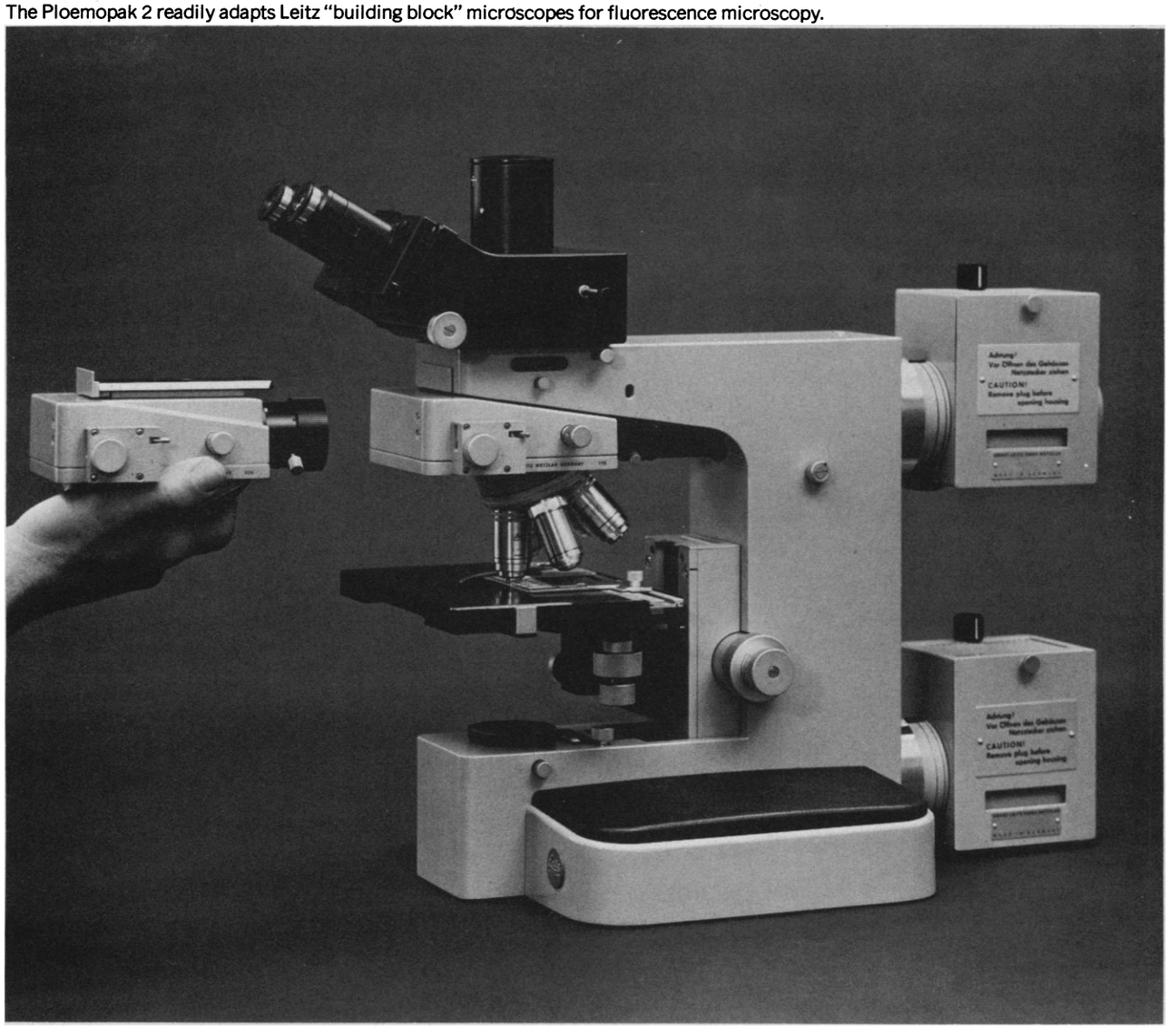
LKB

LKB Instruments Inc.
12221 Parklawn Drive, Rockville MD. 20852

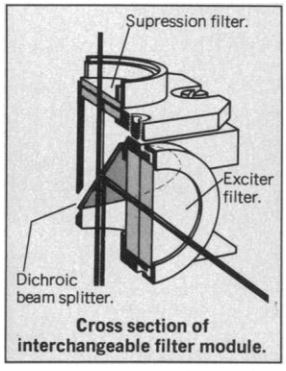
Collect in:
160 tubes, diam 12mm
100 tubes, diam 16mm
45 scintillation vials

Circle No. 39 on Readers' Service Card

The Ploemopak 2 readily adapts Leitz "building block" microscopes for fluorescence microscopy.



Leitz introduces the second generation vertical fluorescence illuminator.



Cross section of interchangeable filter module.

This completely new Ploem unit is designed to ease your work by making flourescence techniques as convenient as possible; to permit use of all the methods of fluorescence microscopy; and to be adaptable to any new development.

These requisites are met with interchangeable filter modules. About the size of a Flashcube, each module is an entire filter system: exciter filter, dichroic beam splitter and suppression filter.

Four modules can be placed in the illuminator body. They mount on a turret so you can quickly switch from one to another.

Sixteen modules are available. Twelve have filter systems that meet the characteristics of specific fluorochromes. Four other modules have built-in beam splitters; you choose your own filters.

New optics complement the system. These 10 X to 100 X oil immersion objectives provide highest intensity and contrast.

Ploemopak models are available for all current Leitz microscopes. For information call 201-767-1100 or write E. Leitz, Inc., Rockleigh, N.J. 07647. Dept. SX1

Leitz®

Where most new developments start.

Circle No. 52 on Readers' Service Card

21 January 1977

Volume 195, No. 4275

SCIENCE

SCIENCE is published weekly, except the last week in December, but with an extra issue on the fourth Tuesday in November, by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C., and additional entry. Member rates on request. Annual subscription $50; foreign postage: Canada $10, other $13, air lift to Europe $30. Single copies $2 (back issues $3) except Materials Issue (20 Feb. 1976) is $3 and **Guide to Scientific Instruments** is $6. School year subscription: 9 months $37.50; 10 months $41.75. Provide 6 weeks' notice for change of address, giving new and old address and zip codes. Send a recent address label. **Science is indexed in the Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

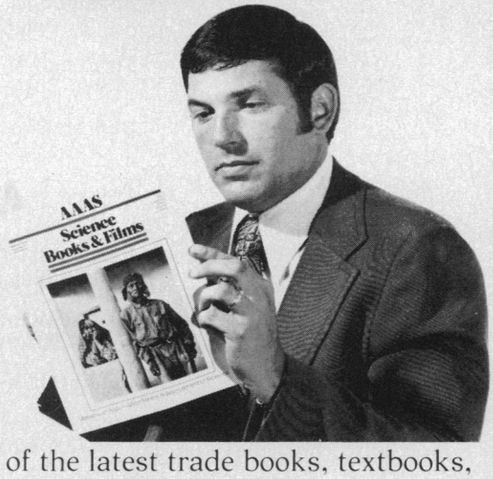
The American Association for the Advancement of Science was founded in and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress. Postmaster: Send Form 3579 to SCIENCE, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.

COVER

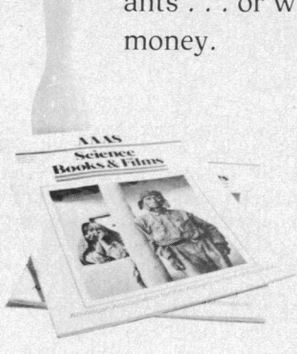
Erythrocyte membranes attached to polylysine-coated polyacrylamide beads (2000 : 1). The positively charged beads facilitate isolation of cell membranes whose protoplasmic surfaces are fully accessible to further probing. See page 302. [B. S. Jacobson and D. Branton, Harvard University, Cambridge, Massachusetts]

Finding good science books and films can be very hard . . .

. . . or very easy.



It's really up to you. If you have plenty of time, shelf space, and money you may not need **SCIENCE BOOKS & FILMS.** But if you're looking for a quick, *reliable* way to find good science information sources, let **SB&F** be your guide. Each issue reviews hundreds of the latest trade books, textbooks, reference works, and 16mm films in the pure and applied sciences. Using this single selection tool, you can find good science materials for readers and viewers at all levels—from kindergarten through college. And you can have confidence in the reliability of the reviews and the rating system. Our reviewers are specialists with scientific expertise as well as practical teaching experience. Their signed reviews are authoritative, informative, and interesting. A simple coding system shows at a glance how the reviewer rates each book or film and for what level it is suitable. So the next time you're looking for science materials—on euthanasia . . . or land use and misuse . . . or manned spacecraft . . . or atomic physics . . . or hang gliding . . . or endangered wildlife . . . or ants . . . or whatever—remember **SB&F.** We take the trouble to save you time and money.

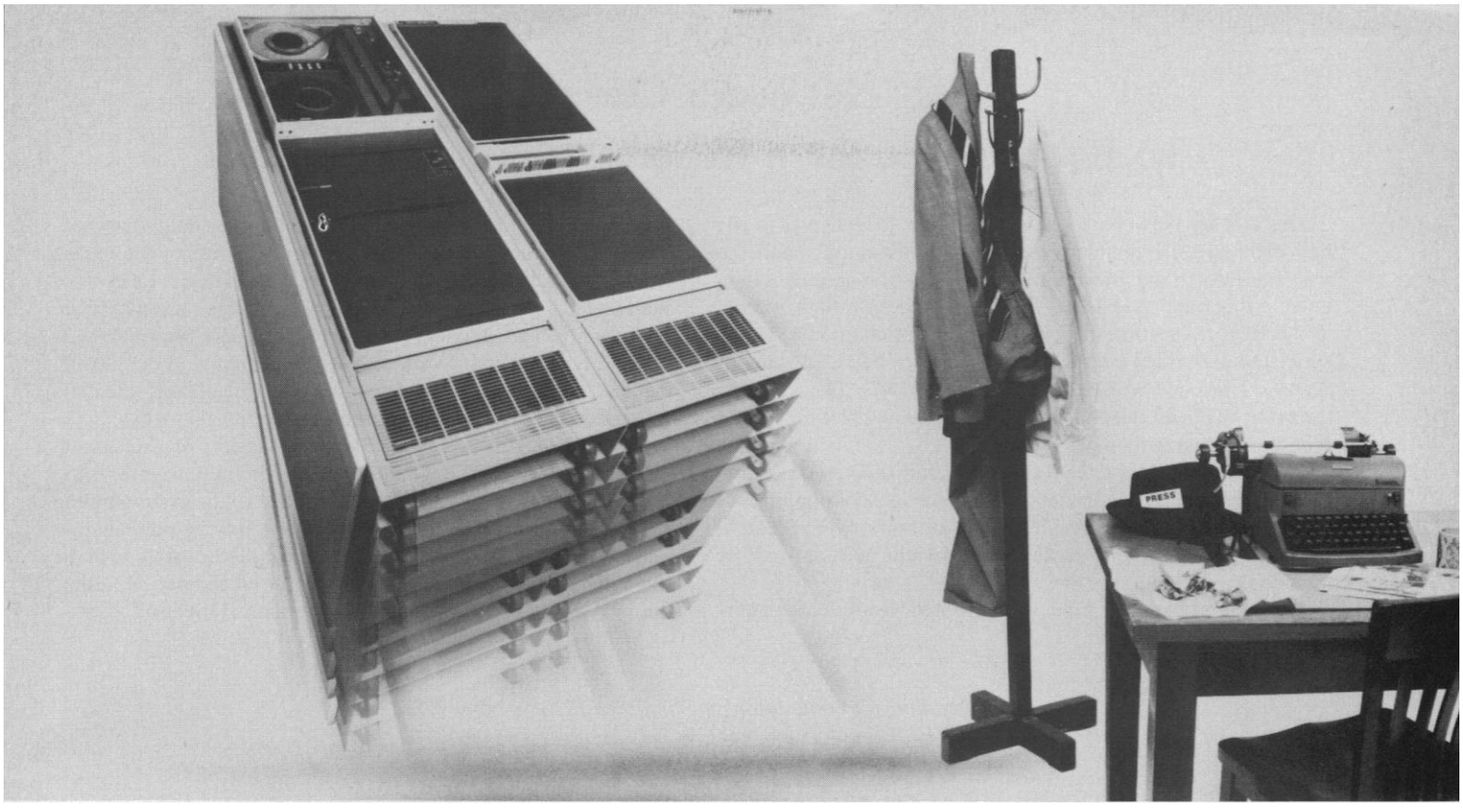


Subscriptions are $16.00 per year ($15.00 for AAAS members) or $28.00 for two years.

SB&F

the quarterly review

AAAS SCIENCE BOOKS & FILMS
Subscriptions Department
1515 Massachusetts Ave., NW
Washington, D.C. 20005



Faster than a speeding bullet. More powerful than an Eclipse S/200.

It's more memory. It's more software. It's more speed. It's SuperEclipse!

Disguised as a mild mannered small computer, our new Eclipse S/230 leaps to the top of the scientific Eclipse line. More powerful because it has double the memory of the S/200, with 512K Bytes. As well as our new heuristic Advanced Operating System, for maximum resource utility and intelligent multiprogramming.

And if you think the S/200 was fast, our new time fighter has a 500 nanosecond MOS memory cycle time, and "look ahead" mapping for faster memory access.

Our SuperEclipse can meet the toughest challenges with the most advanced instruction sets in the industry. Regular 16-bit single word or 32-bit double word instructions. And super fast floating point.

But the Eclipse S/230 is more than powerful; its high density core or MOS memory modules make it super reliable, too. With a full range of options and peripherals. And lots of support. For a lot less than you might think.

The Eclipse S/230. Here when you need it. With powers far beyond those of ordinary small computers. To discover its true identity, send for our brochure.

S/230 IT'S A SUPERECLIPSE

Circle No. 120 on Readers' Service Card

Data General

Data General, Route 9, Southboro, Mass. 01772, (617) 485-9100. Data General (Canada) Ltd., Ontario.
Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361

AAAS–Newcomb Cleveland Prize
To Be Awarded for a Report Published in *Science*

The AAAS–Newcomb Cleveland Prize, which previously honored research papers presented at AAAS annual meetings, will henceforth be awarded annually to the author of an outstanding paper published from September through August in the Reports section of *Science*. The first competition year under the new rules starts with the 3 September 1976 issue of *Science* and ends with that of 26 August 1977. The value of the prize has been raised from $2000 to $5000; the winner also receives a bronze medal.

To be eligible, a paper must be a first-time presentation (other than to a departmental seminar or colloquium) of previously unpublished results of the author's own research. Reference to pertinent earlier work by the author may be included to give perspective.

Throughout the year, readers are invited to nominate papers appearing in the Reports section. Nominations must be typed, and the following information provided: the title of the paper, issue in which it was published, author's name, and a brief statement of justification for nomination. Nominations should be submitted to AAAS–Newcomb Cleveland Prize, AAAS, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Final selection will rest with a panel of distinguished scientists appointed by the Board of Directors.

The award will be presented at a session of the annual meeting at which the winner will be invited to present a scientific paper reviewing the field related to the prize-winning research. The review paper will subsequently be published in *Science*. In cases of multiple authorship, the prize will be divided equally between or among the authors; the senior author will be invited to speak at the annual meeting.

Deadline for nominations: postmarked 15 September 1977

Nomination Form
AAAS–Newcomb Cleveland Prize

AUTHOR: _____

TITLE: _____

_____

DATE PUBLISHED: _____

JUSTIFICATION: _____

(Continue on additional sheet, if necessary)
Machine reproduction of this form may be used.

Soviet Civil Defense

Deborah Shapley's article "Soviet civil defense: Insiders argue whether strategic balance is shaken" (News and Comment, 10 Dec. 1976, p. 1141) provides information that should prove useful to scientists and others concerned with the strategic significance of realistic civil defense preparations.

Her description of the Soviet civil defense installations is quite comprehensive. The only relevant point that we found lacking is the instruction of the people in civil defense measures. Every schoolchild has 3 years' instruction in the effects of nuclear weapons and in the civil defense measures to minimize them. A total of about 135 hours is devoted to the subject. There is similar instruction in factories, and hundreds of thousands of handbooks on civil defense are published and distributed.

Another factor, mentioned by Shapley but in our view underemphasized, is the plan for evacuation. If this is carried out and followed by a set of demands resulting in a confrontation, the bargaining position of our country would be miserable. The Soviet Union could threaten to destroy half of the U.S. population; we could destroy only a small fraction of theirs. The Soviet losses would be well below those suffered in World War II. Such a threat, "nuclear blackmail," is the danger many of us fear most. The first of the above numbers is confirmed in the published part of the *Ponast II* study (*1*). Soviet losses are estimated to be between 2¾ and 4½ percent in their civil defense handbooks, but some of the U.S. estimates, though still quite low, are considerably higher. The estimate of one of us (E.P.W.) agrees with the Soviet estimate.

To discover the "motives behind Soviet population defense" one should read what Soviet leaders have clearly and repeatedly told their own people. One key to the understanding of these motives is Lenin's often quoted dictum: "The primary productive factor of all of humanity is the laboring man, the worker. If he survives, we can save everything and restore everything—but we shall perish if we are not able to save him" (*2*). Of course, if they can push us by threats into repeated concessions, just as Hitler pushed Czechoslovakia, there would be no need to rebuild their factories. The Soviets, like the majority of mankind, always have believed that a primary responsibility of any nation's government is making preparations to save the lives of its citizens if war occurs. Soviet military and civilian leaders have always rejected the concepts of "mutual assured destruction," a strategic theory based on the United States and the Soviet Union leaving their populations vulnerable. One of the Soviet responses to U.S. threats, first of "massive retaliation" and then of "assured destruction," is their comprehensive preparations to survive even an all-out war.

Let us observe, finally, that we cannot quite understand Panofsky's and Garwin's fear, quoted in the article, that a U.S. civil defense effort would alarm the Soviet leaders and would be destabilizing. If the Soviet civil defense does not alarm them and is not destabilizing, why would our emulation of some of these measures be alarming and destabilizing? Did Khrushchev not say, "Don't be afraid. If I offer my embrace, you will not refuse it"?

CRESSON H. KEARNY
Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830

EUGENE P. WIGNER
Department of Physics, Princeton University, Princeton, New Jersey 08540

References

1. *Ponast II* (briefing prepared by the Defense Civil Preparedness Agency, Washington, D.C., 1975; based on a classified interagency study sponsored by the Joint Chiefs of Staff, Studies Analysis and Gaming Agency, Washington, D.C., 1973).
2. V. I. Lenin, *Collected Works*, vol. 38, p. 359, as quoted in the comprehensive Soviet handbook *Civil Defense* (Publishing House for Higher Education, Moscow, ed. 2, 1974).

TVA's Record

I should like to compliment Deborah Shapley on her article (News and Comment, 19 Nov. 1976, p. 814) concerning the Tennessee Valley Authority (TVA). The case against TVA is convincingly delineated from the early days when it "arrived" to tame the rampaging rivers, advise the farmers on better agricultural methods, and, yes, as a by-project, to produce the electrical energy hitherto absent in the Tennessee Valley.

Over the course of its development, TVA has performed a comprehensive service to the citizens of this poverty-shackled valley that private utility companies were reluctant to offer. Utility planners worth their keep could not survive for long by suggesting that large capital expenditures be directed toward a rural, backward region where the median income was less than half that of the rest of the country. However, Congress accepted the socioeconomic challenge and created TVA. Yet because it is the largest utility in the nation, TVA de-

serves more than a thumbnail analysis. Bigness, in and of itself, does not connote wrongness, nor does it imply that decision-making is divorced from humanistic considerations. Perhaps these people, who must gaze into the crystal ball of future energy needs, may see a demand mirage which will vanish as time progresses. Then, again, one may also assume that their projective techniques are reasonably accurate. After all, our natural gas deliveries have been curtailed by almost 50 percent since 1973, while the price of other hydrocarbon fuels has more than doubled. Availability and price coupled with national security implications have already begun to exert their combined influence on our traditional energy mix. We must become increasingly dependent on the electrical energy provided by utilities like TVA.

The decision to use the controlled fission of slightly enriched uranium to produce this additional electrical energy was not something that TVA's engineers, economists, and planners came up with overnight. Such decisions required long, arduous studies by many talented experts. From the time a decision is reached to add nuclear generating capacity, or for that matter any capacity, it takes another 5 to 10 years to design, construct, and license this capacity. Large, 1000-megawatt generating units now require capital investments in excess of a quarter of a billion dollars. In short, electric utilities cannot create additional capacity without gargantuan front-end investments of manpower, time, and capital.

TVA rates have, like the price of coal, escalated rapidly since the 1973 energy crisis. Poor people, as well as those more economically blessed, have felt the pinch of higher monthly electric bills. However, there are few rich or poor consumers in the Valley who would trade their electric bills for those arriving at the homes of residents in the northeastern part of the country.

It is true that the massive fire born from the small candle at TVA's Brown's Ferry Nuclear plant should never have happened. Although the damage and resulting inactivity of the plant was very costly, the fire did illustrate that the multiplicity of safeguards built into the plant did indeed work. Nuclear power, as the proponents had preached, was safe.

Finally, it has become increasingly popular to heckle TVA and to attack it as being nonresponsive, self-serving, and divorced from the real needs of the Valley residents. Critics have forced TVA to open its board meetings to public scrutiny. This move has not damaged the effec-

tiveness of TVA, nor made it vanish; in fact, the move may prove to be highly beneficial over the long run.

TVA will continue to make mistakes, like all institutions which are managed by man. However, they will be honest mistakes from which all of us can learn. It is in this atmosphere of trust and mutual respect that the TVA experiment will go forward toward improving the stations of those of us fortunate enough to call the Valley our home.

JACK A. THOMAS
Tennessee Energy Office, 250 Capitol Hill Building, Nashville 37219

Human Rights

The recently appointed AAAS Committee on Scientific Freedom and Responsibility (*1*) has asked us to constitute its Subcommittee on Infringements of Scientific Freedom in Foreign Countries. We are, of course, well aware of widespread violations of human rights, which affect people of all classes and occupations in many parts of the world. We believe, however, that we can be more helpful by focusing attention on rights of our fellow scientists, rather than diffusing our concern more widely. This subcommittee therefore will collect data on, and endeavor to find ways to ameliorate, violations of the human rights of scientists, particularly those rights which are of special importance to their scientific work. Briefly, these rights include (*2*):

- Free access to education and employment.
- Freedom of expression and publication.
- Freedom of assembly and association.
- Freedom of movement and residence, including the freedom to attend international scientific meetings.
- Fair recognition for one's work.

There are continuing violations of these rights in many nations, and the situation in some of them is growing worse. The recent instances of serious persecution of scientists in nations such as Argentina (*3*), which had hitherto generally respected the human rights of scientists, demonstrate that there is unfortunately much that needs to be done in this area. Infringement of scientists' rights in any country should be of concern to citizens of all countries, since the success of any scholar's work depends as much on the freedom of others to study and do research as it does on his own.

Our subcommittee will act as a clearinghouse for information on foreign infringements of scientific freedom. We

request that anyone who has such information please communicate with us via our committee's staff officer, Ms. Rosemary Chalk, AAAS, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036 (telephone: 202-467-5436). Unless our informants specifically request that we not do so, we will make the information we receive available to relevant scientific societies affiliated with AAAS, to the National Academy of Sciences Advisory Committee on Human Rights, the British Council on Science and Society, the International Council of Scientific Unions Committee on the Safeguard of the Pursuit of Science, the Federation of American Scientists, and other appropriate groups working to protect scientific freedoms.

JOHN EDSALL

Biological Laboratories, Harvard University, Cambridge, Massachusetts 02138

JOEL PRIMACK

Department of Physics, University of California, Santa Cruz 95064

References and Notes

1. *Science* **193**, 877 (1976); *ibid.* **194**, 1036 (1976).
2. The report *Scholarly Freedom and Human Rights* (Barry Rose, Chichester, England, in press) by a study group chaired by John Ziman of the British Council for Science and Society includes a comprehensive survey of human rights of scientists, together with references to relevant international agreements, such as the U.N. Universal Declaration of Human Rights, the European Convention on Human Rights and Fundamental Freedoms, the American Convention on Human Rights, and the International Covenant on Civil and Political Rights.
3. See, for example, *Nature (London)* **262**, 243 (1976); *ibid.* **263**, 452 (1976); N. Wade, *Science* **194**, 1397 (1976).

Burt's IQ Data

Nicholas Wade, in his article on Cyril Burt (News and Comment, 26 Nov., p. 916), stops short of concluding that Burt's IQ data were fraudulent and leaves open the possibility that his early work might be acceptable science. There are, it must be stated, extraordinary difficulties in obtaining information about any of the data or procedures on which Burt's reported correlations were based. The following quotations from Burt are typical: ". . . methods . . . were described more fully . . . in degree theses by the investigators named in the text" (*1*, p. 46); ". . . buried in inaccessible theses" (*1*, p. 46); "A fuller account of sources and calculations, with detailed tables, will be found in her [J. Mawer's] degree essay . . . (filed at the Psychological Laboratory, University College)" (*2*, p. 85). There is no such essay filed; the same "essay" is also referred to by Burt as a "thesis," but no such thesis was submitted to the University of London.

Elsewhere Burt writes, "Some of the inquiries have been published in L.C.C. [London County Council] reports or elsewhere: but the majority remain buried in typed memoranda or degree theses" (*2*, p. 89); and ". . . the number examined was nearer a hundred and twenty than three" (*3*, p. 10). This unsatisfactory, to say the least, method of citation was employed by Burt throughout his career.

In 1912 Burt and Moore (*4*, p. 385) wrote: "The more important of our tests have recently been carried out . . . upon over a thousand children of other ages (6 to 14) and upon adults, upon children and adults both of different social status (chiefly from Liverpool slums or from Liverpool University), and of different nationality (chiefly Irish and Hebrew). The results may be shortly summarized as follows. Every test appears to differ with differences in race, status, and age. . . ." This bit of scientific reporting must be squared with the following quote from a 1939 article by Burt (*1*, p. 48): "The value and reliability of group testing . . . were demonstrated by Moore, Davies, and myself. . . . These were, we believe, the first investigations in this country in which the number of children tested ran into well over a hundred." The early Liverpool research came center stage in 1954, in a letter (*5*) written to a journal edited by Burt. The correspondent, concerned with questions of scientific priority, indicated that Burt and Moore's "printed reports . . . do not give the detailed tables. Are these still available?" The reply (*6*), jointly authored by Burt and "P. Durant," stated: "Mr. Moore, it is hoped, will himself publish a fuller account of his analysis in a forthcoming issue of this *Journal*" (*6*, p. 123). The fuller account was not published by Moore, who had vanished as a research contributor more than 35 years earlier.

Though accusations of fraud clearly should not be made without substantial evidence, Herrnstein's reaction to my remarks about Burt ("I find it hard to stay in my chair") seems extreme. The circumstances make it appropriate to quote from a letter written by Herrnstein to a reporter on 16 July 1973. The letter is in my file, as Herrnstein mailed a copy to me. Copies were also sent to the reporter's employer, to a number of psychologists, and to the president and dean of Harvard University. Herrnstein wrote:

> Until Kamin started his campaign to discredit Burt, there was no hint that Burt was suspect . . . by . . . any . . . expert you might have consulted. You cannot verify this by asking them now, for their memories might deceive them. You can, however, look at the

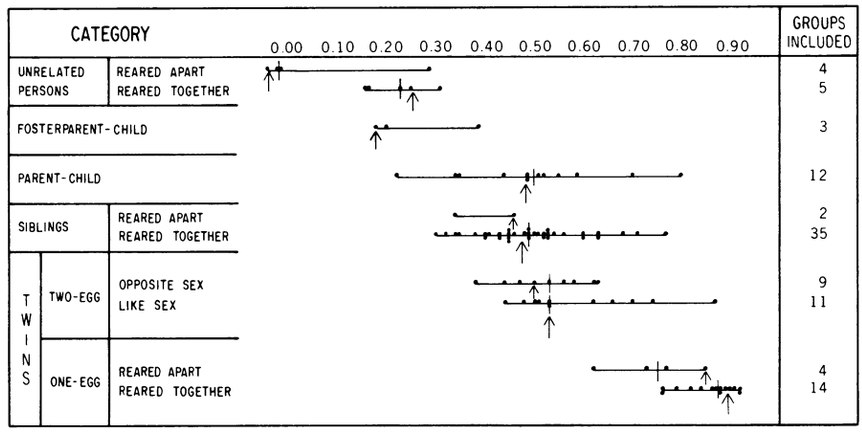


Fig. 1. Correlation coefficients for "intelligence" test scores from 52 studies. Some studies reported data for more than one relationship category; some included more than one sample per category, giving a total of 99 groups. Over two-thirds of the correlation coefficients were derived from IQ's, the remainder from special tests (for example, Primary Mental Abilities). Midparent-child correlation was used when available, otherwise mother-child correlation. Correlation coefficients obtained in each study are indicated by dark circles; medians are shown by vertical lines intersecting the horizontal lines which represent the ranges.

public criticisms of Jensen and me prior to Kamin's revelations and you will find no bad word about Burt's data. Burt was . . . widely considered a person of unimpeachable integrity.

Kamin's assault is as yet unpublished, but I have heard his talk. There was nothing in it to persuade me that Burt was a "cheat," but if Kamin really told you what your article says he said then Kamin is surely a cheat.

The reporter had quoted my critique of Burt accurately. Herrnstein was correct in asserting that no experts—some now described as "early doubters of Burt's data"—had said a bad word. To me it seems apparent that Herrnstein is more concerned with protecting the good name of dead hereditarians than that of his living critics. This, I think, is reflected in Herrnstein's analysis of the data. To readers of Herrnstein's review (*7*) of the IQ literature I recommend, for quite a different perspective, my own book (*8*).

LEON J. KAMIN
Department of Psychology,
Princeton University,
Princeton, New Jersey 08540

References

1. C. Burt, *Br. J. Educ. Psychol.* **9**, 45 (1939).
2. _____, *ibid.* **13**, 83 (1943).
3. _____, *Br. J. Stat. Psychol.* **14**, 3 (1961).
4. _____ and R. C. Moore, *J. Exp. Pediatr.* **1**, 273 (1912).
5. D. M. Friedmann, *Br. J. Stat. Psychol.* **7**, 119 (1954).
6. C. Burt and P. Durant, *ibid.*, p. 119.
7. R. Herrnstein, *I.Q. in the Meritocracy* (Little, Brown, Boston, 1973).
8. L. J. Kamin, *The Science and Politics of I.Q.* (Halsted, New York, 1974).

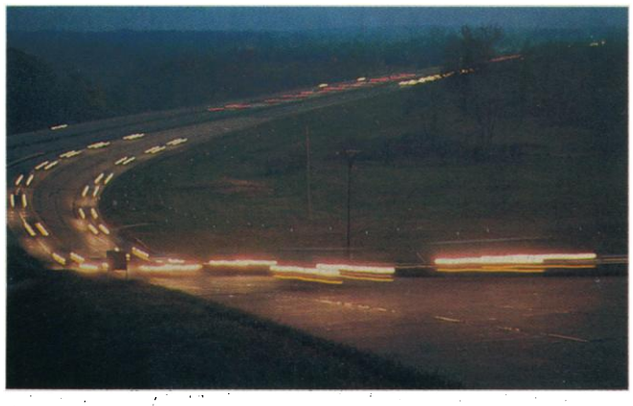
The errors—or whatever they are—in Sir Cyril Burt's heritability data have attracted a great deal of attention recently. Much of what has been written about the matter in both scientific journals and the popular press appears to assume that what is at stake is not just Burt's reputation, but the basic underpinnings of the view that intelligence has a large genetic component. Such a conclusion is unwarranted. The data demonstrating the heavy dependence of IQ on genetic factors are far too solid to be shaken by the rejection of the work of any single investigator—even Sir Cyril Burt.

Figure 1 is reproduced above as it appeared in *Science* in 1963 (*1*, p. 1478), except that arrows have been added to indicate the data points based on Burt's work (*2*). As is readily apparent, the deletion of Burt's data would have no appreciable effect on the overall picture. Note that Burt's figures differ from the median values of the many authors in an unsystematic way. The most likely hypothesis to account for the flaws in Burt's tables is one mentioned in Wade's article—being familiar with the literature and realizing that a few erroneous values wouldn't change things much, the aging Burt regrettably took the shortcut of repeating correlations he had calculated earlier rather than taking the trouble to compute new ones.

BERNARD RIMLAND
Bureau of Personnel Research,
Naval Electronics Laboratory,
San Diego, California 92152
HARRY MUNSINGER
Department of Psychology,
University of California, San Diego,
La Jolla 92093

References

1. L. Erlenmeyer-Kimling and L. Jarvik, *Science* **143**, 1477 (1963).
2. A. R. Jensen, *Behav. Genet.* **4**, 1 (1974).



Large-scale experimental measurements by the Research Laboratories at General Motors have helped answer an important question in atmospheric science.

Predictions by some scientists had suggested that sulfate emissions from catalyst-equipped cars might reach dangerous levels by 1985. An unlikely occurrence—only under rare atmospheric conditions and if most cars have catalytic converters—but still a possibility, they said.

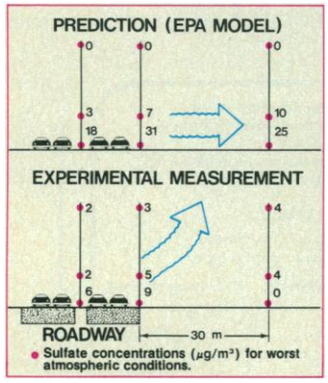
To get hard data, the Research Labs set up "The Great Sulfate Experiment." It was a public test—with the Environmental Protection Agency and other government and university researchers joining in.

Scientific evidence was gathered at the GM Proving Ground by simulating 1985 traffic. During 17 days, a test fleet of 352 catalyst-equipped cars rolled past our six testing towers, creating rush-hour traffic densities of 5,462 vehicles per hour.

During this time, sampling for sulfates and meteorological data took place at 20 points above and at ground level.

The finding: Roadway sulfate emissions are sent aloft by the turbulence and heat generated by vehicles.

It was a key discovery. Atmospheric scientists are now scrapping some old models of dispersion from roadways and drafting new ones based upon this unique data.



Sulfate concentrations ($\mu g/m^3$) for worst atmospheric conditions.

What's more, today's catalytic converter system—the best solution we now know for changing some other exhaust pollutants into harmless gases—is still free to do this important job.

If you would like more information on the experiment and its findings, we welcome your inquiry.

The great sulfate experiment.

General Motors Research Laboratories
Warren, Michigan 48090

21 January 1977, Volume 195, Number 4275 **SCIENCE**

Science in the Ford Years: Last Things

In the short and troubled Ford presidency, one would have expected the affairs of science to take a back seat. The main issues in that harassed interregnum concerned the stumbling national economy, the low estate of government, and general malaise and drift in the country's sense of purpose. If the Ford Administration was to woo any constituency, the scientific community logically would be about the last on the political list.

But politics and the making of public policy are strange and baffling arts. The departing President, a Midwesterner trained for the law and politics, and lacking any visible reason to care about the advancement of science, has turned out to be its good friend. Mr. Ford leaves a considerable legacy in the form of a statutory expression of national policy toward science and technology, the makings of a White House science policy center, and a research and development budget that provides for sensible growth and variety. There is a wryness in the fact that his political exit coincides with America's sweep of Nobel honors.

True, not everything is in order. The state of national affairs in energy decision-making is still dismal, if not disgraceful. The risks of nuclear proliferation seem more real than at any time in the recent past. The defense budget spirals upward while arms control agreements stumble and falter. There is no progress in negotiating the Law of the Sea. Technological innovation in the industrial sector is far from what it could be. Developing countries face frightening contingencies in meeting the needs of their people and dousing the incendiary potential of their rising dissatisfactions.

Even so, it must be said that a battered presidency alone could hardly surround and settle that formidable agenda. Our failures of resolution are the common indictment of all of us, and presidential power cannot be exercised in a vacuum. Neither Mr. Ford's defeat nor Governor Carter's victory was decided on the basis of how these issues entered into the choice. Indeed, the evidence is that politicians run dreadful risks when they stake their political futures on championing scientific freedom and progress rather than on conventional politics. A Daddario in 1970 and a Hechler in 1976 could not win governorship campaigns despite outstanding work for science and technology in Congress. What James Symington got for all his defense of the National Science Foundation in the "MACOS* fracas" was a sound thumping in his home state. In none of these cases was there an observable gathering of the scientific and technical clans on behalf of their embattled defenders. No one should be shocked if, the next time science is ambushed, politicians look the other way.

Americans tend to smirk when the British Honours List appears each year and eclipses briefly the torrent of bad news. But it is a symbol of grace under stress, and it might not do us any great harm to find civilized ways for expressing thanks for substantial public service. It should not be necessary to accumulate a thousand years of history to see that there is no shame in gratitude, and that it need not be pretentious.

There is a stir in the coatrooms of Washington. A government is retiring and a government is entering. The continuity of the political seasons unfolds as it has been ordained, and there is a touch of fever in the anticipation of things to be. But as the Gerald Fords, Guy Stevers, Charles Moshers, and James Symingtons take leave, let them know that their going is noted respectfully and their efforts remembered. If in years to come, science brings something of value to the relief of the human condition, it will not only be because of its own drive, but also because there have been public servants who did not stop to count the votes before putting the advancement of knowledge first.—WILLIAM D. CAREY

*"Man: A Course of Study." See J. Walsh, *Science* **188**, 426 (1975).

Sartorius proudly introduces "affordable" electronic weighing; a completely new series of compact, fully electronic balances in the most popular weighing ranges, priced from $1,895.

The new Series 3700 balances have no beam, no knife edges, no knobs, no dials and no mechanical zero adjustment. To weigh, just place the sample on the pan; in 1-2 seconds the readout is shown on a large, bright 7-segment digital display. Just touch the sensor bar for instant electronic taring (or zero adjustment) over the entire weighing range.

Other advanced features of the Series 3700 include a unique "stable reading" indicator and an electronic filter to eliminate the effects of high frequency vibration. Analog and digital outputs permit interfacing with printers, records, calculators and data processing equipment. Check this table for the cost of the model with the weighing range and readability you need. You'll be amazed at the savings (Model 3706 costs little more than comparable mechanical top loaders).

Model	Weighing Range	Readability	Price
3705	0-160g	0.001g	$2995
3704	0-1200g	0.01g	2995
3716*	a) 0-120g b) 0-1200g	a) 0.01g b) 0.1g	2295
3706	0-1200g	0.1g	1895
3703	0-3000g	0.1g	2295
3709	0-600g	0.01g	2330

*Dual Range Other models available with time integrator.

For an informative folder on these revolutionary balances, write: Sartorius Balances Division, Brinkmann Instruments, Inc., Cantiague Road, Westbury, N.Y. 11590.

The first fully electronic balances with the accuracies you want, in the ranges you need, at a price you can afford.

Sartorius Series 3700.

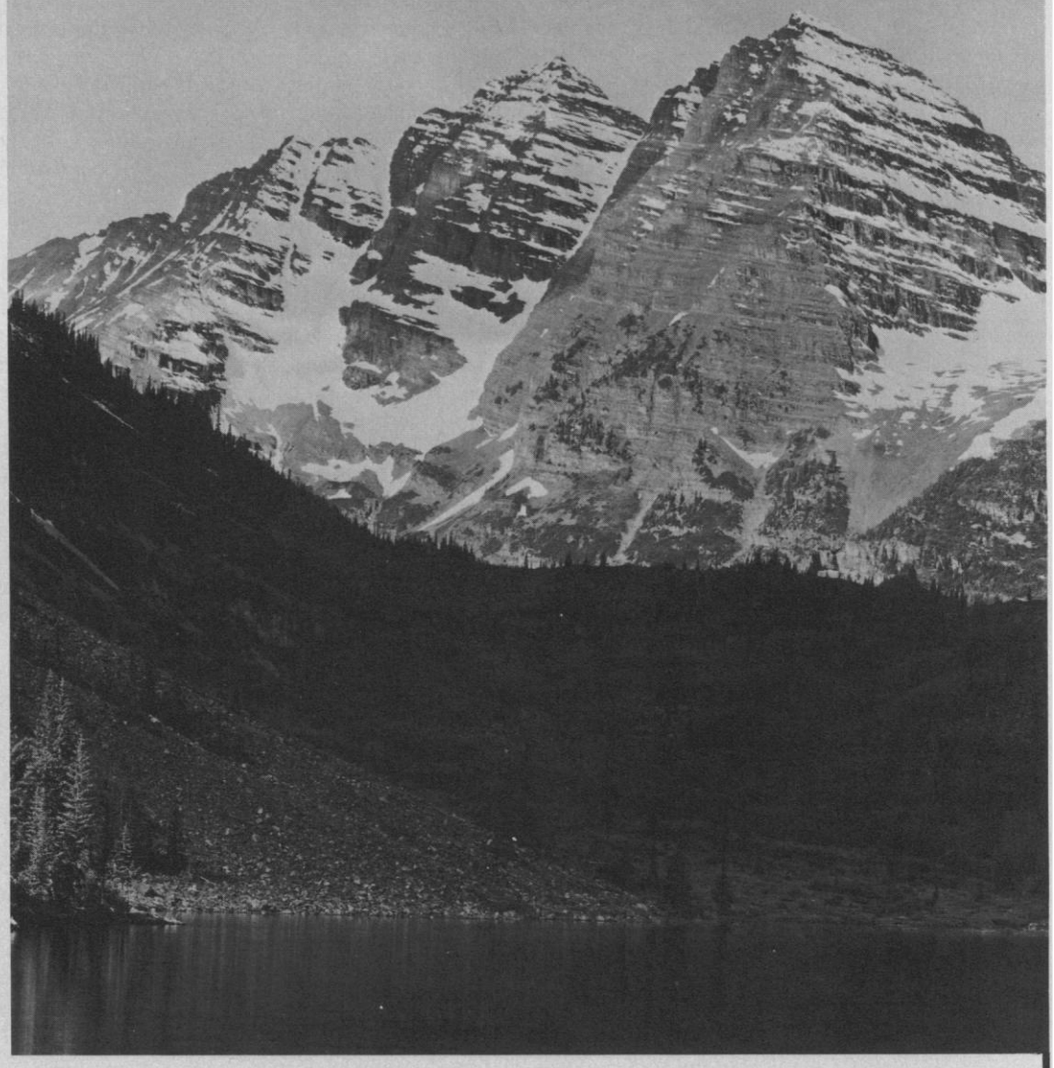
1976 IR 100 COMPETITION WINNER

Cited by Industrial Research magazine for developing one of the 100 most significant technical products of the year

sartorius

Circle No. 18 on Readers' Service Card

DENVER



For details about the Meeting program, as well as housing and registration forms, see the Preconvention issue of *Science,* 7 January 1977

or write

AAAS Meetings Office—Suite 600
1776 Massachusetts Avenue, NW
Washington, D.C. 20036

aaas

Annual Meeting
Denver
20-25 February 1977

SYMPOSIA **EXHIBITS** **SCIENCE FILM FESTIVAL** **TOURS**

New Rules for AAAS–Newcomb Cleveland Prize

The AAAS–Newcomb Cleveland Prize, which previously honored research papers presented at AAAS annual meetings, will henceforth be awarded annually to the author of an outstanding paper published from September through August in the Reports section of *Science*. The first competition year under the new rules starts with the 3 September 1976 issue of *Science* and ends with that of 26 August 1977. The value of the prize has been raised from $2000 to $5000; the winner also receives a bronze medal.

To be eligible, a paper must be a first-time presentation (other than to a departmental seminar or colloquium) of previously unpublished results of the author's own research. Reference to pertinent earlier work by the author may be included to give perspective.

Throughout the year, readers are invited to nominate papers appearing in the Reports section. Nominations must be typed, and the following information provided: the title of the paper, issue in which it is published, author's name, and a brief statement of justification for nomination. Nominations should be submitted to the AAAS–Newcomb Cleveland Prize, AAAS, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Final selection will rest with a panel of scientists appointed by the Board of Directors.

The award will be presented at a session of the annual meeting at which the winner will be invited to present a scientific paper reviewing the field related to the prize-winning research. The review paper will subsequently be published in *Science*. In cases of multiple authorship, the prize will be divided equally between or among the authors; the senior author will be invited to speak at the annual meeting.

Reports

Azaarenes in Recent Marine Sediments

Abstract. *Chemical fractionation and mass spectral probe distillation reveal the presence in recent marine sediments of a complex assemblage of nitrogen-containing aromatic compounds. These azaarenes range from three- to eight-membered rings, with homologs containing up to eight alkyl carbons. In their composition, and presumably in their origin in natural fires, they resemble the aromatic hydrocarbons found in the same sediments. The analytical, geochemical, and environmental implications of these findings are discussed.*

Soils and recent marine sediments contain a complex assemblage of polycyclic aromatic hydrocarbons (PAH) together with thienologs and extended series of alkyl and cycloalkyl derivatives (*1*, *2*). Nitrogen analogs of the PAH had not been discovered in these samples. If the PAH are formed pyrolytically, as has been suggested (*2*), they should of course be accompanied by similarly complex assemblages of azaarenes.

Recently we have discovered a rich source of azaarenes and of their alkyl analogs in curtisite and idrialite (*3*), two fossil hydrocarbon minerals thought to be formed from plant material by pyrolysis in deeply buried sediments. These minerals are hydrocarbon mixtures pure enough to require little chemical separation before mass spectral analysis. The fact that these minerals require so little preliminary treatment led us to suspect that any azaarenes that might be present in recent sediments at low concentrations may have been overlooked because they were lost during the extensive prefractionation.

A reexamination of our earlier mass spectra revealed an excess intensity at the $M + 1$ ion of the principal PAH components, over and above that expected from the isotope contributions alone. This, of course, is also the position of the intense molecular ions of the aza analogs of the individual arenes. We now have tested and modified our analytical procedure for optimum recovery of the azaarenes, using 1-azapyrene as a reference compound.

The work-up presented here follows the method of Giger and Blumer (*1*) for sampling, extraction, and initial separation by gel permeation chromatography on Sephadex LH-20. However, the removal of elemental sulfur on active copper is avoided, since it leads to some loss of aza compounds. The eluate from gel permeation is chromatographed from pentane on acidic silica gel (8 ml, containing 3 percent 1*N* HCl). A pentane eluate is discarded, and the arenes are collected in two fractions (benzene and benzene with 2 percent methanol, 20 ml each). The bases are then recovered with 35 ml of methanol containing 3 percent concentrated aqueous ammonia. This eluate is partitioned between water and benzene; the organic layer is dried over anhydrous sodium sulfate, evaporated, and chromatographed on a bed of alumina packed over silica gel (4 ml each, both with 3 percent water). Eluates of pentane and methylene chloride (20 ml each) are discarded, and the azaarenes are eluted in two fractions (methylene chloride with 10 and 40 percent methanol, 20 ml each). These last eluates are combined, dried, and redissolved in benzene containing 20 mg of picric acid. After evaporation at room temperature in a rotary evaporator, the solids are washed three times with 2 ml of pentane; the washings are discarded. The remaining solids are dissolved in benzene and washed in a separatory funnel three times with 5 percent aqueous ammonia. The benzene layer is washed with water, dried, evaporated, and chromatographed over alumina (5 ml with 1 percent water). A 10-ml pentane fraction is discarded, and the azaarenes are eluted with 40 ml of pentane containing 60 percent methylene chloride.

The azaarene fraction is weighed and fractionally distilled from a capillary with a restricted opening (*4*) into the source of a mass spectrometer (Finnigan 3200) operated at 12 ev. Individual spectra, acquired on a Finnigan model 6000 data system, are inspected for the presence, appearance, and disappearance of homologous aza series. Because of the changing vapor composition during the distillation, individual spectra do not represent the true composition of the total samples. However, successive addition of all spectra that contain appreciable aza components reconstructs a spectrum that is representative of the total sample composition.

Few azaarenes and alkyl derivatives of

BOOKS RECEIVED

(Continued from page 282)

ver, Kurt Amplatz, Howard B. Burchell, and Jesse E. Edwards. Springer-Verlag, New York, 1976. xvi, 584 pp., illus. $62.50.

Cybernetics and the Philosophy of Mind. Kenneth M. Sayre. Humanities Press, Atlantic Highlands, N.J., 1976. xiv, 266 pp. $15.75. International Library of Philosophy and Scientific Method.

Death, Dying, and the Biological Revolution. Our Last Quest for Responsibility. Robert M. Veatch. Yale University Press, New Haven, Conn., 1976. x, 324 pp. $12.95.

Demographic Anthropology. Quantitative Approaches. Papers from a seminar, Santa Fe, N.M., Jan. 1973. Ezra B. W. Zubrow, Ed. University of New Mexico Press, Albuquerque, 1976. xx, 300 pp. $20. A School of American Research Book. School of American Research Advanced Seminar Series.

Designing a National Scientific and Technological Communication System. The SCATT Report. Russell L. Ackoff and ten others. University of Pennsylvania Press, Philadelphia, 1976. xviii, 174 pp. $12.

The Easy Way to Better Grades. Otis D. Froe and Otyce B. Froe. Arco, New York, ed. 2, 1976. 174 pp., illus. Paper, $1.50.

Electricity and Magnetism. B. I. Bleaney and B. Bleaney. Oxford University Press, New York, ed. 3, 1976. xiv, 762 pp., illus. Cloth, $38.50; paper, $22.

Electronics. From Theory into Practice. J. E. Fisher and H. B. Gatland. Pergamon, New York, ed. 2, 1976. 2 vols., illus. Vol. 1, Devices and Amplifier Design. xvi pp. + pp. 1–210 + index. Paper, $9.50. Vol. 2, Operational Amplifiers, Oscillators and Digital Techniques. xvi pp. + pp. 211–446 + index. Paper, $9.50. The set, $17.50. Applied Electricity and Electronics Division. Pergamon International Library.

Energy for Rural Development. Renewable Resources and Alternative Technologies for Developing Countries. National Academy of Sciences, Washington, D.C., 1976. xii, 306 pp., illus. Paper.

Epidemiology as a Fundamental Science. Its Uses in Health Services Planning, Administration, and Evaluation. Proceedings of a conference, Mar. 1975. Kerr L. White and Maureen M. Henderson, Eds. Oxford University Press, New York, 1976. xvi, 236 pp. Paper, $6.95.

Galileo against the Philosophers in his *Dialogue* of Cecco di Ronchitti (1605) and *Considerations* of Alimberto Mauri (1606). In English translations with introductions and notes by Stillman Drake. Zeitlin and Ver Brugge, Los Angeles, 1976. xviii, 152 pp. $32.50.

Geometry of Spheres in Normed Spaces. Juan Jorge Schäffer. Dekker, New York, 1976. viii, 228 pp. Paper, $24.50. Lecture Notes in Pure and Applied Mathematics, vol. 20.

Glossary of Genetics and Cytogenetics. Classical and Molecular. R. Rieger, A. Michaelis, and M. M. Green. Springer-Verlag, New York, ed. 4, 1976. 648 pp., illus. Paper, $14.80. Springer Study Edition.

Graph Theory 1736–1936. Norman L. Biggs, E. Keith Lloyd, and Robin J. Wilson. Clarendon (Oxford University Press), New York, 1976. xii, 240 pp., illus. $21.

Handbook of Electronic Safety Procedures. Edward A. Lacy. Prentice-Hall, Englewood Cliffs, N.J., 1977. xvi, 270 pp., illus. $14.95.

Health Care. Ruth Rand Kolman. Hayden, Rochelle Park, N.J., 1976. x, 166 pp. Paper, $4.50. Hayden American Values Series.

Hot Atom Chemistry Status Report. Proceedings of a panel, Vienna, May 1974. International Atomic Energy Agency, Vienna, 1975 (U.S. distributor, Unipub, New York). viii, 336 pp., illus. Paper, $19. Panel Proceedings Series.

The Humane Technologist. Duncan Davies, Tom Banfield, and Ray Sheahan. Oxford University Press, New York, 1976. x, 180 pp., illus. $10.50. Science and Engineering Policy Series.

Hydrological Forecasting Practices. Prepared by the Working Group on Hydrological Forecasting of the Commission for Hydrology. World Meteorological Organization, Geneva, 1975 (U.S. distributor, Unipub, New York). xvi, 134 pp., illus. Paper, $11.50. World Meteorological Organization Operational Hydrology Report No. 6.

Hydrology of Marsh-Ridden Areas. Proceedings of a symposium, Minsk, Soviet Union, June 1972. Unesco Press-IAHS, Paris, 1975 (U.S. distributor, Unipub, New York). 564 pp., illus. Paper, $33. Studies and Reports in Hydrology, 19.

Jupiter. Studies of the Interior, Atmosphere, Magnetosphere and Satellites. Tom Gehrels, Ed. University of Arizona Press, Tucson, 1976. x, 1254 pp., illus. $38.50.

Laboratory Techniques in Biochemistry and Molecular Biology. Vol. 5. T. S. Work and E. Work, Eds. North-Holland, Amsterdam, and Elsevier, New York, 1976. 2 parts. Part 1, Techniques of Sample Preparation for Liquid Scintillation Counting. Brian W. Fox. 334 pp.,