6 June 1980 • Vol. 208 • No. 4448 $1.50

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

On photography, the three Rs, and articulateness

That right-brain/left-brain business has become fashionable doctrine. Vast numbers of words are spilled about it. Those words are mostly spilling out of the left sides of brains, if we understand the doctrine itself, which we may not. We feel more comfortable making judgments in the field of chemical engineering than in neuroanatomy or psychology. We would steer quite clear of this subject but for the fact that the major product of our chemical engineering finds one of its uses in preparing children for adulthood.

In pre-TV days little was spent on special help for kids who were finding it especially hard to learn how to read and write. It was assumed they would be making their way with their muscles. That has become very hard to do. So special arrangements are made. Oddly enough, the special classes consist mostly of little boys. Whatever the adult result, development schedules in the brain seem to differ between the sexes in childhood.

If Albert Einstein were eight years old now, he might well be in one of those classes as a non-intellectual despite latent power enough in the spatially reasoning right side of his brain to discover special relativity. Little Albert did it without TV stimulating that nonverbal right brain. Classmates similarly slow in the left sides of their heads would tend to turn into young men whose every statement will sound more or less alike because they will have too few words (and even fewer mathematical equations) with which to express their thoughts.

The schools and the traditions of scholarship favor the user of words. If overexposure of children to the pictures on the tube is causing the trouble and is too hard to prevent, pictures, *if under control of the child himself,* are seen by many educators as also the cure.

Overcoming verbal handicap is the price of admission to the world as now constituted, where writing advertisements for large companies beats felling large trees by hand axe. To help overcome it, photography is used in many schools to transfer strength from the overstimulated right brain to the underdeveloped left brain, even if the educators who offer evidence of the effectiveness of their techniques for doing this do not all rely on brain-splitting to explain their results.

Though the use of photography to encourage literacy in children represents a very small part of our business and probably always will, we have plenty of material to send you about the techniques and the evidence. It may help in confrontation with taxpayers who claim that a hickory stick works better than a camera for driving the three Rs into young heads.
Write Jim Sucy, Education Markets, Kodak, Rochester, N.Y. 14650.

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Corn growing in a no-tillage system on a central Kentucky farm. The residue on the soil surface is a killed fescue sod. The topography is representative of land in no tillage in Kentucky. See page 1108. [William B. Mesner, Department of Public Information, College of Agriculture, University of Kentucky, Lexington]

HP introduces the

If you've been thinking that only a 32-bit computer can handle your matrix intensive jobs, think about this: with HP's new Vector Instruction Set (VIS), the HP 1000 does matrix inversions at speeds comparable to a 32-bit mini. At less than one-third the price.

The HP 1000 F-Series computer has built a solid reputation for handling complex scientific calculations involving floating point arithmetic, trigonometric and logarithmic functions, and other computation-intensive problems. And now it's even better.

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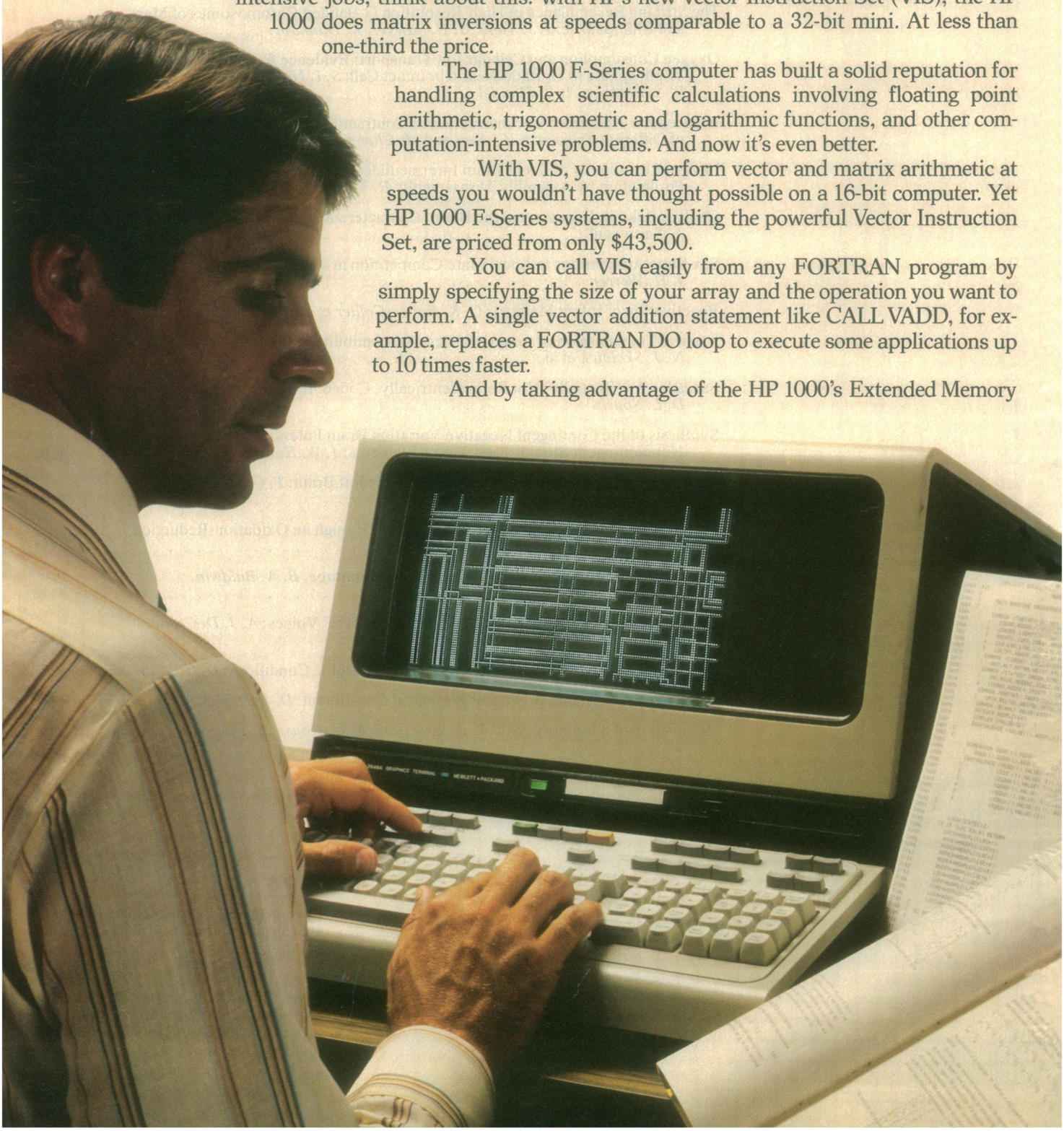
And by taking advantage of the HP 1000's Extended Memory



Matrix Machine.

Area, VIS can address extremely large data sets (up to 1.8 megabytes) in main memory. All array and memory management tasks are handled automatically so you can do large array applications like image processing, three-dimensional graphics, process optimization and simulations. Without writing any new software.

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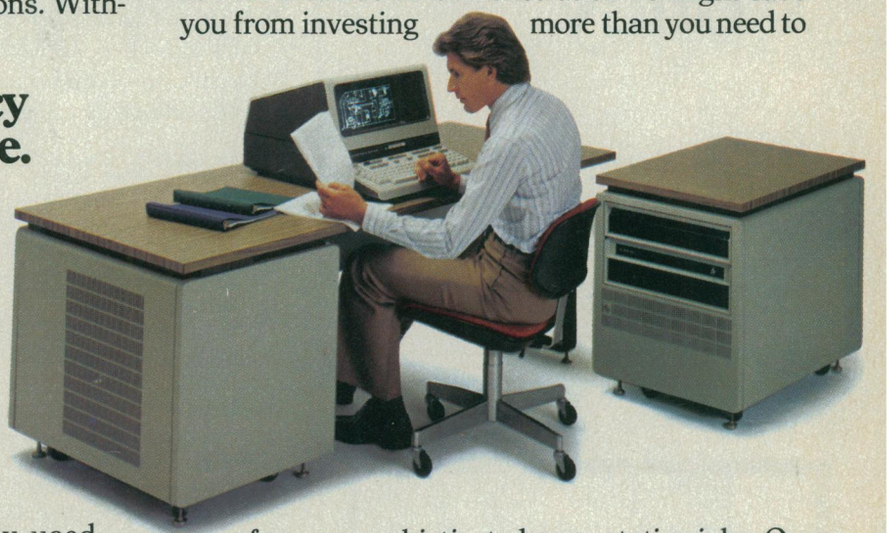
To find out how the HP 1000 makes matrix arithmetic a snap on a 16-bit computer, call your nearest HP office listed in the White Pages and ask for a hands-on demonstration. It might save you from investing more than you need to



for your sophisticated computation jobs. Or write for more information to Hewlett-Packard, Attn: Roger Ueltzen, Dept. 3560, 11000 Wolfe Road, Cupertino, CA 95014.

Matrix Inversion Times*

Size	HP 1000 VIS-enhanced F-Series	32-bit Minicomputer
50x50	1.8 sec	1.5 sec
100x100	12.3 sec	11.7 sec
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19-20 June 1980

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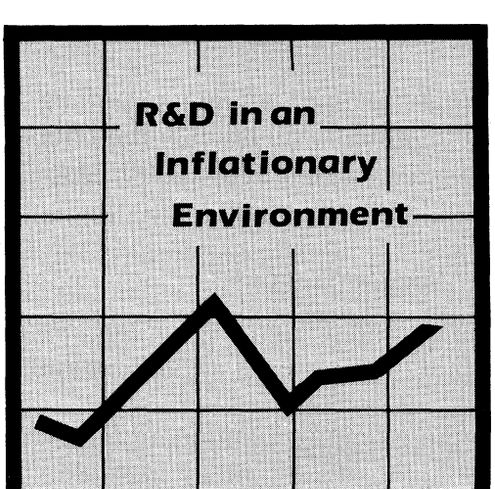

Colloquium Topics

- *Federal R&D Issues in the FY 1981 Budget* • The original FY 1981 budget and the budget revision • Federal policies on R&D • Outlook for FY 1982 and the future • Impact of inflation
- *Industry R&D and the Economy* • Problems of R&D in industry • Implementing federal policies on innovation • Coping with inflation • Impacts on economic outlook of federal and industry R&D policies
- *Science and Research at Universities* • Outlook for federal funding of research at universities • Impact of demographic changes on university needs and capabilities • Impact of federal policies and priorities • Public accountability vs. excessive paperwork
- *State and Local Interests in R&D* • State and local funding of R&D • Federal R&D and state and local needs • Technology transfer and building state and local science and technology capabilities

Colloquium Speakers

Speakers at the Colloquium will include:

Betsy Ancker-Johnson, Vice President for Environmental Affairs, General Motors Corporation

The Honorable Thomas J. Anderson, Member, Michigan House of Representatives, and Member, Intergovernmental Science, Engineering and Technology Panel

Thomas Bartlett, President, Association of American Universities

D. Allan Bromley, Professor of Physics, Yale University

Wayne Brown, Director, Utah Innovation Center, University of Utah, and Chairman of the Board, Terratek, Inc.

W. Bowman Cutter, Executive Associate Director for Budget, Office of Management and Budget

Irwin Feller, Director, Institute for Policy Research and Evaluation, Pennsylvania State University

The Honorable Robert N. Giaimo, Chairman, Committee on the Budget, U.S. House of Representatives

John H. Gibbons, Director, Office of Technology Assessment, U.S. Congress

The Honorable Dale E. Hathaway, Undersecretary for International Affairs and Commodity Programs, U.S. Department of Agriculture

Charles V. Kidd, Research Professor of Public Affairs, George Washington University

Edwin Mansfield, Professor of Economics, University of Pennsylvania

George Maslach, Provost, Professional Schools and Colleges, University of California at Berkeley

Gilbert S. Omenn, Associate Director for Human Resources, Veterans and Labor, Office of Management and Budget

Joseph A. Pechman, Director of Economic Studies, Brookings Institution

Frank Press, Director, Office of Science and Technology Policy, Executive Office of the President

The Honorable John C. Sawhill, Deputy Secretary, U.S. Department of Energy

Research and Development: AAAS Report V, by Willis H. Shapley, Albert H. Teich, Gail J. Breslow, and Charles V. Kidd, will be provided in advance to Colloquium registrants. The *Report* covers R&D in the federal budget, R&D in industry, and other topics relating to R&D and public policy. Registrants will also receive the published proceedings of the conference.

Interested persons are urged to register early by using the Colloquium registration form on the facing page.

5th R&D Colloquium Washington 19-20 June 1980

The fifth AAAS R&D Policy Colloquium will be held on Thursday and Friday, 19 and 20 June 1980 at THE SHOREHAM HOTEL, 2500 Calvert St., NW, Washington, DC 20008.

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Previous Reports and Proceedings (at **$5** each):
☐ R&D FY 80; ☐ R&D FY 79; ☐ R&D: FY 78; ☐ R&D: FY 77
☐ Proc. 79 Col.; ☐ Proc. 78 Col.; ☐ Proc. 77 Col.; ☐ Proc. 76 Col.

Program, badge, meal tickets, and R&D: FY 81 Report will be sent about 9 June. Registrations received after 9 June will be held at the AAAS Registration Desk at The Shoreham Hotel. Previous reports ordered will be sent as soon as possible. Proceedings of 80 Colloquium will be sent as soon as available.

Registrant's Name _____
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LETTERS

Saccharin Controversy

I am writing to express my deep disappointment in the cavalier commentary on the saccharin controversy published in the 11 April issue of *Science* (News and Comment, p. 154). Author R. Jeffrey Smith selectively quotes scientists who agree with the Food and Drug Administration's (FDA's) intent to ban saccharin. He relegates the majority dissenting view to the categories of misguided public, misguided press, misguided Congress, and a misguiding diet food industry.

Smith does not quote one scientist as opposing the FDA ban, creating an illusion of unified scientific support for the obsolete Delaney clause. That is FDA's absolute zero risk standard, which, if generally and sincerely applied to all synthetic and natural chemicals, would ban most of the food supply, most industrial jobs, going outdoors and staying indoors, and much of the rest of the universe. Fortunately, it only applies lawfully to food additives, though the Occupational Safety and Health Administration wants it extended to the workplace.

It was correct for Smith to report that Emmanuel Farber, and the National Academy of Sciences (NAS) panel which he chaired, both concluded that (i) "saccharin should be considered to be a carcinogen." It was deception (whether of him or by him) to omit that an 80 percent majority of the NAS scientific panelists also concluded that (ii) saccharin should *not* be banned, but that (iii) the food safety law should be amended to a basis of relative risk assessment.

It was correct of Smith to report that Frederick Robbins, as chairman of the second NAS panel, endorsed the FDA proposal at a hearing before the House Commerce Subcommittee on Health. It would have been more correct to point out that Robbins was expressing a personal opinion contrary to the consensus of the panel of scientists which he chaired, a fact made clear by NAS staff at the hearing.

For Smith to assert that NAS only wanted to remove saccharin from processed foods is to rewrite history. That tabletop sweetener proposal was their fallback position after the uproar from the real consumer movement (people who actually use the stuff). What's more it was a scam and a distraction because the FDA made no pretense that saccharin or any artificial sweetener would ever be approved as an over-the-counter drug, so the result would be the same as a total ban.

It was correct for Smith to clarify that there is value to maximum tolerable overdose testing, a "methodology made necessary by the difficulty of picking up a low level effect in a small group of animals." He should have added that there is growing evidence and concern that such biological extremism often is picking up not a low-level effect but rather only a high-level dysfunction. When you take a cancer-prone test animal and then overload what little renal function remains, or its hematologic or immunologic function or DNA repair resource, or whatever, you have not thereby proved anything other than your capacity for overwhelming biological defenses.

Finally, we get to the policy question. It is understandable that Smith would preen over the difficulty nonscientist legislators have understanding a complex scientific question, even as he adds to the confusion by crafting a one-sided summary of the issue. But if the credibility of the FDA is diminished, as it claims, the fault is the FDA's for being so dogmatic in pursuit of an outmoded absolute-zero risk concept. The Delaney clause was written by Congress in 1958, before analytical chemists extended the sensitivity of their tests a millionfold and before the rat breeders and rat feeders "perfected" their methodology. That clause and the food safety law of which it is a part need to be modernized to allow relative risk to be considered as well as benefits to the population at risk, as well as safeguards to verify that overdose testing is detecting low-level effects rather than high-level dysfunction. Smith's commentary is "an excellent example of [why] a difficult scientific issue might founder in the political and public arena." If the independent scientific leadership does not make an effort to help interpret these matters to legislators, it may be that we will never modernize the food safety law.

JAMES G. MARTIN
House of Representatives,
U.S. Congress, Washington, D.C. 20515

Upwelling Agents?

I found the article by Beverly Karplus Hartline (Research News, 4 Apr., p. 38) on coastal upwelling very interesting, particularly "the exciting discovery that winds hundreds of thousands of kilometers away can disturb the local currents . . ." and lead to upwellings. Since

the earth has a circumference of only 40,000 kilometers and the earth-moon distance is on the order of hundreds of thousands of kilometers, I assume lunar winds are the upwelling agents referred to. This new earth-moon interaction is indeed an exciting discovery!

PHILIP A. MEYERS

Department of Atmospheric and Oceanic Science, College of Engineering, University of Michigan, Ann Arbor 48109

The text should have read "hundreds *to* thousands of kilometers away."

—BEVERLY KARPLUS HARTLINE

"Retreading" Ph.D.'s

Like the weather, personnel shortages in engineering are discussed universally. I wish to discuss a short-term alleviation of the problem that we have demonstrated (locally) but which, I believe, has important national implications.

Since the minimum time it takes to create B.S.-Ph.D. manpower in engineering by means of the traditional high school stimulus, increased B.S. facilities, and Ph.D. programs requiring additional research support, is on the order of 5 to 10 years, one must look elsewhere. There is in this country a substantial pool of persons trained in theoretical physics, the more theoretical regimes of chemistry, and many subdisciplines of the biosciences. This set is at least underemployed. Our experience in our own interdisciplinary laboratory has been that, in 2 years, persons trained in any of the above named disciplines can become active teacher-researchers in fields of engineering and applied science.

I envisage a program funded by the U.S. government (or any combination of government and industry) to provide "retraineeships" for U.S. citizens (or any selected group) with at least a M.S. or Ph.D. in the above disciplines. A simple administrative mechanism is available:

University laboratories (departments and institutes in the relevant fields with the manpower deficiency) would be permitted to locate any suitable candidates whom they can put to work in an active research program. (Evidence must be provided about the quality and size of the research effort.) Such candidates will have two responsibilities: conduct research in the defined areas and either take or teach a couple of courses per year. These traineeships should be paid at the going local rate for nontenure postdoctoral positions or junior faculty. No overhead, supplies, and so forth should be involved, thus making it possible to pay the individual directly if necessary. This total immersion in an active research group in applied sciences or engineering "retreads" Ph.D.'s (and M.S.'s) so that they can become useful in new disciplines in 2 years. I cannot think of any other process that can come close. This kind of process also does not generate or continue the feast-or-famine syndrome in engineering schools. The retrained individuals could also contribute some new frames of reference to departments in industry or universities.

An increase of say $10 million to, say, the National Science Foundation Science Education Directorate could get such a program started immediately.

RUSTUM ROY

Materials Research Laboratory, Pennsylvania State University, University Park 16802

The "Monster" Proof

Recently, Robert L. Griess, Jr., announced, in a private communication, that he could prove the existence of a certain finite simple group—the "monster" F_1 with order

$$2^{46} \cdot 3^{20} \cdot 5^9 \cdot 7^6 \cdot 11^2 \cdot 13^3 \cdot 17 \cdot 19 \cdot 23 \cdot 29 \cdot 31 \cdot 41 \cdot 47 \cdot 59 \cdot 71$$

Science reporter Gina Bari Kolata, in a provocative article (News and Comment, 25 Apr., p. 377), upbraids Griess for not having given her and another science reporter details or descriptions of his work over the telephone.

Griess presented a lecture on his construction of F_1 at the Institute of Advanced Study on 5 May, and at the group therapy seminar at the University of Chicago on 6 May. His penetrating and powerful conceptual methods will be eagerly studied.

There is a great difference between private communication between scientists reporting their activities and published reports in regular channels. In view of the great complexity of his work, we think Griess was quite justified in not discussing it with a reporter.

JONATHAN ALPERIN

SAUNDERS MAC LANE

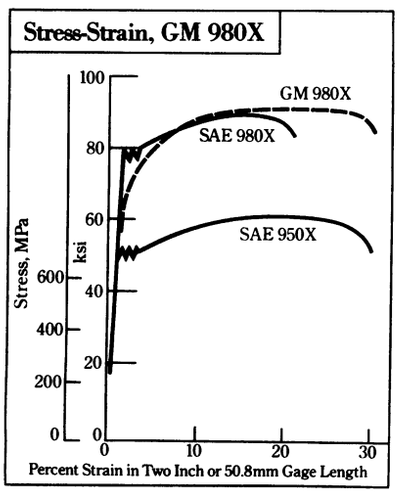
Department of Mathematics, University of Chicago, Chicago, Illinois 60637

Erratum: In the report by K. L. Webb and C. F. D'Elia (29 Feb., p. 983), the title should read "Nutrient and oxygen redistribution during a spring neap tidal cycle in a temperate estuary."

The Ductility Factor

The Ductility Factor

The use of high strength, low alloy steel has been severely limited, due to its low ductility. Now, a simple heat treating and controlled cooling process, developed at the General Motors Research Laboratories, has successfully enhanced formability properties without sacrificing strength.



A comparison of the stress-strain behavior of GM 980X, SAE 980X, and SAE 950X steels. GM 980X offers greater ductility at the same strength as SAE 980X, and greater strength at the same ductility as SAE 950X.

Scanning electron microscope micrograph of dual phase steel at a magnification of 2,000. The matrix (background) is ferrite; the second phase is martensite.

FOR SOME TIME, automotive engineers and designers have been faced with the challenge of building cars light enough to get good gas mileage, but still roomy enough to comfortably transport four or five passengers. One technique which has proved fruitful is materials substitution.

Lighter materials, such as aluminum alloys and plastics and high strength, low alloy steels (HSLA), are being phased into new vehicle designs to replace certain plain carbon steel components. Each, though, has displayed inherent problems which limit its utilization.

Unlike plastics and aluminum, however, HSLA steels have the same density as plain carbon steel. Weight reduction is achieved because thinner sections (less volume) can be used to carry the same load. Since the formability (ductility) of most high strength steels is poor, though, it has only been possible to form simple shapes from it. This has severely limited the widespread use of HSLA steels (such as SAE 980X) for auto components. New hope for the increased utilization of HSLA steel has arisen, however, with the development of a new dual-phase steel, GM 980X, at the General Motors Research Laboratories.

General Motors is not in the steel business, and GM 980X is not a brand of steel. GM 980X is the designation for a type of steel displaying mechanical properties similar to those of the samples first formulated at the General Motors Research Laboratories. "GM" in the designation indicates that the steel is a variation of the conventional SAE 980X grade. In the standard SAE system for material identification, "9" designates that the steel is HSLA. "80" is the nominal yield strength of the metal in thousands of pounds per square inch. The "X" denotes a micro-alloyed steel—one containing on the order of 0.1% of other metals such as vanadium, columbium, titanium, or zirconium as a strengthening agent.

GM 980X displays the same strength, after strain hardening, as SAE 980X steel, but has far more ductility. This characteristic allows it to be formed into various complex shapes which were previously thought to be impossible with HSLA steels. The superior formability of GM 980X has substantially increased the utilization of HSLA steel in the manufacturing of automotive components such as wheel discs and rims, bumper face bars and reinforcements, control arms, and steering coupling reinforcements.

Dr. M.S. Rashid, discoverer of

the technique to make GM 980X steel, comments, "I was working on another project using HSLA steel, when I noticed that if SAE 980X steel is heated above its eutectoid temperature (the temperature at which the crystalline structure of metal is transformed) for a few minutes, and cooled under controlled conditions, the steel developed significantly higher ductility and strain-hardening characteristics, with no reduction in tensile strength."

FURTHER experiments proved that the key variables to make GM 980X are steel chemistry, heating time and temperature, and the rate at which the steel is cooled. Specimens of SAE 980X were heated in a neutral salt bath, then cooled to room temperature with cooling rates ranging from 5° to 14°C/sec. (9° to 26°F/sec.). Dr. Rashid notes, "We found that the maximum total elongation resulted when the cooling rate was 9°C/sec. (16°F), and the lowest total elongation resulted from the highest cooling rate (14°C or 26°F/sec.)."

GM 980X steel has a high strain-hardening coefficient or n value, accompanied by a large total elongation. The n value gives a measure of the ability of the metal to distribute strain. The higher the n value, the more uniform the strain distribution and the greater the resistance of the metal to necking (localized hour-glass-shaped thinning that stretched metals display just prior to breaking). Tests have proved that GM 980X distributes strain more uniformly than SAE 980X, has a greater resistance to necking, and thus has far superior formability.

"The superior formability of GM 980X compared to SAE 980X steel appears to depend on the nature of two microstructural constituents, a ferrite matrix (the principal microstructural component) with a very high strain-hardening coefficient, and a deformable martensite (the other crystalline structure) phase. In the SAE 980X, failure occurs after the ferrite becomes highly strained, but when the GM 980X ferrite is highly strained, strain is apparently transferred to the martensite phase, and it also deforms.

"Therefore, voids leading to failure do not form until after more extensive deformation has occurred and the martensite phase is also highly strained. Obviously, the exact nature of these constituents must be important, and any variations in the nature of these constituents could influence formability. This is the subject of ongoing research."

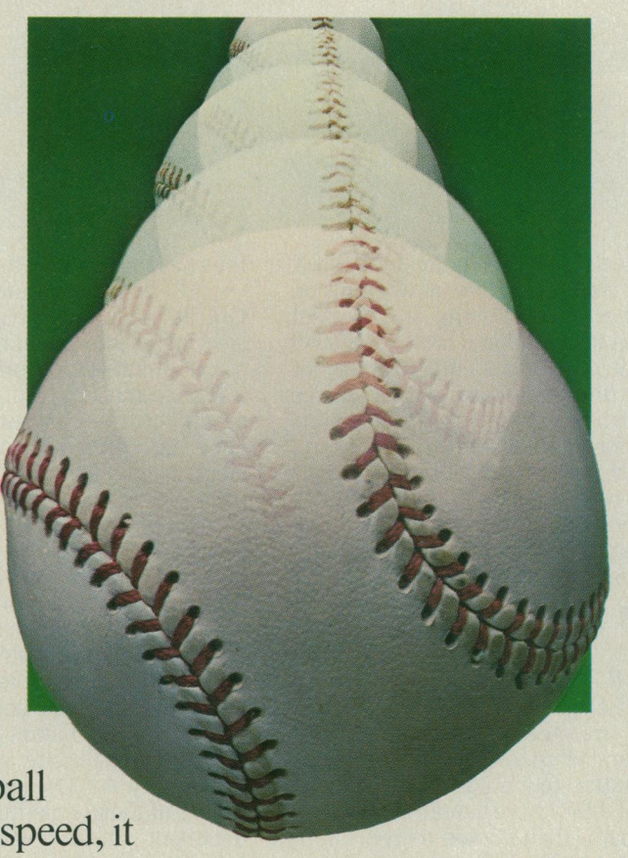
Dr. Rashid's discovery represents a significant breakthrough in the area of steel development. His findings have opened the door to a new class of materials and have completely disproved the commonly held belief that high strength steel is not a practical material for extensive automotive application. "At GM, we've done what was previously thought to be impossible," says Dr. Rashid, "and now we're hard at work to find an even stronger and more ductile steel to meet the needs of the future."

THE MAN BEHIND THE WORK

M.S. Rashid is a Senior Research Engineer in the Metallurgy Department at the General Motors Research Laboratories. He was born in the city of Vellore in Tamil Nadu (Madras), India, and attended the College of Engineering at the University of Madras–Guindy. He came to the United States in 1963 and was awarded a Ph.D. in Metallurgical Engineering from the University of Illinois at Urbana-Champaign in 1969. After a three year Post-Doctoral Fellowship at Iowa State University, he joined the staff of the General Motors Research Laboratories.

Dr. Rashid is continuing his investigations into the development of even more ductile high strength, low alloy steels. When not in the lab, he enjoys relaxing by playing tennis and racquetball with his wife, Kulsum.

THE 100 MPH FASTBALL.



The baseball manager wants it.

So does the information systems manager.

What is it?

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The baseball manager dreams of finding a pitcher who can throw a 100 mile per hour fastball consistently. Because that fastball could mean more games in the 'win' column.

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6 June 1980, Volume 208, Number 4448 **SCIENCE**

Public Doubts About Science

Important to the future of science and technology is the fact that the public has somewhat lost confidence in the ultimate value of the scientific endeavor. It is not that they hold pure science or scientists in any less esteem. But they are less certain that scientific research will inevitably yield public benefit.

For the first time in centuries, there are thoughtful persons who are not morally certain that even our greatest achievements do, indeed, constitute progress. To some philosophers it is no longer clear that objective knowledge is an unquestioned good. Glimpses of such doubts have emerged in public discussions of nuclear energy, or sociobiology, and, most recently, in the heated but foolish discussions of research utilizing recombinant DNA. The intellectual elite in every era has always been pessimistic. But today, concerned that "that which can be done, will be done," there has arisen an antiscientific, antirationalistic trend that should give us pause. At its ugliest—or most absurd—it finds expression in gurus, tarot cards, and astrology, faddist approaches to nutrition, and easy assertion and acceptance of unfounded allegations of environmental hazard. That antiscience attitude perniciously infiltrates the news media, affecting the intelligentsia and decision-makers alike. It must be confronted at every opportunity.

The public image of science and scientists has been distorted by the participation of scientists in public policy formation. Beneath the surface, the environmental and consumer movements may be an expression of anomie, a cry of protest for the sense of powerlessness of the individual educated citizen—patently a serious sociopolitical circumstance. However, a frequent surrogate for that deep-seated complaint is an expression of concern about the safety of some product or technology, based always on an assertion of risk that was first brought forward by some member of the scientific community. The societal response has been attempts at examination of such matters by risk and cost/benefit analysis. Well, risk/benefit analysis can certainly inform the decision-maker. But his decision must necessarily still turn on a value judgment, conditioned by his social, economic, philosophic, and religious views. But that is the nature of the political process. The public acceptability of a given level of risk is a political, not a scientific, question.

Difficulty arises in the scientific community from confusion of the role of scientist qua scientist with that of scientist as citizen, confusion of the ethical code of the scientist with the obligation of the citizen, blurring the distinction between intrinsically scientific and intrinsically political questions. When scientists fail to recognize these boundaries, their own ideological beliefs, usually unspoken, easily becloud seemingly scientific debate.

A decade ago it might have been desirable to flag potential hazards for public attention and proceed as if each were a clear and present danger. It is time to return to the ethics and norms of science so that the political process may go on with greater confidence. The public may wonder why we do not already know that which appears vital to decision—but science will retain its place in public esteem only if we steadfastly admit the magnitude of our uncertainties and then assert the need for further research. And we shall lose that place if we dissemble or if we argue as if all necessary information and understanding were in hand. Scientists best serve public policy by living within the ethics of science, not those of politics. If the scientific community will not unfrock the charlatans, the public will not discern the difference—and science and the nation will suffer. There is, in short, a large burden on the scientific community to be seen as constructive in dealing with real problems, as straightforward, forthcoming, honest, and courageous—not intimidated, as all too many have been for the last decade.—PHILIP HANDLER, *President, National Academy of Sciences, Washington, D.C. 20418*

Excerpted from a speech on "Science and the American Future," given at Duke University, Durham, North Carolina, on 6 March 1980.

HALOGENATED ALIPHATIC & OLEFINIC HYDROCARBON SYMPOSIUM WORKSHOP

June 19 & 20, 1980 • Washington, D.C.

Quality Inn — Capitol Hill

SYMPOSIUM OBJECTIVES

Overall symposium objective is to prioritize concerns regarding halocarbons.

Since the discovery of the carcinogenicity of vinyl chloride, there has been an explosive growth in halohydrocarbon research. Widely used as industrial degreasers, in food processing, the automotive and aircraft industry, chemical manufacturing, anesthesiology, agriculture and a host of other areas, some of these compounds have been banned by federal regulators and replaced by others about which even less is known.

To generate the in-depth understanding the subject area merits, the International Study Center, a non-profit organization, is sponsoring a symposium workshop highlighted by a panel of some 20 leading scientists and academic physicians. This distinguished group will air matters concerning the testing and carcinogenicity of halogenated hydrocarbons, freely and informally...an academic review of the acute and chronic effects as well as the safety of these compounds.

SYMPOSIUM PANEL

- Benjamin L. Van Duuren
  Symposium Chairman, *NYU Institute of Environmental Medicine*
- Bernard Boesterling
  Stanford University School of Medicine
- Joseph F. Borzelleca
  Medical College of Virginia
- Maynard B. Chenoweth
  Dow Chemical Biology Research
- Joseph A. Cimino
  New York Medical College
- Harry B. Demopoulos
  NYU School of Medicine
- Richard Mazze
  Stanford University School of Medicine
- Herbert S. Rosenkranz
  New York Medical College
- Jerome Stara
  Environmental Protection Agency
- James Trudell
  Stanford University School of Medicine
- Herman Turndorf
  NYU School of Medicine
- Herman Uehleke
  Bundesgesundheitamt Abteilung, Berlin
- Russell A. Van Dyke
  Mayo Clinic
- Phillip Watanabe
  Dow Chemical Toxicology
- Sidney Weinhouse
  Temple University School of Medicine
- Elizabeth K. Weisburger
  National Cancer Institute
- John H. Weisburger
  American Health Foundation
- Gary Williams
  American Health Foundation

PROGRAM

Thursday, June 19

8:30 AM	Introduction & Objectives
9:00 AM	Session I: Chemical Structure & Metabolism of Halocarbons
10:30 AM	Session II: Short-Term Assays
12:00 Noon	Lunch
1:30 PM	Session III Chronic Toxicities
3:30 PM	Session IV: Halohydrocarbons as Co-Carcinogens & as Promoters
5:00 PM	Session V: Summary

Friday, June 20

8:30 AM	Session VI: Halohydrocarbons as Anesthetics
10:30 AM	Session VII: Prevalence in the Environment & Regulatory Aspects
12:00 Noon	Lunch
1:30 PM	Session VIII: Summary of Current Status, Problem Areas & Research Needs
3:00 PM	Press Conference

REGISTRATION CARD

International Study Center for Environmental Health Sciences
503 Grasslands Road
Valhalla, New York 10595
Phone: (914) 592-4150, (212) 679-8746

Registration fee of $750 is payable in advance and includes costs of meeting materials.

☐ Number of tickets

Name _____ Title _____
(Please print)
Company _____ Division _____
Street _____
City _____ State _____ Zip _____
Tel. No. ( ) _____

☐ This confirms telephone registration.

HALOCARBON SYMPOSIUM
June 19th and 20th, 1980

DETAILS

The symposium will be held on Thursday and Friday, June 19th and 20th at the Quality Inn — Capitol Hill, 415 New Jersey Avenue, NW, Washington, D.C. 20001. The proceedings will start promptly at 8:30 AM each day. Lunch will be served to audience attendees on both days. Individual ticket prices are $750 and include costs of meeting materials. Early response via pre-paid mail registration is strongly advised. *A limited number of scholarships are available for university faculty and students; government rates for federal, state and local officials are available.* Call the Study Center for more information.

The Quality Inn has reserved rooms for attendees and individual reservations can be made by calling them at 202-638-1616. The Hyatt-Regency is directly across the street *(400 New Jersey Avenue, NW) and its number is 202-737-1234.*