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### COVER

High water banding on a standard boat in a Delaware salt marsh resulting from interception of the estuarine surface microlayer and resulting fouling. See page 1010. [Dan Murphy, College of Marine Studies, University of Dela-ware, Newark]

# VAX Program Capacity. Askanyuser.

### "VAX offered us almost three times the address space of our 370/168."

Bill Miller, Senior Systems Analyst Chevron Geophysical Co., Houston, Texas



Chevron Geophysical is heavily engaged in seismic data processing involving matrix operations on large arrays.

As Senior Analyst Bill Miller states the problem: "Our IBM systems, running on TSS, give 24 bits of true address space – for a maximum program size of 16 megabytes. But only 10 to 12 megabytes of this can be used by the programmer – and our application had grown to the point that TSS was simply cramping us.

"With the VAX-11/780, we know we can have application programs that use a full 32 megabytes as we're configured now – and it could be more if we wanted."

But Chevron didn't buy their VAX without first benchmarking it against the far more expensive 168.

Miller comments: "We developed a number of benchmarks to test specific areas of performance. On the average, the VAX CPU appears to be about a third as fast as the 168, which is really quite impressive. And it's very possible that for certain applications, we may see a negligible loss of throughput over the 168, thanks to VAX's unique page clustering scheme."

And as far as system performance to date, Miller reports: "The VAX/VMS operating system has been remarkably reliable. The people at Digital have done a phenomenal job."

### "VAX's true 32-bit addressing puts its potential capacity so far out, we don't have to worry about it."

Dr. Edwin Catmull, Director, Computer Graphics Lab New York Institute of Technology, Old Westbury, New York

The Computer Graphics Lab at New York

Institute of Technology is a leading research and production facility for computer animated commercial and educational films.

In Dr. Catmull's words, here's what brought NYIT to the VAX-11/780: "While spending years developing our capabilities with minicomputers, we



continually ran into the problem of small address space. Our work demands the large address space we can get with a 32-bit machine. We were dealing with extremely large, randomly accessed data bases, and memory mapping is not the answer."

Dr. Catmull continues, "The VAX UNIBUS lets us easily hook up a wide range of special video display equipment that had previously been on the minicomputers, and allows us to easily convert our algorithms." According to Dr. Catmull, "VAX has fulfilled our opportations for speed pro-

fulfilled our expectations for speed, program size, ease of conversion, and ability to attach special graphics equipment."

### "With a 22,000-point data base, we really needed VAX's huge memory capacity."

Peter Ackermans, Manager of Computer Systems Engineering CAE, St. Laurent, Quebec, Canada

CAE Electronics Ltd., currently has thirteen VAX-11/780 systems under development for both flight simulation and supervisory power control.

Here again, VAX capacity was key. Systems Manager Peter Ackermans told us: "Our SCADA systems for the power market need to handle a 22,000-point data base. VAX's large memory capacity and the VAX/VMS virtual memory operating system made it a very attractive machine."

But speed was also important. "In flight simulators," Ackermans continues, "top FORTRAN performance is essential, and on that score, VAX measures up well. Our FOR-TRAN programmers have also been impressed with the machine's debug facility and file handling capabilities."

Digital's VAX-11/780, with its true 32-bit address space, has set a new standard for program capacity. This means that you can run large programs easily on VAX, with a potential for growth that's unmatched in the industry.

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Note: An identical system is also available with reverse flow.

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Note: An identical system is also available with reverse flow.

# are five Stay-Clean to protect your animals from contamination.



### System C

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### For more Information

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- b. Screens of mouse and human shotgun collections (approx. 25% of original autoradiogram). Prepared by the Blattner and Smithies groups, Laboratory of Genetics, University of Wisconsin. Technique described in the following papers: 1) Blattner, F. R. et al. 1978. Science. 202:1279-1284; 2) Smithies, O. et al. 1978. Science. 202: 1284-1289.
- c. Genome screening of a sea urchin library cloned in Charon 4<sup>\lambda</sup> bacteriophage. Prepared by D. M Anderson, R. H. Scheller and J. W. Posakony, Division of Biology, California Institute of Technology.

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Photos by S. Miller, The Biological Laboratories, Harvard University.

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### LETTERS

### Wind Generators and the Oil Reserve

The U.S. national program to store 109 barrels (bbl) of imported oil underground by 1985 is progressing. A different "reserve," which would be, in a certain sense, equivalent can be obtained at the same cost by using large wind generators. In 10 years wind generators could save a total of more than 10<sup>9</sup> bbl of oil that otherwise would be burned to make electricity. If oil were imported at the same rate as it would be in the absence of a wind generator program, domestic oil fields would, after 10 years, contain 109 bbl more petroleum than they otherwise would have. Moreover, the wind generators, which have an expected life much greater than 10 years, would be delivering energy at a rate equivalent to 175  $\times$ 10<sup>6</sup> bbl of oil per year.

This calculation is based on the availability of large wind generators at an installed cost of \$500 per kilowatt (1). They would operate at an average plant capacity factor of 0.30 (2). It is assumed that construction of the underground storage facility to be used to store the oil will cost, when completed,  $\$3.5 \times 10^9$  (3). This would be filled with crude imported petroleum costing \$15 per barrel or  $15 \times 10^9$  for the entire inventory (4). To simplify the calculation it is assumed that the construction would be completed before any oil were purchased for storage, and that all 109 bbl would then be purchased and stored at one time, at the beginning of year 1.

The alternative to constructing the oil storage facility would be to buy wind generators. At the beginning of year 1 the sum of  $3.5 \times 10^9$  (the construction cost of the storage facility) would be available to buy 700 megawatts of wind generator capacity. These would operate for 1 year, producing  $18.4 \times 10^6$  megawatt-hours. At the end of year 1 the stock of wind machines would be augmented by an amount corresponding to the interest (at 10 percent) on the full petroleum inventory for 1 year. Thus \$15  $\times$ 10<sup>8</sup> would become available. At the end of the second year another  $$15 \times 10^8$ would become available, and so on. The wind generators, grid-connected, would save oil in power stations at an assumed average heat rate of 10,000 Btu's per kilowatt-hour or 554 kilowatt-hours of wind electricity would save 1 bbl of oil. At the end of 10 years the wind capacity in place would total 37,000 megawatts, the annual oil savings would be  $175 \times 10^6$ bbl/year, and the cumulative oil savings would be  $1.15 \times 10^9$  bbl.

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The wind generators in place at the end of 10 years could be expected to go on producing for several more decades, at least, although they would already have been "paid for." More wind capacity could be added every year, using the money that would have been spent to finance the oil reserve.

simplified. However, the assumed and calculated numbers are reasonable. Wind has substantial environmental advantages as compared to oil. Perhaps we should be studying the replacement of at least a part of the oil reserve with wind generation capacity.

MARSHAL F. MERRIAM **Department of Materials Science** and Mineral Engineering, University of California, Berkeley 94720

### **References and Notes**

- 1. Prices of large wind generators are not well defined at the present time; much depends on the scale of production and existing machines the scale of production and existing machines are all prototypes. Several studies sponsored by the Department of Energy have developed costs, based on present designs, in the \$500 per kilowatt range for rated wind speeds consistent with a plant capacity factor of 0.30.
  Plant capacity factor is the factor by which the number of hours per year and the kilowatt rating of the generator must be multiplied to yield the number of kilowatt-hours generated in a year.
  According to press reports (*Wall Street Journal*, 11 January 1979, p. 22) the cost of constructing facilities to store the oil seems likely to exceed \$3.50 per barrel.
- 3.50 per barrel.
- considers that most of the crude petro-If one leum is likely to be purchased at some future, higher price, the number \$15 per barrel is conservative.

### **Biological "Strategies"**

The term "strategy" has become common currency among biologists of various persuasions from the molecular to the population level. We read of biochemical strategies exhibited by marine invertebrates and reproductive strategies of birds, not to speak of osmotic strategies in desert plants!

The term "strategy" implies that a rational choice has been made and has its origin in ancient military parlance. While I will concede that some higher mammals, such as a pride of hunting lions, may employ a decision-making process which borders on strategy, can you imagine a group of barnacles convening a meeting to decide on which set of isoenzymes to use so that their metabolism could become temperature-independent? The term is therefore semantically quite incorrect but, far more important, it is philosophically grossly misleading, as it implies that a process has occurred which is the very antithesis of the evolutionary concept of chance and necessity.

Let us therefore agree on the strategy 9 MARCH 1979

to expunge this nasty little word from our biological vocabulary and, while we are about it, let us also exclude its kid brother or congener the "trade-off principle," which is philosophically equally misleading.

GIDEON LOUW

Department of Zoology, The above is, of course, drastically, Arizona State University, Tempe 85281

### **Carcinogen Report to the Public?**

Luther J. Carter's article (News and Comment, 9 Feb., p. 525) on the amendment to the National Cancer Act requiring the Department of Health, Education, and Welfare (HEW) to issue a report each year on carcinogens suggests to me that, in addition to preparing this type of report, HEW should make a presentation to the general public concerning the dangers of various substances. This presentation could be sent to newspapers throughout this country, informing readers about what substances might increase their chances of contracting cancer. The report could also inform the public as to where these substances occur, that is, in gasoline, solvents, adhesives, paint, and so forth. With this knowledge the public would not only be aware of the dangerous substances but could carry out a surveillance action of its own, informing the proper regulatory agency of any possible overexposure to toxic substances. The reports should be in simple, nontechnical language; the use of brand names of particular products would be best, as it would put pressure on various companies to "clean up their act," so to speak. KENNETH A. DEVOR

Department of Chemistry, California State University, Los Angeles 90032

### The Piltdown Hoax: Piltdown 2

The theory that Piltdown man was a joke, at least partially designed by W. J. Sollas (News and Comment, 8 Dec. 1978, p. 1062), does not fit the facts. Piltdown 1 and "associated fossils" were found over a number of years either by Charles Dawson or someone who was with Dawson at the time of the discoveries. The motivation appears to have been to prove that the eoliths were human-made by providing the maker, stone tools, and associated fossils for determining the age. The evidence pointing to Dawson has been carefully presented by





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Weiner (1) and recently evaluated by Krogman (2). The history surrounding the "discovery" of Piltdown 1 is vague, complex, and will probably never be completely understood.

The discovery of an anatomically modern braincase with an ape-like lower jaw set off a controversy that lasted until 1953, when all the supposed fossils and stone tools were shown to be fakes (l). If the forgery were just a joke that went too far, the matter, presumably, would have stopped after the discovery of Piltdown 1, but apparently the forger wanted to prove that the lower jaw and the skull belonged together. With this end in mind, Piltdown 2 was created. It consisted of a piece of frontal bone, a bit of occipital, and a lower molar tooth-just enough to suggest similarity with Piltdown 1 and to prove that the ape-like molar tooth belonged to a human with a high forehead and small browridge. The only person associated with Piltdown 2 was Dawson, who died shortly after the discovery; after his death no further stone tools or fossils were found. Clearly, Piltdown 2 was no joke but an attempt to end the controversy which gravely affected the importance of Pitldown 1.

Piltdown 2 had the desired effect and converted many scientists (3), or reinforced the opinions of others (4). The motivation behind 2 seems to have been the same as behind 1-to prove that a primitive form of human being had made the stone tools. The evidence suggests a serious attempt at fraud, not a joke or minor hoax. It must be remembered that at that time the eolith problem was one of the major issues in prehistory. Dawson had been involved in it, had faked tools (1), and, as Piltdown 1 failed to settle the issues. Piltdown 2 may well be regarded as a bold stroke to settle the matter beyond any reasonable doubt.

The argument that someone else with more anatomical knowledge must have been involved is very weak. Although it cannot be proved that someone else might have helped on Piltdown 1, the case is clear on 2. Further, if the forger had anatomical experience, the parts for Piltdown 1 would surely have been selected differently. To provide an ape-like jaw it was not necessary to find the simian shelf or the canine. Most of the body with the two molar teeth would have been quite enough. Further, if the jaw were to be associated with the skull, it was essential to remove the very distinctive human temporomandibular joint from the skull, not the condyle from the jaw. The joint is uniquely human, the condyle is much less distinctive, particularly if abraded a little (as was done to the teeth). Dawson had been collecting stone tools, eoliths, and fossils for more than 20 years (l), so there seems to have been no necessity that anyone else be involved. That cannot, of course, be proved so many years later.

The great interest in Piltdown, both popular and scientific, was due, in part, to the belief that it was the first human fossil to be found in England. Smith Woodward's book is titled The Earliest Englishman (5)! But for the scientists, the discovery fitted the theory that, in human evolution, the brain had evolved earlier than the face, and that all previous discoveries were on side branches of the human evolutionary tree (6, 7). Weidenreich could not accept the "chimera" because it would not fit in with his view of human evolution (8). For Hooton, Eoanthropus was central to his theories (9). I think it was these implications of Piltdown that kept the controversies alive. For many years it was not possible to draw a scheme of human evolution without considering the Piltdown problem.

Sollas took a strong position favoring Piltdown, the association of the lower jaw and skull, and Smith Woodward's reconstruction (10). On the possibility that the jaw did not belong with the skull, he wrote, "The chances against this are, however, so overwhelming that the conjecture may be dismissed as unworthy of serious consideration" (10, p. 54). The canine was found after Sollas's book had been written, but it is described in a footnote (10, p. 55). Sollas commented that, "Thus, Dr. Smith Woodward's method receives an unexpected and triumphant vindication." In the second edition of Ancient Hunters, pages 51 to 57 are devoted to Piltdown, with no suggestion that there was anything suspicious about the finds.

A new theory suggests that Sollas was involved in a joke to discredit Smith Woodward, but the hoax became too successful to be revealed (11). Whatever Sollas's personal feelings about Smith Woodward may have been, what he published was strong support. The Piltdown finds were made over a period of several years, and each of the later ones was designed to answer the problems which had emerged in earlier reconstructions. The nasal bones helped in understanding the face. The canine tooth ended the problem of reconstructing the jaw. Piltdown 2 proved that skull and jaw went together. Is there any evidence that Sollas was involved in these "discoveries," which occurred over a period of more than four years?

If Sollas knew that Piltdown was not a

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**American Association for** the Advancement of Science genuine fossil, he knowingly published a most misleading account, allied himself with the forger, and silently watched the futile controversy for 25 years. These are serious charges to bring against a person who has been dead for more than 40 years. Surely Sollas should not be blamed unless there is more evidence than that he did not like Smith Woodward, had access to fossils, and was not pictured in a group of scientists studying Piltdown. I believe that what Sollas wrote is a far better guide to what he thought than the recently disclosed suspicions of a person who did not voice them until the critical actors in the drama had been dead for many, many years.

S. L. WASHBURN

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### The Humanities and Science

I question Charles A. Lave's notion (Letters, 19 Jan., p. 224) of the humanists who "were the first to define 'education' long ago." As I understand the humanists of Western history, they did not limit themselves to arts and letters but sought to understand and codify all possible human experience and knowledge. Da Vinci and Newton are only two of the most obvious examples. These early humanists even understood how the drive to acquire knowledge of all things can lead to the illusion that we can control all things, as the enduring power of the legend of Faust shows us.

I strongly agree with Lave that we in the humanities need to know the issues debated in the sciences and have our educated say on those issues-that is why I read Science. But the strong insistence that the scientists understand the issues in the humanities is based on a simple matter of scale. If I write a poem, it is unlikely to change the world for better or worse, regardless of the number of people who read it. But those in the physical and mechanical sciences have a great potential for changing the lives of a very great number of us, whether we choose to cooperate with them or not. Many lives have been saved by the invention and use of the Salk vaccine; many lives have been lost by the invention and use of nuclear weapons. Moral choices must always be made.

JAMES F. SCHAEFER, JR. 1707 Stevens Avenue South, Minneapolis, Minnesota 55403

Lave complains of anti-science discrimination by educational institutions, and by humanities departments in particular. I do not pretend to speak for institutions, but Lave and other readers might be interested to know that in the humanities few new topics have seemed more attractive in the last decade than science. Science's epistemology, ethics, social structure, psychology, rhetoric, and relations to current policy issues have been taken up by a broad spectrum of teacherresearchers in humanities (and social science) departments, including English departments like my own. Half a dozen new publications (for example, Science, Technology & Human Values) have appeared to display the fruits of this activitv.

Also-and this is not untypical-members of my department are teaching advanced writing courses that take for their content the current debates over nuclear power and recombinant DNA research, two topics Lave implies are hopelessly beyond the range of humanities departments.

JOHN WOODCOCK

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### Reflections

There seems to be come confusion in the picture caption on page 15 of the 12 January issue (News and Comment) about the 13-inch reflecting telescope at Vassar. The ladies may be reflecting, but I am quite sure the telescope is refracting.

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### FITC: Something New or More of the Same?

On 29 March 1978 President Carter announced his Administration's plan to create a Foundation for International Technological Cooperation (FITC). The proposed foundation will be considered in this session of Congress and is expected to be part of the 1980 budget. The purpose of the FITC is to expand knowledge and increase the availability of technology to meet the needs of developing countries. The FITC will engage in or contract for programs aimed at building an indigenous capacity for science and technology in developing countries as well as a capacity to plan for expansion of the technical sector and for amelioration of side effects of such expansion. It will support and foster direct nongovernmental linkages among scientists, planners, and analysts engaged in development activities in the United States and developing countries.

The FITC offers an opportunity to foster a collegial, expert-to-expert, nonbureaucratic, nonpatronizing, no-strings-attached approach. It could also be a signal of real change in the U.S. response to the entirely new environment for development. The foundation form appears to promise that assistance will be awarded on the basis of the merit of proposals. A major expansion of the arm's-length foundation model for exchange of personnel, experts, and professional groups has long been needed in international programs. The Agency for International Development (AID) has provided some support to the development of collegial, productive exchanges by funding programs such as those of the Board on Science and Technology for International Development of the National Academy of Sciences. But AID support has been too small in relation to the need and has been conducted in the shadow, real or perceived, of an agency dominated by American political objectives abroad and political pressures at home.

Widespread consultation gives encouragement that the FITC will be well planned, adequately funded for this time of necessary budget restraint, and launched with the support and enthusiasm that are needed. But there is a real hazard that it may not keep a sufficient distance from government and make a distinct break with the past, and without these features the enterprise will surely fail. The FITC will probably become one of the group of agencies under the general rubric of a new International Development Cooperation Agency. Such a placement may be administratively necessary, but it would be risky. A major part of the FITC budget and possibly of its personnel will be transferred from the present AID. Its public board will probably be only advisory, without policy or program responsibilities. The aura of the AID, fair or unfair though the image may be, will be very much around. Whatever the true nature of the new agency, it may not be perceived as new and independent.

The proposed foundation offers this country the best available chance to participate in international political and economic development under the present circumstances, which are entirely different from those on which past programs have been based. To succeed, it must be completely insulated from large bilateral national aid programs and their associated political history. It must have, both in fact and in perception, the independence that the word foundation implies.

The United States is at its best in foreign scientific and technological programs when it treats foreigners like colleagues and not like wards. The "ugly American" has too often been a patronizing U.S. expert. A separate foundation, independently operated, can make an immense contribution to development. It may be able to achieve more with limited funds than has been possible with large infusions of capital into development projects. This is a chance to create a long-needed institution; it will be a shame if we fall short of meeting that need. -- BREWSTER C. DENNY, Dean, Graduate School of Public Affairs, University of Washington, Seattle, Washington 98195

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### Spectrofluorometer

The Ratio II instrument can obtain the percent transmittance of a solution in addition to its fluorescent properties. It compensates for the inherent instability and decreasing output of xenon lamps to electronically divide the sample output by the output of the reference photomultiplier. This real-time compensation is suited to analyses of short-lived phosphorescence and fast kinetic reactions. Six scan rates are available and there is an Autoranging feature to select the proper scale for a given sample. American Instrument. Circle 806.

### **Electrophoresis Chamber**

Model VQS uses silicone rubber sealing gaskets and single-action rapid clamps to mount electrophoresis plates without sealing grease, removable spacers, or pinch clamps. The unit employs Lucite electrolyte chambers and glass electrophoresis plates. The electrophoresis path-length is 13 centimeters. Two-dimensional electrophoresis is easily set up with optional gel plates that have beveled tops. Electrodes are platinum; stainless steel and brass are used for hardware. Atlantis Scientific. Circle 807.

### **Digital Electrometer**

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### Laboratory Freezer

Model PR120-17 is used for medical research, biological storage, preserving tissue, plasma, blood cells, and microbiology. The cabinet is made of steel with a counterbalanced lid. An indicating temperature control provides an adjustable temperature range from  $-18^{\circ}$ C to  $-85^{\circ}$ C. The cabinet has an air-cooled condenser; no liquid is required. Chamber dimensions are 69 by 20 by 21 inches high. Outside dimensions are 79 by  $35^{1/2}$  by 50 inches high. Model PR120-17 is also available with a recording thermometer and a buzzer alarm. So-Low Environmental Equipment. Circle 812.

### **Reversed-Phase Thin-Layer Plates**

Microslides, 1 by 3 inches, employ a silica gel in which the surface hydroxyl units are reacted with octadecylsilane ( $C_{18}$ ) to form layers 200 micrometers

thick. Interaction of the sample hydrocarbons with octadecyl groups in this layer is the basis of separations occurring on these plates. This silica gel accommodates high loads and rapid flow. The new plates also include an inorganic fluorescence indicator for visualization under ultraviolet excitation at 254 nanometers. Whatman, Circle 810.

### **Microbial Plating and Counting**

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### **Computer Interface for Mass**

### Spectrometers

Interlink interfaces many types of 16bit computers and desk-top calculators with mass spectrometers. With the appropriate hard- and software, these data processors can control mass scanning, signal acquisition, and many other functions of a mass spectrometer. Interlink uses a 16-bit digital-to-analog converter for mass command and 12-bit analog-todigital converter for analog data acquisition and scalers for pulse counting. Other controls and status checks are routed through three 10-bit digital-to-analog converters and various switches and latches. Extranuclear Laboratories. Circle 809.

### Literature

Instrumentation Tape Recording is written for scientists who must evaluate, select, and use tape recording systems with their experimental apparatus. EMI Technology. Circle 815.

*Vacuum Filtration Manifold* describes a means for simultaneous filtration of up to 12 samples. Amicon. Circle 817.

Neuroscience, Statistics and Psychology is devoted to apparatus and audiovisual materials for these disciplines. Life Science Associates. Circle 818.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (on pages 946A and 1042A) and placing it in the mailbox. Postage is free. —RICHARD G. SOMMER



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### AAAS NEWS

### (Continued from page 996)

published in the Proceedings Issue of Science.

The new procedures call for publication of a directory of AAAS Fellows, to be sold to AAAS members at cost. The directory cannot be published before the 22 May deadline for submission of nominations, but inquiries about the fellowship status of prospective sponsors may be directed to the Executive Office. As soon as the directory is available, an announcement will appear in the AAAS News section of *Science*.

### For the Library

The Double Bind: The Price of Being a Minority Woman in Science, third printing. Shirley Mahaley Malcom, Paula Quick Hall, and Janet Welsh Brown. Report of a 1975 conference of Black, Puerto Rican, Mexican-American, and Native American women scientists. The report discusses problems of minority women in science and contains policy and program suggestions which can serve as guides to public agencies, educational institutions, professional associations, and funding organizations. 70 pp. Cost: \$3 per copy.

Programs in Science for Minority Students, 1960–1975, second printing. Compiled by Shirley Mahaley Malcom, John Cownie, and Janet Welsh Brown. An inventory of projects, undertaken since 1960, aimed at improving the quality of science education for minority students. Single copies available at no cost.

For further information, contact Karen L. Ehrlich, Office of Opportunities in Science, at the AAAS address.

### **CSFR** Committee to Meet

The AAAS Committee on Scientific Freedom and Responsibility will meet on Friday and Saturday, 16 and 17 March, in the AAAS Board Room, 1515 Massachusetts Avenue, NW. The meeting is open. For further information, contact Rosemary Chalk, CSFR staff officer. Telephone: 202-467-5236.

For more information about the activities and publications described in AAAS News, write to the appropriate office, AAAS, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036, unless otherwise indicated.

### BOOKS RECEIVED AND

### BOOK ORDER SERVICE

### (Continued from page 1001)

Robert B. Taylor, John L. Buckingham, E. P. Donatelle, William E. Jacott, and Melville G. Rosen, Eds. Springer-Verlag, New York, 1978. xl, 1366 pp., illus. \$38.50. To order circle 587 on Reader Service Card.

Fibrinolysis. Current Fundamental and Clinical Concepts. Papers from a symposium, Istanbul, Turkey, Sept. 1977. P. J. Gaffney and S. Balkuv-Ulutin, Eds. Academic Press, New York, 1978. x, 240 pp., illus. \$19.65.

Field Theory, the Renormalization Group, and Critical Phenomena. Daniel J. Amit. McGraw-Hill, New York, 1978. xiv, 336 pp. \$23. International Series in Pure and Applied Physics. To order circle 615 on Reader Service Card.

Flow, Mixing and Heat Transfer in Furnaces. Papers from a conference, Cairo, Feb. 1977. K. H. Khalil, F. M. El-Mahallawy, E. E. Khalil, and D. B. Spalding, Eds. Pergamon, New York, 1978. viii, 248 pp., illus. \$30. HMT, vol. 2. To order circle 604 on Reader Service Card.

FORTRAN 77 Programming. Walter S. Brainerd, Charles H. Goldberg, and Jonathan L. Gross. Harper and Row, New York, 1978. xviii, 360 pp. Paper, \$9.95.

The Fourier Transform and Its Applications. Ronald N. Bracewell. McGraw-Hill, New York, ed. 2, 1978. xviii, 444 pp., illus. \$23. To order circle 605 on Reader Service Card.

Garden Spice and Wild Pot-Herbs. An American Herbal. Walter Conrad Muenscher and Myron Arthur Rice. Illustrations by Elfriede Abbe. Comstock (Cornell University Press), Ithaca, N.Y., 1978. x, 214 pp. Paper, \$6.95. Reprint of the 1955 edition.

The Gas Industry and the Environment. Proceedings of a symposium, Minsk, Soviet Union, June 1977. Published for the United Nations by Pergamon, New York, 1978. xvi, 264 pp., illus. \$34. To order circle 623 on Reader Service Card.

Gaseous Electronics. Vol. 1, Electrical Discharges. Merle N. Hirsh and H. J. Oskam, Eds. Academic Press, New York, 1978. xii, 506 pp., illus. \$39.50.

General Relativity from A to B. Robert Geroch. University of Chicago Press, Chicago, 1978. xii, 226 pp., illus. \$11.95.

The Genius of Arab Civilization. Source of Renaissance. John R. Hayes, Ed. MIT Press, Cambridge, Mass., 1978. xii, 232 pp., illus. Paper, \$15. Reprint of the 1975 edition.

Geomagnetic Diagnosis of the Magnetosphere. A. Nishida. Springer-Verlag, New York, 1978. viii, 256 pp., illus. \$38.80. Physics and Chemistry in Space, vol. 9. To order circle 588 on Reader Service Card.

German-English Science Dictionary. Louis De Vries. Updated and expanded by Leon Jacolev with the assistance of Phyllis L. Bolton. McGraw-Hill, New York, ed. 4, 1978. xxxviii, 628 pp. \$14.50. To order circle 592 on Reader Service Card.

Group Theoretical Methods in Physics. Papers from a colloquium, Tübingen, Germany, July 1977. P. Kramer and A. Rieckers, Eds. Springer-Verlag, New York, 1978. xviii, 546 pp., illus. Paper, \$23.50. Lecture Notes in Physics, vol. 79. To order circle 606 on Reader Service Card.

Horizons in Biochemistry and Biophysics. Vol. 5. E. Quagliariello, F. Palmieri, and Thomas P. Singer, Eds. Addison-Wesley Ad-

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