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For two decades, U.S. scientists, educators, corporate executives, and government officials have struggled vainly to plug a pipeline: Minorities are leaking from our educational system at a rate that guarantees a predominately white scientific workplace through the end of this century. Beginning on page 1175 and including an essay by NSF director Walter Massey (page 1177), a special section in this issue probes the causes of our past failures on this front and identifies solutions on the horizon. [Illustration: Stephen Bauer]
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REFERENCE UPDATE
THE CLEAR CHOICE
Minorities in Science

A special news report in this issue of Science, coordinated by Ellis Rubinstein, Ann Gibbons, and Elizabeth Culotta, focuses on minorities in science, their successes and the obstacles they face. Fortunately there are some excellent success stories, and unfortunately there are some disappointing failures. It is widely stated that we need more representation from minorities and women (an underrepresented majority) to beef up a dwindling pipeline of scientists, but past efforts in this regard have appeared to yield only marginal improvement. Because so many have thought so much about this subject, only angels and editors would venture into an area in which wise men fear to tread. This editor, who teaches at a "majority" university, not only is impressed by the reports of successes, but also is challenged by the disappointing statistics; I have therefore looked for possible additional ideas that might be helpful to the dedicated people who are attempting to attack this important problem.

Anyone who interviews graduate science students is struck by the fact that almost all had decided to be scientists by the time they finished high school and that a majority had indicated a preference for science as they finished elementary school. This group also points out that they were very good at math in elementary school, even those who ended up in more descriptive areas of science. Even those scientists who claimed that they were not good at math at the college or graduate school level excelled in, or liked, math in elementary school.

Math in elementary school has little cultural background and has a logical purity and puzzle-solving seductiveness that lures the beginning scientist. Finding minority students who are particularly good at math in elementary school and encouraging them to take the right courses thereafter, offering them scholarships, and mentoring where appropriate might produce more faculty scientists than do programs, valuable as they are, that start later. The current programs, many of which are begun at the college level or beyond, are needed because we cannot afford to lose students—whether majority or minority—once they are embarked on the arduous but highly rewarding path of a scientific career. We also know that some minority students who lack privileged parents can be late bloomers. Programs that encourage those most likely to succeed therefore might be a useful addition to those in existence.

The low percentages of minorities in science probably reflect two aspects of past history: (i) that prejudice did exist and (ii) that the pool sizes at the college and graduate school level of that ethnic group were small. The world fortunately has changed. The pool sizes are increasing, and the number of scientists who want to increase the representation of minorities through affirmative action vastly outnumber those who wish to exclude individuals on the basis of race or gender. Under these circumstances the opportunities for able young minority scientists or women should be good in future years. Also for a newcomer without connections a career in science has the great advantages that one can advance on the basis of ability and be your own boss without investment of personal capital. The majority cannot become complacent; they are needed to help. The news stories in this issue indicate how the actions of majority scientists are helpful, especially in mentoring, which is crucial even in the case of the most successful scientists. National Science Foundation Director Walter Massey, for example, points to his mentors as keys to his success (see page 1177). So those who discuss the glass ceiling and the existence of prejudice should do so in order to abolish these unfair barriers, but they should not overdo it because they can do a disservice by discouraging the young minority students who might elect a career in science.

As our earlier issue on Careers (18 September 1992) showed, the disappointment and feelings of betrayal can be great even for majority scientists who entered a long and arduous training only to discover that the "room at the top" is small. Those who are less privileged and entering a new world need early encouragement and optimism, but there is then the danger of loss of faith and pessimism if expectations are not achieved. The encouragement should not be withheld, but realism in achieving the goal should be part of the mentoring in the hope of minimizing the disappointment factor. Identifying individuals in early years who have the potential of being scientists, providing them with mentors, helping them, and not losing them as a result of poor teaching, poor funding, or racial prejudice are important ways to augment the many fine programs already in existence. Improvement in elementary school science and math will be helpful to all students, but it will be particularly helpful for those who are likely to have the least help from parents and environment.

Daniel E. Koshland, Jr.
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European Research Institutes

Alun Anderson asserts that a "U.S. juggernaut overwhelms [a] divided European elite" in molecular biology research (Science in Europe, 24 Apr., p. 460). He may be right. However, part of his evidence is a graph of "world ratings" (p. 460) that uses data from the Institute for Scientific Information's (ISI) "Science Indicators Data Base." These data and their interpretation are open to doubt.

In the graph, quality is defined as "mean citations per paper (1981-1991)." This is fine, but what is a paper? Anderson has informed us that "70 journals dedicated to molecular biology and genetics only" were screened electronically at ISI; excluded were "papers published in Science, Nature, and the Proceedings of the National Academy of Sciences." The result of such a screening might say something about the abilities of researchers publishing in those 70 journals, but it does not allow one to rank the institutes where these researchers work.

Two examples from the Federal Republic of Germany illustrate our point. The Max-Planck-Institut für Biochemie, which is fifth in the ranking, is shown to have produced only 35 molecular biology papers per year. The Deutsches Krebsforschungszentrum is eleventh, with only 27 papers per year. These giant research institutes have been profoundly misrepresented, and we hope these dubious ratings will not influence European science policy-makers.

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Benno Müller-Hill
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Response: Herbertz and Müller-Hill are, of course, correct that the data published in Science do not take into account all papers published by the universities and research institutes that were listed. Most research institutions—and this is especially true for universities—pursue a wide variety of topics, and their research staff publishes in a number of different fields. The figures in Science were meant to estimate research performance only in molecular biology and genetics, as measured by average citations per paper. The question is, how does one isolate such papers for hundreds of research institutions from among the hundreds of thousands of papers they have published? The scheme used, admittedly a convenience, allows sets of journals to define distinct fields. Using such a system, unfortunately, does not permit papers published in several high-impact multidisciplinary journals to be included in the analysis. This bias, however, works against all institutions.

The numbers that Herbertz and Müller-Hill would have liked to see for several German research institutions focusing on the biological sciences are as follows (1).

<table>
<thead>
<tr>
<th>Institution</th>
<th>Papers 1981-92</th>
<th>Citations 1981-92</th>
<th>Citations per paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universität zu Köln*</td>
<td>703</td>
<td>17,722</td>
<td>25.21</td>
</tr>
<tr>
<td>Max-Planck, Martinsried-München†</td>
<td>3,363</td>
<td>52,225</td>
<td>15.53</td>
</tr>
<tr>
<td>Max-Planck, Berlin‡</td>
<td>1,200</td>
<td>17,901</td>
<td>14.92</td>
</tr>
<tr>
<td>Deutsches Krebsf., Heidelberg§</td>
<td>5,064</td>
<td>66,198</td>
<td>13.07</td>
</tr>
</tbody>
</table>

*Institut für Genetik, Universität zu Köln, Köln, Germany. †Max-Planck-Institut für Biochemie, Martinsried bei München, Germany. ‡Max-Planck-Institut für Molekulare Genetik, Berlin, Germany. §Deutsches Krebsforschungszentrum, Heidelberg, Germany.

Because all these institutions pursue only biological research, a rough comparison of their citation impact scores can be made. Even then, however, it should be noted that the Deutsches Krebsforschungszentrum (German Cancer Research Center) also publishes articles well outside of molecular biology and biochemistry, which perhaps explains why its average is the lowest of the group (molecular biology and genetics papers exhibit some of the highest average citation rates in the sciences). Moreover, the Institut für Genetik at the University of Cologne (Universität zu Köln) has been isolated from the university as a whole on the basis of the addresses listed on the papers. To the extent that authors have omitted the designation "Institut für Genetik" from these addresses, these papers would not be represented in the counts. Policy-makers should certainly be aware that citation data always require inhumane interpretation and are meant to supplement other types of evaluation and not substitute for thoughtful assessments.

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REFERENCES

The Federal Budget and Special Interests

Recent News & Comment columns (see 18 Sept., p. 1619) have reported that efforts to increase federal funds for research and development (R&D) were headed for the “brick wall” separating and capping domestic and defense spending in the federal budget. Further, in the scramble for domestic funds, science would suffer at the hands of such programs as Medicare and Medicaid, which Congress is unlikely to cut.

These reports appear to have been based on comments of congressional staff persons, many of whom see their jobs in terms of the special interests with which their committees happen to be involved. Unhappily, congressional committees can be expected to take such narrow views of the federal budget, but the R&D community, along with the higher education lobby, ought not take that approach. Such an approach (i) makes the R&D and higher education communities just two of many special interest pleaders; (ii) puts science at odds with some powerful and legitimate concerns, at a time when R&D and higher education are in dire need of some effective allies to help make their case for public support; and (iii) adds to the fragmentation of the body politic and to the refusal to deal with the base on which the budget wall rests—annual deficits.

The outcome of the 1992 election, by itself, will neither ease the paralysis caused by countless claims competing for shares of shrinking budgets nor encourage effective action to reduce deficits and free up resources for the future. The directions of future federal policies could be determined by groups of special interests that move beyond fragmentation and put together new alliances in support of particular policy options. Such alliances can be organized around short-range, self-serving aims as well as around long-range goals looking to the future well-being of society.

Given that the R&D and higher education communities, by definition, ought to be concerned about the quality of the future, and that both groups need allies to help advance their agendas, the communities should give high priority to working with other special interests to create a progressive alliance. They could start by viewing aging organizations as potential allies rather than powerful competitors for public funds.

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UV Light Exposure and HIV Replication

The Research News article by Brigid M. Wallace and Jill S. Lasker (28 Aug., p. 1211) raises the possibility that exposure to ultraviolet (UV) light can activate the human immunodeficiency virus (HIV) by mechanisms that involve chromatin unwinding, with subsequent activation of HIV genes integrated in the eukaryotic cell genome. A second mechanism by which exposure to UV light could be detrimental in HIV-infected individuals is suggested by three recent observations that are seemingly independent. First, it has been

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reported that exposure to UV light increases interleukin-10 (IL-10) production by monocytes (1). Second, it was found that a subset of asymptomatic, HIV-seropositive individuals who exhibit a particularly severe defect in T helper cell function (determined by reduced T cell proliferation and interleukin-2 production) shows elevated production of IL-10 (2).

Third, it appears that T helper 1-type responses that augment cellular immunity may be protective against AIDS, whereas T helper 2-type responses that enhance humoral immunity are not (Jon Cohen, News & Comment, 10 July, p. 152) (3). Because T helper 2-type responses are characterized by elevated IL-10 levels, a cytokine that down-regulates T helper 1-type responses (4), it is possible that the potential immunoprotective effect provided by T helper 1-type responses would be reduced or eliminated by a UV-induced increase in IL-10 production. Thus, UV exposure could also exacerbate progression to AIDS by interfering with protective immunity.

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REFERENCES

New Observations

Although a letter is not the accepted way of reporting new observations, my preliminary findings are of significant enough interest to warrant an exception. In my last year of investigations into the field of jobhuntology, specifically focused on my transformation from tenuous to tenure track, I have made some startling observations. In physiology and related biomedical departments there has been an unexpected modification from hard-money positions into institutional opportunities for cost-cutting. From approximately 36 nationally advertised positions in biomedical and biology departments, 5 positions are confirmed to have undergone such a modification. This process occurs unexpectedly, and at least in one case (University of California, Los Angeles), after second interviews and negotiations. Although clearly based on a small sample size, these observations have implications for the entire field of academic jobhuntology. I am continuing my studies to verify my hunch that the frequency of these job modifications is increasing.

Christopher Hardin
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University of Washington, Seattle, WA 98195

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1993-94
AAAS Fellowships for Scientists & Engineers

**Congressional**

**AAAS Congressional Science & Engineering Fellows Program.**
Fellows spend one year on Capitol Hill working with Members of Congress or congressional committees as special assistants in legislative and policy areas requiring scientific and technical input. Two fellowships will be offered, with annual stipends of $40,000.

**Executive Branch**

**AAAS-Sloan Executive Branch Science & Engineering Fellows Program**
Fellows work in the White House Office of Science and Technology Policy (OSTP) for one or two years, providing expertise in industrial research and development, technology transfer, international competitiveness, and related issues. One or two Fellows will be selected. Applications are invited from candidates with a minimum of five years industrial experience, through mid-level and senior executives. Stipends are negotiable, depending on qualifications and experience. Applicants must be U.S. citizens.

**Diplomacy**

**AAAS Science, Engineering, & Diplomacy Fellows Program**
Fellows work in international affairs on scientific and technical subjects for one year, either in foreign policy at the U.S. Department of State or in international development for the U.S. Agency for International Development. Approximately 12 Fellows will be selected. The annual stipend varies with experience, starting at approximately $40,000. Applicants must be U.S. citizens.

**Environmental**

**AAAS Environmental Science & Engineering Fellows Program**
Fellows work as special research consultants with the Office of Research and Development (ORD) of the U.S. Environmental Protection Agency for 10 weeks in the summer. The detailed, future-oriented research assists ORD in assessing the significance of long-range environmental problems. The stipend is $950 a week. Applicants must be residents of the United States. Ten Fellows will be selected.

Applicants should be postdoctoral to midcareer scientists and engineers, from any physical, biological, or social science or any field of engineering. The programs are designed to provide each Fellow with a unique public policy learning experience; to make practical contributions to the more effective use of scientific and technical knowledge in the U.S. government; and to demonstrate the value of science and technology in solving important societal problems. All Fellows participate in a rigorous orientation on the relevant congressional and executive branch operations and foreign affairs plus a year-long seminar series on issues involving science, technology, and public policy. The Congressional, Diplomacy, and Executive Branch programs begin in September 1993, and the Environmental program begins in June 1993. All application deadlines are January 15, 1993. For additional program information and application instructions, write:

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AAAS★93 Annual Meeting
Hynes Convention Center, Boston, Massachusetts
February 11-16, 1993

AAAS Pacific Division Annual Meeting
University of Montana, Missoula
June 20-24, 1993

Science Innovation ‘93:
The Conference on New Research Techniques
Hynes Convention Center, Boston, Massachusetts
August 6-10, 1993

The Employment Exchange is an on-site job referral service for job candidates and employers, providing position posting, résumé referral, a message center, and interview facilities (including private interview booths) during the week of these AAAS-sponsored meetings.

We are inviting corporate, government, nonprofit, and academic recruiters representing a wide spectrum of scientific disciplines to review member and nonmember résumés and interview job candidates on-site.

EMPLOYER BENEFITS:

- Hundreds of top-notch candidates. Access to all résumés cross-referenced by discipline.
- Copy of the Pre-Meeting Candidate Bulletin (mailed to employers enrolled by January 29, 1993).
- On-site interview facilities and scheduling services at no extra charge.
- Unlimited position postings.
- Special rates for AAAS★93 Annual Meeting and Science Innovation ’93 exhibitors, nonprofit organizations, and AAAS Corporate Members.

CANDIDATE BENEFITS:

- FREE enrollment for AAAS members who enroll by the advance enrollment dates: January 29, 1993 for AAAS★93 Annual Meeting; June 4, 1993 for AAAS Pacific Division Annual Meeting; and July 16, 1993 for Science Innovation ‘93. Low $10 fee for nonmembers.
- Hundreds of current position openings in a variety of disciplines and experience levels.
- On-site interview facilities, including on-the-spot interviews.
- Access to full descriptions of all available positions.*
- On-site résumé workshops.
- EMPLOYMENT EXCHANGE ONLY fee for non-conference attendees. (Applicable to AAAS★93 Annual Meeting and Science Innovation ‘93).

If you are presently in the job market, a student anticipating graduation in 1993, or if you are an employer with positions to be filled, and wish to take advantage of our efforts on your behalf, complete the appropriate enrollment forms and forward them to: Jacquelyn Roberts, AAAS Employment Exchange, 1333 H Street, NW, Washington, DC 20005. Phone: 202-326-6737. Fax: 202-842-1065.

*Applies to candidates attending the meeting. Candidates who are unable to attend the meeting may obtain a copy of posted positions for an additional fee (Members: $15; Nonmembers: $25).
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE  
1333 H Street, NW, Washington, DC 20005 (202)326-6737

EMPLOYMENT EXCHANGE

Name

Contact address_________________________________________ __________________________

City_________________________ State________ ZIP________

Phone Work (____)________ Home (____)________

Citizenship____________________ Visa Type______________

(if non-US citizen)

Will you be available for an on-site interview at the:

AAAS★93 Annual Meeting ☐ Yes ☐ No

Pacific Division Annual Meeting ☐ Yes ☐ No

Science Innovation ‘93 Meeting ☐ Yes ☐ No

CANDIDATE

Discipline __________________ Year obtained __________

Position(s) sought:
☐ Postdoctoral ☐ Consultant
☐ Academic ☐ Research
☐ Government ☐ Development
☐ Nonprofit ☐ Administrative
☐ Industrial ☐ Management
☐ Other__________________

(specify)

Salary desired __________________

Date available __________________

Geographic preference __________________

FILE NO.________

POSITION SOUGHT AD:

Please prepare your Position Sought Ad in the box below. Your Position Sought Ad should include degree, discipline, degree date (month/year), skills and techniques, experience, salary desired, geographical preference, and date of availability. No personal information (names, addresses, phone numbers) will be published in the Position Sought ads. NOTE: All Position Sought ads postmarked by December 31, 1992 (for AAAS★93 Annual Meeting), and July 2, 1993 (for Science Innovation ’93) will be published in the Employment Exchange ’93 Pre-Meeting Candidate Bulletin. The bulletin will be mailed to all enrolled employers prior to the AAAS★93 Annual Meeting and Science Innovation ’93.

FEES:

Enrollment with the Employment Exchange is a FREE service for AAAS members. Nonmembers are required to pay a $10 enrollment fee (US funds). Meeting attendance is not required in order to enroll with the Employment Exchange; however, all candidates planning to be available on-site at the meeting(s) are required to be registered as a meeting attendee or as an “Employment Exchange/Exhibition Only” attendee (applicable for the AAAS★93 Annual Meeting and Science Innovation ’93). “Employment Exchange/Exhibition Only” fees are $25 for AAAS members and $50 for nonmembers.

DEADLINES:

All Candidate Enrollment Forms must be received by the advance enrollment dates: January 29, 1993 for AAAS★93 Annual Meeting; June 4, 1993 for AAAS Pacific Division Annual Meeting; and July 16, 1993 for Science Innovation ’93. On-site enrollment is available. NOTE: Candidates wishing to have their Position Sought Ad published in the Pre-Meeting Candidate Bulletin should submit their complete enrollment forms and information by December 31, 1992 (for the AAAS★93 Annual Meeting), and July 2, 1993 (for Science Innovation ’93).

INSTRUCTIONS:

1) Complete the Candidate Enrollment Form by including your name, mailing address, and daytime telephone number where you may be reached. Prepare your Position Sought Ad as indicated above.

2) Enclose a current curriculum vitae (including at least three professional references), along with applicable fees, and mail to: Jacquelyn Roberts, Manager; AAAS Employment Exchange, 1333 H Street, NW, Washington, DC 20005.
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE  
1333 H Street, NW, Washington, DC 20005 (202) 326-6737

EMPLOYMENT EXCHANGE

Complete and return enrollment form to the address above with prepared postings.

Name
Title
Organization
Department
Address
City State ZIP
Daytime Phone (___) ___________ ext. ___________

<table>
<thead>
<tr>
<th>AAAS☆93 ANNUAL MEETING</th>
</tr>
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<tbody>
<tr>
<td><strong>ENROLLMENT FEES:</strong></td>
</tr>
<tr>
<td>□ Nonprofit            $225.00</td>
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<tr>
<td>□ Nonprofit/Meeting Exhibitor $200.00</td>
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<tr>
<td>□ Commercial           $375.00</td>
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<tr>
<td>□ Commercial/Meeting Exhibitor $350.00</td>
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<tr>
<td>□ AAAS Corporate Member $250.00</td>
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<tr>
<td>□ Reserved Interview booth (optional) $ 75.00</td>
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| **Posting Only Fees** (not conducting on-site interviews): |
| □ Per Posting: Science Advertiser $50.00 |
| □ Per Posting: Non-Advertiser $60.00 |
| **TOTAL AMOUNT** $ ____ |

| **PAYMENT:** |
| □ Check enclosed |
| □ Original purchase order attached |
| □ Will pay on-site |

**NOTE:** Enrollment fee includes unlimited postings and up to three recruiters. Reserved interview booth fee is optional. Employers enrolled by January 29, 1993 will receive the "Employment Exchange '93 Pre-Meeting Candidate Bulletin", which will be mailed on February 1, 1993.

<table>
<thead>
<tr>
<th><strong>Recruiters Attending:</strong></th>
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<tr>
<td>Name</td>
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<td>Name</td>
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| **Days Interviewing:** |
| □ Friday | □ Saturday |
| □ Sunday | □ Monday |

□ Please send additional information for:  
| □ AAAS☆93 Annual Meeting |
| □ AAAS Pacific Division Annual Meeting |
| □ Science Innovation '93 Meeting |

INSTRUCTIONS:
1) Complete enrollment form including the days you will be interviewing.
2) Prepare your position available description(s) on an 8 1/2" x 11" page. Description(s) should include: position title, educational and experience requirements, geographical location, field of work and duties, annual salary/range, position availability date, organization name, address, and representative.
3) Submit appropriate payment (check or original purchase order) with completed enrollment form and position description(s) to the address above.

**NOTE:** Payment of enrollment fees for the Employment Exchange does not include meeting registration. If you wish to attend lectures, workshops, or sessions, you must register for the meeting.
Books Received


Vignettes: Real Powers

Statistical studies have shown that the most diverse animals are not only small in size but also highly mobile, giving them access to the most bountiful variety of foods and other resources. The ultimate exemplars of this principle are the insects, so diverse and abundant that they project a popular image of near invincibility. (In the nuclear aftermath a cockroach surveys the scorched landscape atop a blasted beer can.) Entomologists are often asked whether insects will take over if the human race extinguishes itself. This is an example of a wrong question inviting an irrelevant answer: insects have already taken over.

—Edward O. Wilson, in The Diversity of Life (Harvard University Press)

... These thoughts reminded me of the contrast between the definition of “entomology” in the eleventh edition of the *Encyclopedia Britannica* and the official definition stated by the Entomological Society of America in 1966. Entomology as described by the encyclopedia is “the science that treats of insects.” As stated by the society it is “the profession that controls insects.”

So small a triumph as finding and listening to the Northern Bush Katydid brought to mind Edmund Burke’s words in his *Reflections on the Revolution in France*, where he cautioned that those who make themselves most conspicuous are not necessarily the most important.

—Vincent G. Dethier, in Crickets and Katydid, Concerts and Solos (Harvard University Press)