SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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Kodak

Renovated facilities

London's Royal Institution, where mankind in the person of Michael Faraday first saw clearly the principles of electromagnetic induction, has given the name Eastman Laboratory to certain recently renovated facilities. It commemorates an American entrepreneur who had Lord Kelvin on his board of directors.

NOTE DATE

We'll also be at "Electro-Optics East" in N.Y. Coliseum Sept. 14, 15, and 16

In person

On May 18, 19, and 20 in the Anaheim Convention Center at Anaheim, Calif., at a trade fair called "Electro-Optics West," we shall be on hand to discuss any of the following:

Photographic problems in laboratory or field biology, including photomicrography and direct infrared photography.

Photographic materials for astronomy and physics

EASTMAN Organic Chemicals, including reagents and supplies for all manner of laboratory techniques and procedures in the bio-medical field, in organic synthesis, and in analytical chemistry

Counseling on photomaterials for advanced technologies still in the planning stages

Look-up service from largest commercially accessible bank of published and unpublished infrared spectra, from which, no later than next working day after receipt of submitted spectrum, we send names of closest matching compounds in decreasing order of match.

KODAK WRATTEN Filters to modify spectral distribution in and near the visible; also neutral density wedges, step tablets, and other gelatin light attenuators of high precision

KODAK IRTRAN Infrared-transmitting Materials and Optics: 6 materials to cover out to 30μm, polycrystalline, with a broad choice of index, immune to cold flow, retaining strength and clarity despite heat, without cleavage planes, insoluble, grindable, polishable

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Laser Dyes: Rhodamine 6G and many others; production lots tested in actual dye laser systems and supplied as solutions for dilution

Photochromic Compounds

White Reflectance Paint and Standard of unsurpassed nonselective diffuse reflectance from 200 nm to 2500 nm; purified $BaSO_4$ that stays white longer than MgO smoke

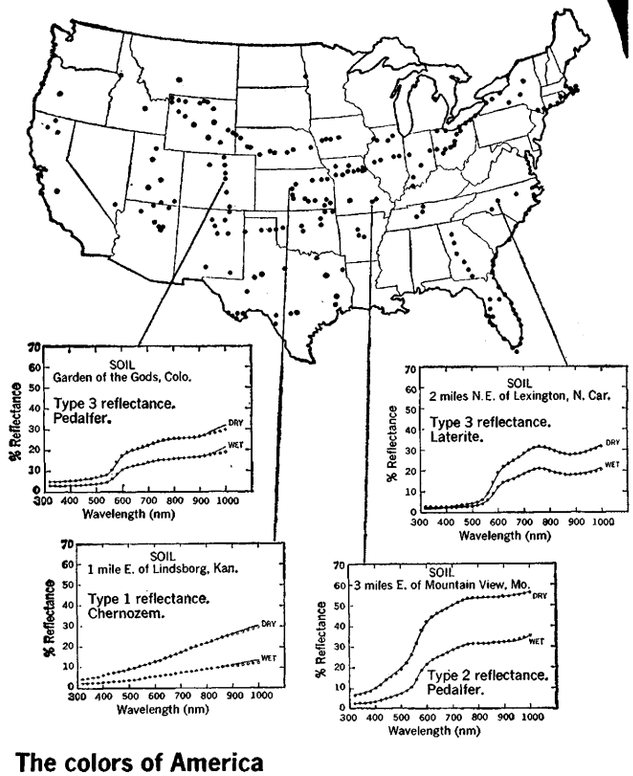
Neutral Density Circular Wedges (Inconel alloy-Coated) on glass from stock, glass or quartz to order, nonselective over long spectral range covering UV, visible, IR

Liquid Crystal Mixtures from a constantly expanding list

Optical Cements, six different formulations for optical parts, three for instrument assembly

MgF_2, ZnS, CaF_2, MgO, ZnSe, or CdTe in chunks for well-controlled evaporation

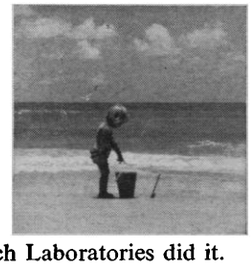
Mail inquiries on any of the above can be directed to the same address as given at end of adjacent column.



The colors of America

Both standardized wet and standardized dry, we have measured spectral reflectance of soils, sands, and silts predominant at each of 160 places in the U.S.A. We have then tried some taxonomy on the curves. They seem to fall into three types, one of which splits again.

Our work suggests that a spectrophotometer may not always be needed. Our study of the curves indicates that a good-to-excellent match of most of them can be calculated from reflectances measured at just five wavelengths. This can be done from aloft with readily available Kodak aerial film, narrow-band interference filters, and targets of known spectral reflectance. There are places where one click of the shutter provides more data than a thousand hand-collected samples like ours. The camera is mightier than the trowel.



Talk of collecting data from aloft has been leading to arguments. How far aloft? How much data. How much is it worth? Who decides? On what grounds?

While awaiting reasonable answers we felt that a study of the photographically accessible spectrophotometric variability of soil was something we ought to do, so H. R. Condit of the Kodak Research Laboratories did it.

In Photogrammetric Engineering *for September, 1970 Condit gives a table of the constants which, when substituted in*

$$R_\lambda = a_{0,\lambda} + a_{1,\lambda}R_{440} + a_{2,\lambda}R_{540} + a_{3,\lambda}R_{640} + a_{4,\lambda}R_{740} + a_{5,\lambda}R_{860}$$

R_{440}=reflectance at 440 nm, etc,

yields quite a decent fit to actual spectral reflectance, as seen from the dots along the above sample curves. The paper presents curves for 30 locations. Reprint on request from Eastman Kodak Company, Dept. 55W, Rochester, N.Y. 14650.

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COVER

Green leaves manufacture many chemical products. The details of the control of carbon metabolism are not fully understood, but the results of experiments answer some questions about specific molecular mechanisms. Feedback is apparently involved in the control of certain steps in these processes. See page 526. [Gary Laurish Photography, Washington, D.C.]

LETTERS

Problem-Oriented Research

In his editorial (12 Mar.), Long has omitted an important issue—the relationship of applied research to the application of research. The application of research is not a simple process, but rather an interdisciplinary activity of great complexity. It takes place at the interface between knowledge and action. At that interface there are differences of language, psychology, and values.

The experience of industry, and of such mission-oriented agencies as National Aeronautics and Space Administration and the Department of Defense, has shown that successful application of applied research is very difficult if there is not a close and continuous interaction between those who are doing the research and those who are expected to use the results of research. The possible consequences of such interactions and their effect on the freedom and independence of the university and its programs should be carefully considered by those who would like to see more applied research for the public good done in universities.

HAROLD GERSHINOWITZ
Rockefeller University, New York 10021

Male Bias and Women's Fate

In a letter (12 Feb.) Demorest Davenport defends the widespread discrimination against women in science on the grounds that women are (for a variety of reasons kindly supplied by M. B. Jensen in a following letter) too irresolute to be trusted to succeed in the opportunities that might be offered to them. The paucity of good openings for female scientists, and the substandard character of those that are available, is proof that the male scientists who run the establishment are largely in agreement with Davenport's views.

Yet the argument is one that could be made in better conscience by a physicist or a geologist than by a biologist. The physical scientists keep their female graduate students down to a tiny minority, and thus avoid the paradox of training those whom they would not employ. Biologists, however, have not been so fastidious. Beguiled by lavish federal funds for graduate student training, the men who run our graduate biology departments have played a shameless numbers game, eagerly enticing women students to swell departmental rolls and bring in the money. The inconvenient fact that winning a Ph.D. would be unlikely to entitle a girl to more than second-class citizenship in the scientific world has, of course, gone unmentioned. The acceptance of this situation is to many men merely a matter of being realistic, though some are honest enough to admit that "cynical" would be a better word. The best word for it would be stronger.

During the 1960's, the percentage of Ph.D.'s in biology awarded to women ranged from 16 percent in the 11 most prestigious institutions to more than 30 percent in numerous others. I should like to ask Davenport who was a department chairman during that decade: How many members of my unreliable sex has his department admitted in recent years? How many have been awarded doctorates? Why?

FLORENCE MOOG
Department of Biology, Washington University, St. Louis, Missouri 63130

In their attempts to justify lower salaries for women scientists, both Davenport and Jensen assume that there are "no data" on the relative scientific productivity of men and women and that such comparisons are only "theoretically possible." As readers of *Science*, they should not have to rely on what they "have heard" or would be "willing to bet" on what they "think the results would be," since a recent article on this subject noted the *higher* productivity of women in science (*1*). Or do they feel that an obligation to consider all available evidence only applies in the laboratory, and may conveniently be discarded when one is dealing with trivial matters like human aspirations?

WILLIAM LOCKERETZ
Department of Physics, Harvard University, Cambridge, Massachusetts

Reference

1. M. S. White, *Science* **170**, 413 (1970).

By resorting to hearsay in the absence of data, Jensen has himself already refuted at least one prejudice against women which assigns gossip to the female domain.

RUTH ROSIN
Department of Zoology, Hebrew University of Jerusalem, Jerusalem, Israel

Davenport and Jensen have alluded to a situation which is present in many fields . . . if the expectation of less job mobility in males is considered an important asset, over and above the current performance for which pay is ostensibly given, an easy solution is possible. At present, what happens if the male, paid at a preferred rate because of statistical expectation of longer employment, leaves for another job after a couple of years? Well, for one thing, he gets to keep the extra money.

If there is going to be a differential in rate of pay, it should be based on an *enforceable* expectation. That is, a bonus rate should be paid to anyone, male or female, who is willing to sign a long-term contract binding him or her to remain with the employer for a period of years, barring involuntary physical disability (this wouldn't include pregnancy), with a penalty clause providing that the extra pay over and above that of persons not signing such a contract, must be repaid to the employer if he defaults.

Some persons might be reluctant to sign such a contract, feeling that they were selling themselves into slavery. But at least it would mean that the person who claims a right to preferential pay on the basis of hypothetically greater job stability would have to either deliver or forfeit the extra proceeds.

The principle which Davenport and Jensen appear to accept is reminiscent of the man who gave his three sons a good whipping every day after breakfast, on the grounds that they were sure to do something to deserve it before the day was over. If we are going to punish occupational infidelity, it would be better to adopt the more generally accepted corrective principle of exacting the penalty after rather than before the crime is committed.

ALICE M. BRUES
Department of Anthropology,
University of Colorado, Boulder 80302

Some hypothesis might be tested to the satisfaction of all participants. Assume the validity of the following statements: (i) women receive lower salaries than men, all things but gender being equal; (ii) such a situation would be rational if, in fact, the "job mortality" would be higher for women than for men (due to sex-specific factors). Both of these statements should receive grudging agreement from all parties. Further, assume that past and present behavior is the best predictor available for future behavior (most behavioral scientists would accept this); specifically, it should be possible to stipulate a period of employment (N years, say, where $N = 4$ or 5?) which would indicate that a specific woman had a "job mortality" factor at least as low as that of a typical man in the same position.

If the above assumptions are accepted, then an employer should be willing to give parity to prospective or current women employees (in terms of hiring preference or salary) if such employees had completed N years of continued performance as a professional. Do the employers who write to *Science* have salary parity for women who have been employed N years? Are they as likely to hire women with N years of employment as men with equivalent experience? If the answer is "yes," then the employers are behaving rationally, and women must argue the tenability of the "job mortality" assumption. If the answer is "no," then the employers are merely rationalizing irrational behavior in their letters to *Science,* and are hoist by their own petards (in the Middle French meaning of the term). Empirical tests can discriminate the good guys or gals from the bad.

DAVID E. CLEMENT
Department of Psychology,
University of South Florida,
Tampa 33620

Amen

Several letters dealing with the properties, preparation, and use of yogurt have appeared in *Science* during the past few months (*1*). I have recently been informed of some less technical studies which the researcher has compiled and plans to publish in a modest manual entitled "60 Things You Can Do With Yogurt" (*2*). Then too, his research assistants have prepared a short follow-up paper entitled "One More Thing You Can Do With Yogurt" (*3*).

FREDERICK H. GILES, JR.
Department of Physics,
University of South Carolina,
Columbia 29208

References

1. E. F. Segal, *Science* **169**, 425 (1970); M. Kroger, *ibid.*, p. 816; J. Goodman, *ibid.* **170**, 123 (1970); B. H. Bagdikian, *ibid.*, p. 582; G. A. Garabedian, *ibid.* **171**, 847 (1971).
2. Private communication.
3. An even more private communication.

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Changing Attitudes toward Environmental Problems

During 1970 public concern about pollution reached an emotional peak. Many people became convinced that the environment was deteriorating rapidly and that all of us were about to choke to death from pollution. Politicians of the two major parties scrambled to establish positions on the antipollution bandwagon. Federal legislative and administrative actions that were taken will eventually result in substantial improvement in our air and waters. Convinced that the public demands cleaner air and cleaner water, American industry will spend billions of dollars on antipollution measures.

An emotional peak, such as that witnessed in 1970, cannot be sustained. Earth Day activities this year were a pale shadow of those of a year ago. The mass media are beginning to diminish their coverage of environmental matters, and debunking stories are starting to appear. More important for the long haul is a growing recognition that environmental improvement is going to cost a lot of money and that the costs are going to be paid by everyone.

The emotional peak of 1970 was built in part on a solid base but it was also built in part on erroneous information and bad judgment. We must achieve and maintain a livable environment, but we are not about to choke to death from pollution, and the world is not going to run out of oxygen.

One of the odd features of the emotional peak was that it occurred at a time when most of the important components of pollution had leveled off or declined. For example, suspended particulate matter over some large cities had already decreased and carbon monoxide and sulfur dioxide content had diminished in others.

Contributing heavily to the timing and the shape of the emotional peak was the behavior of the mass media. Reporters selectively quoted people who gave them the scary kind of story that their editors would print, or that radio and TV would use. Public emotion quickly rose. However, after a time the public interest began to level off, and the mass media are now turning elsewhere. Typically, a period of inattention will be followed by another phase in which low-key, sober assessments will provide a more realistic picture to the public.

One of the misapprehensions of many people is that they can enjoy a perfect environment but that somebody else will pay for it. The cost of attaining even a moderately decent environment will be in the tens of billions of dollars and will be borne by everyone. Experience with abatement of sulfur dioxide pollution is illustrative. The added costs of low-sulfur fuels are in excess of a billion dolars a year. But the public will pay far more in the form of increased costs for electricity and other items.

We are entering a new phase in efforts to attain a better environment. In future, emotional appeals based on inaccurate information are not so likely to be effective. As it becomes apparent that the public must pay for improvements, new criteria will enter discussions concerning the environment. Benefits will be weighed against costs. Intellectual leadership in environmental matters will be shared by economists who are already beginning to hold useful symposia on these topics. Changes in political attitudes that are already occurring will continue as ghetto congressmen find their constituents feeling the costs of pollution abatement. The constituents are unaware of much improvement for their money. They have not been fully informed, and they are unable to detect small changes in sulfur dioxide. At the same time their eyes and their noses tell them that garbage collection has not improved.

—PHILIP H. ABELSON

The background for much of this discussion was a symposium organized by Resources for the Future and held in Washington, D.C., on 20 and 21 April.