SCIENCE 28 September 1973
Vol. 181, No. 4106
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Index Issue

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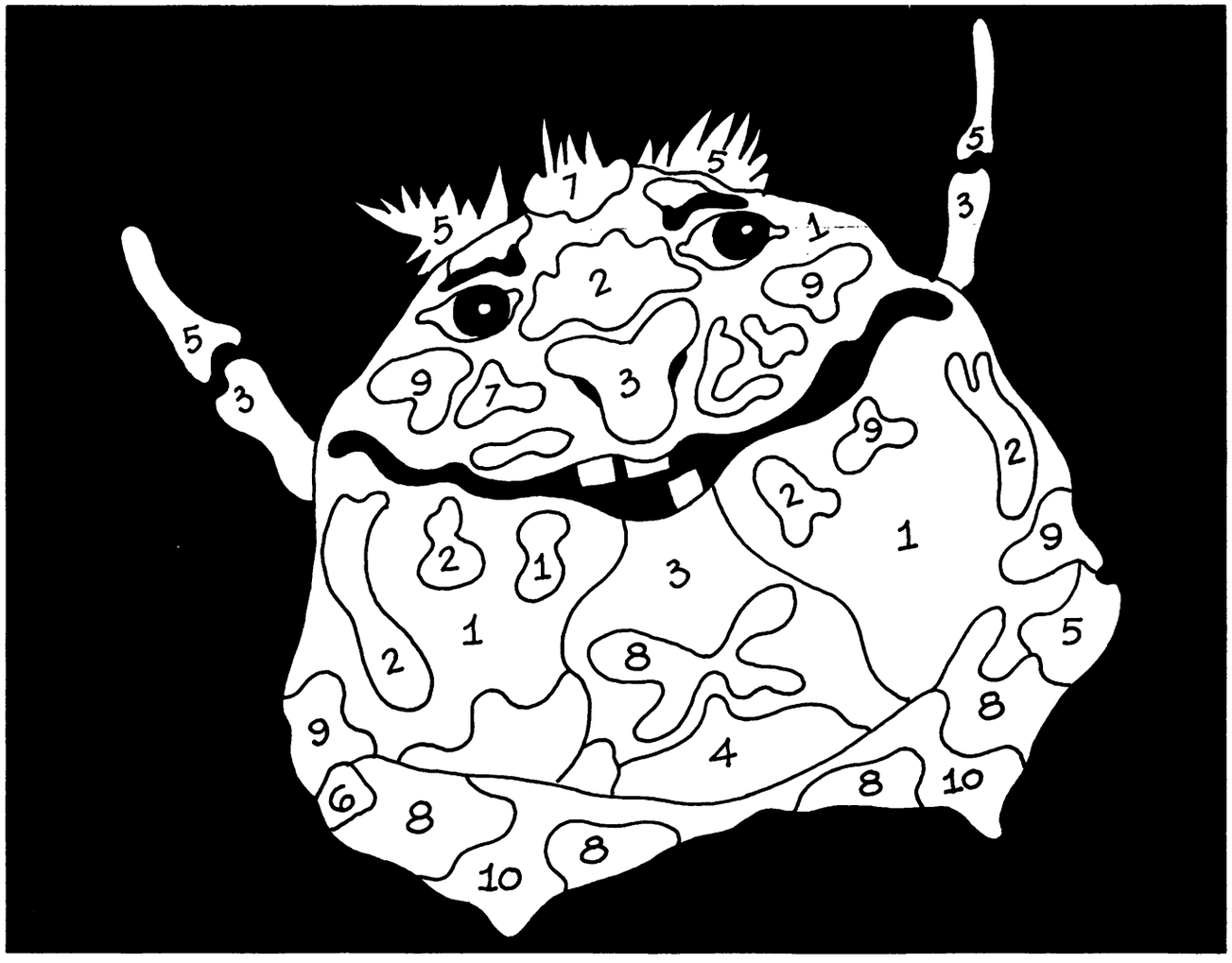

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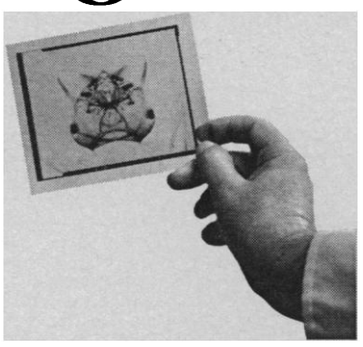

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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COVER

Tattooing of monkeys in the first year of life and regular census observations at the Caribbean Primate Research Center allow long-term family and social relationships and normal social behavior to be studied in free-ranging individuals after specific brain biochemical lesions. Unlike some of the treated monkeys, this captured, cannulated, and sham-treated female returned immediately to her infant and social group and thereafter appeared entirely normal. See page 1256. [D. E. Redmond, National Institute of Mental Health]

AAAS Audiotapes in 1973

Recordings of symposia held during the AAAS Annual Meeting in Washington, D.C., are available as 5-inch open reels (3¾ i.p.s. for standard machines) or as cassettes. Price: single-session symposium, $15; multi-session: $15 first session, $12 each additional session of same symposium. Each session lasts about three hours.

120-72—Cross Cultural Perspectives on Early Development (One Session).
Cognitive growth of children in rural and town settings in Guatemala. The disadvantages of sensory deprivation may be overcome as an innate and highly plastic capacity for learning develops. *Jerome Kagan, Harvard University.*

121-72—Genetic-Physiological Approaches to Animal Improvement (One Session).
Improving animal performance in the production of food from research in the genetic-physiological aspects of livestock production. *Gordon E. Dickerson, Edward G. Buss, H. H. Hafs, B. N. Day.*

122-72—Facts and Fiction with Regard to Sex Differences (One Session).
Facts and fiction with regard to sex differences from the physiological and sociological point of view, and the psychological basis of sex differences as related to ability in science. *Estelle Ramey, Jacqueline J. Jackson, Barbara Bergmann, Deborah Shapley, and others.*

123-72—Ethical, Legal, and Social Issues of Behavior Control (Sessions I-II).
Preliminary findings of the Research Group on Behavior Control of the Institute of Society, Ethics and the Life Sciences, engaged in long-term study of ethical, legal, and social issues of particular technologies, and their interrelationship and cumulative impact. *Herbert G. Vaughan, Jr., Gerald Klerman, Robert Michels, Harold Edgar, Robert C. Neville, and Perry London.*

124-72—Crime Prevention: Heredity and Environment Revisited (Sessions I-II).
Respective roles of "nature" and "nurture" in shaping human behavior receive a careful reexamination in light of current scientific knowledge, with emphasis on prevention before the criminal act, and the use of research from diverse fields such as genetics, architecture, education, and biochemistry. *Nicholas N. Kittrie, David Rosenthal, Leopold Liss, Samuel Corson and others.*

126-72—Genetic Vulnerability of Crops (One Session).
Study by the National Academy of Sciences on the epidemic of Southern Corn Leaf Blight which created a loss of nearly 15 percent of the corn crop nationwide in 1970, with the suggestion that a much more comprehensive gene pool is needed so that the genetic hazard of vulnerability may be decreased. *James G. Horsfall, Warren H. Gabelman, David H. Timothy, and George F. Sprague.*

128-72—The New Urban Vision (One Session).
A new humanistic architecture seems to be emerging which seeks to design the urban environment with nature, rather than against it, and which makes new, specific, and as yet unmet demands on science and technology. *Wolf Von Eckardt,* The Washington *Post.*

129-72—Changing the Weather (Sessions I-II).
What weather management efforts are in the public interest, involving economic, legal, political, and administrative, as well as scientific and technical considerations. What degree of freedom should be used to manage the atmosphere. *Charles L. Hosler, Thomas Malone, Reid Bryson, J. Eugene Haas, and others.*

130-72—Genetics and Human Disease (Sessions I-II).
Topics include: "Cytogenetics," "Immunogenetics," "Sickle Cell Anemia," "Genetic Counseling." *H. Neil Kirkman, Barbara R. Migeon, Robert F. Murray, Edmond A. Murphy and others.*

131-72—Temperate Climate Forestry and the Forest Ecosystem (Sessions I-II).
Environmental problems facing today's forest manager as he seeks to adjust production and regeneration technology to the broad goals of an environmentally sensitive economy. *Theodore C. Byerly, Gene E. Likens, F. Herbert Bormann, William H. Smith, T. C. Nelson, Arnold Bolle, George Staebler, and Donald Dahlston.*

132-72—Sex Role Learning in Childhood and Adolescence (Sessions I-III).
How sex roles come into being in our culture. Traditional sex roles with attention paid to the concept of self as "girl" or "boy" among children and youths in relation to adult sexuality. *John Money, Walter Emmerich, Eleanor Maccoby, Aletha H. Stein, David Lynn, and others.*

133-72—Human Learning Capacity in Neurobiological Perspective (Sessions I-IV).
Four domains in the neurosciences: the architecture of the brain, the study of learning behaviors in other vertebrates, biological basis of language and communicative behavior, and the relationship of brain characteristics to learning environments. *S. Dillon Ripley, Philip C. Ritterbush, Jerome Kagan, Karl H. Pribram, Mark R. Rosenzweig, Peter Klopfer, Richard Chase, Roger Sperry, and others.*

134-72—Must We Limit Economc Growth? (Sessons I-IV).
Questions discussed: Must we limit economic growth in the United States and other developed countries to avoid a world catastrophe of resource exhaustion and environmental pollution? Would such growth preclude a higher standard of living for the underdeveloped world? Are there positive benefits to continued growth? What is the role of energy in controlling growth? *Edward F. Denison, Dennis L. Meadows, S. Fred Singer, Chauncey Starr, Marc Roberts, and others.*

135-72—Genetics, Man, and Society (Sessions I-II).
Current use of genetic knowledge and its implications for the individual and society in the light of the current biologic revolution of fast accumulating knowledge in genetics, taking into account the means and consequences of accumulating this knowledge and the ways to minimize the likelihood of its misuses. *Mack Lipkin, Jr., David C. Duncombe, Michael M. Kaback, James R. Sorenson, Y. Edward Hsia, Muriel F. Humphrey, and others.*

136-72—Communications Revolution (One Session).
Andrew A. Aines, Office of Science Information Services, National Science Foundation.

137-72—Social Applications of Genetic Knowledge (One Session).
Gene manipulation and some of the individual and societal opportunities and problems that will result when this new technology is fully developed. *E. G. Stanley Baker, Robert G. Martin, William J. Mellman, Harold B. Green, and others.*

138-72—New Approaches to Global Weather (One Session).
Response of the international atmospheric research community to the Global Atmospheric Research Program (GARP). Detailed look at two aspects of the program: new observing systems (especially satellites) and predictability. The question is asked: should we control the weather? *Walter Orr Roberts, Philip E. Merilees, Robert W. Stewart, Edward N. Lorenz, and Eugene W. Bierly.*

139-72—Conceptions and Alleviations of Aggression and Violence (Sessions I-II).
Symposium represents the First National Congress of the Organization for the Study of Group Tensions. *John E. Exner, Jr., Jerome Singer, Amitai Etzioni, John Speigel, Irving Salan, Robert Reiff, and others.*

140-72—Man-Environment Relations and Health (Sessions I-IV).
Representatives of major conceptual positions discuss the implication of their systems with health professionals and biological and behavioral scientists, with the focus on the consequences of certain theories of man-environment relations for physical and mental health, and the goal of exploring the possibilities of integrating theoretically conceived relations between man and his environment with the changing practices of health care and maintenance. *Aristide H. Esser, Virginia R. Hannon, Charles Ferster, Edwin Williams, William Ittelson, Dorothea Leighton, Viola Bernard, and others.*

141-72—Understanding Parapsychological Phenomena (One Session).
An attempt to integrate results and theory in four important areas of parapsychological research, with emphasis on aspects of internal state and some of the cognitive processing factors involved, and concluding with a discussion of the general effects of cultural differences and personality patterns. *Robert L. Morris, Charles Honorton, Rex G. Standford, Robert L. Van de Castle, Irvin L. Child, and Walter J. Levy.*

142-72—Educational Achievement and Social Indicators (One Session).
Review, interpretation, and relation to current issues in education of assessments in science, citizenship, and reading, and an analysis of the measurement problems and the relationship between national assessment, social indicators, and educational policy. *Wilbur J. Cohen, Selma J. Mushkin, Dorothy M. Gilford, C. Philip Kearney, J. Stanley Ahmann, and others.*

143-72—Limits to Growth of Technology (One Session).
Technological growth, how it interacts with the other variables, and the necessity of such growth if there are any plausible non-catastrophic scenarios for the future of mankind. *Chauncey Starr, Richard A. Carpenter, Roy P. Jackson, Arthur Kantrowitz, S. Fred Singer, W. Hunter II, and Glen P. Wilson.*

144-72—Prison Research (Sessions I-II).
Review of prison research and proposal of methods, patterns, and programs of research for the future, directed to the prison institution, prison processes, and prison behavior in the United States and Europe (especially Sweden). *John P. Conrad, Norman Bishop, Edwith E. Flynn, Nicholas M. Kittrie, Philip G. Zimbardo, and others.*

145-72—Interdisciplinary Approaches to Community Health with Emphasis on Social Sciences and Mental Health (Sessions I-II).
Various programs and approaches to clinical services, research, graduate students in various disciplines working in communty health. Effective use of student manpower in delivery of health services. *Jack A. Wolford, Jan Nolan, Tobias Brocher, Mirta T. Mulhare, and others.*

146-72—. . . and shall we have Science for ever and ever? (One Session).
We face today, as in Alexandrian times, disciplinary fragmentation within science and estrangement of many outsiders from its ideals. Unless the barriers of sympathy and understanding between "scientists" and their fellow-citizens are demolished, and the spirit and integrity of earlier "natural philosophy" are restored, a new Dark Age might well overtake science. *Stephen Toulmin, University of California, Santa Cruz.*

147-72—Humanizing the Earth (One Session).
Using knowledge and reason man can improve on nature. Man-made nature can remain ecologically stable, economically rewarding, and esthetically pleasurable for immense periods of time. Civilizations emerge from a creative symbiosis between man and nature. *Rene Dubos, Rockefeller University.*

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I agree with DeVault that the difficulty of selling the metric system to nontechnical people is semantic rather than technical, but I disagree with his approach.

We can sell the metric system by pointing out its advantages in computation (addition, subtraction, multiplication, and division for nontechnical persons) and resulting standardization [to both nontechnical and technical persons; for example, the garage mechanic must now sort out different sizes—SAE (Society of Automotive Engineers), English, and metric].

Yet, we cannot teach the metric system simply by teaching equivalents (for example, DeVault's new inch). Experienced teachers of foreign languages know that students learn a language by using it, not simply by learning vocabulary. By analogy, we can best learn the metric system by using it. Many readers of *Science*, including myself, teach; I suggest *we* (not the amorphous they) use the metric system exclusively in our courses. Quickly we would learn to think metric and live metric.

WILLIAM H. CALHOUN
Department of Psychology,
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Knoxville 37916

Pollution Taxation

Richard Wilson's suggestion of a tax based on the product of air pollution concentration and the affected population density would appear to have limitations not covered in his report (13 Oct. 1972, p. 182). With his scheme in effect, areas of low population concentration would suddenly become economically desirable locations for heavily polluting industries. Wilderness areas would then suffer; the rights of minorities (homeowners, scientific investigators, and appreciative visitors) in these areas would then be subject to gross abuse ("I moved to the city because I couldn't stand the pollution in the country").

There is more to the pollution problem than just its effect upon the health of the people. We must be concerned with our paucity of knowledge of perhaps irreversible trip points in nature (just what are the factors initiating an ice age?). From a worldwide viewpoint, any advantages accrued by limiting pollution in heavily populated areas would be speedily nullified by the relatively uncontrolled emissions in remote areas.

Wilson's final statements, ". . . the tax should be related to people because smog where there are no people is unimportant" and "there are mountain valleys filled with smog from natural NO_x, but no one is worried about this natural smog," at best indicate an unnecessary pessimism concerning the interests of the environmental community.

ERIK GOTTSCHALK
Bachtelstrasse 56,
CH-8810 Horgen, Switzerland

I believe my proposed tax will safeguard the rights of those in the countryside much better than current procedures. Present air quality standards specify a definite limit below which air quality is considered adequate (although there is some litigation in progress on this).

A common way of meeting such standards is to disperse the pollutant. Great Britain, for example, already has many tall stacks from power stations located in the countryside. Complaints have been reported from Sweden and Norway.

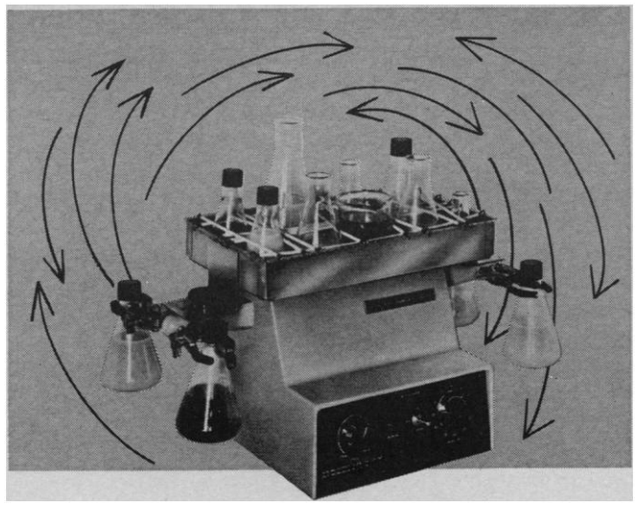
My proposed tax would continue to encourage this dispersal, but a simple computation of the tax based on the numbers I propose shows that there are very few areas in the world where there would not be an economic incentive to install good air pollution control equipment. At the moment there is almost no incentive.

Of course, there are limitations in any simple formula, and it is possible that my formula will not suffice to keep global, man-made sulfur dioxide and nitrogen oxide emissions to a small fraction of natural emissions (the present U.S. figure is about 20 percent). If so, I agree that other measures will be necessary.

RICHARD WILSON
Department of Physics,
Harvard University,
Cambridge, Massachusetts 02138

Artifacts or Geofacts?

Charles Dawson, presumed architect of one of the greatest scientific hoaxes—Piltdown man—devised in the early part of this century a simple experiment that now could be used to support one facet of the argument Vance Haynes advances (27 July, p. 305) about the ori-



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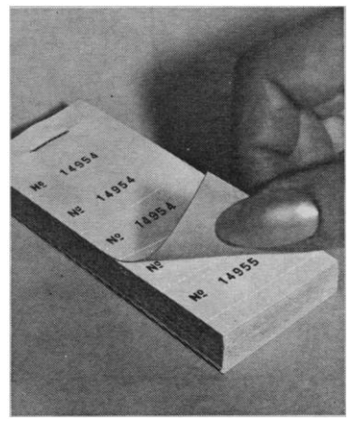

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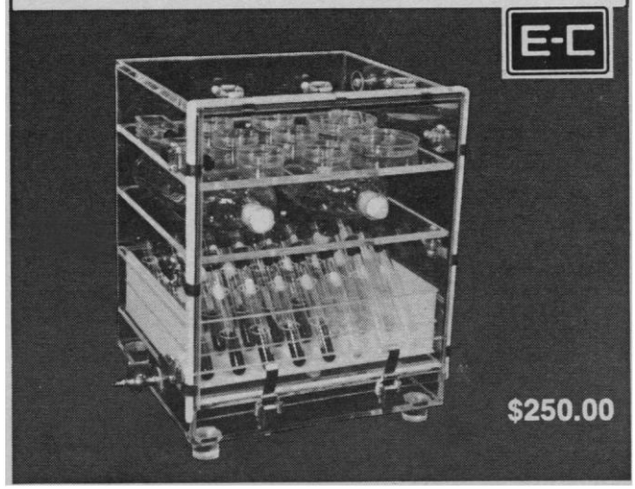

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gin of the chipped flints at the Calico site.

A lawyer, Dawson belonged to a local society of science hobbyists and antiquarians in Lewes, East Sussex, England. He was annoyingly insistent that the stone artifacts proudly displayed by fellow members could have been the result of geologic processes. One day, Dawson arrived at a meeting of the society, a sackful of flint in hand. He placed the sack on the floor and then proceeded to jump up and down on the rocks, crunching them to fragments. In a little while, he removed the stones and, with a triumphant smile on his face, showed them to his incredulous colleagues. Many of the newly splintered rocks exactly resembled the so-called hand tools.

Thereafter, Dawson was snubbed by the society. A few years later, in 1912, he made an amazing discovery that propelled him to fame—the skull and jaw fragments of the Piltdown man.

It is curious, and refreshing, to note that K. P. Oakley—mentioned in Haynes's article as having examined the Calico specimens—defrocked the spurious *Eoanthropus dawsoni*, using a fluorine dating technique, in 1949.

FREDRIC BREWER
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Indiana University,
Bloomington 47401

Health and Technology

In his article, "Health care delivery and advanced technology" (29 June, p. 1339), Charles D. Scott argues that the development and application of advanced technology is "exactly the kind of effort that will be necessary to help solve our 'health care crisis.'" He dismisses the notion "that sufficient biomedical technology is now available for health care delivery," but supports this dismissal with no evidence. This is surprising in light of (i) the growing realization that the health status of a population is more dependent on environmental, ecological, or social factors than it is on the delivery of medical care (*1*) and (ii) the persistence of inequities in health status among subgroups of a population, despite available technology. It is not clear to us, for example, that the development and application of advanced technology would remove social gradients in morbidity and mortality. Advanced technology may indeed have a place in the solution of problems in the health care system, but intermediate or low-level technology may be the major strategy of choice (*2*).

More fundamentally, Scott fails to make clear the exact nature of the "health care crisis" he is considering. He makes no distinction between health care and medical or disease care. When referring to "detection and treatment of incipient disease," he uses the term "preventive health care," which he seems to find interchangeable with "preventive medical care." True "health care" should be the promotion of positive health and the prevention of disease before it occurs. In this context, we submit that personal action, social organization, and environmental control will be more potent problem-solvers than advanced biomedical technology.

MICHAEL G. MARMOT
WARREN WINKELSTEIN, JR.
Epidemiology Group,
School of Public Health,
University of California,
Berkeley 94720

References

1. W. Winkelstein, Jr., *Int. J. Epidemiol.* **1**, 69 (1972); T. McKeown, *Medicine in Modern Society* (Allen & Unwin, London, 1965).
2. J. Powles, *Ecologist* **2**, 24 (1972).

The remarks of C. D. Scott regarding applications to health care delivery of the technology of the engineering sciences also hold for the technology of the applied social sciences. In fact, the responsiveness of the health care system and the cost of health care can probably be affected more, in the short term, by changes in the organization of the delivery of services than by applications of advanced biomedical engineering. The response of medicine to additional funds for biomedical engineering research might be similar to the response to the recent increase in funds for health services research—social scientists have not been brought in as experts to work on the problems.

The employment of the applied social scientist in the exploration and evaluation of alternative ways or organizing the delivery of health care frequently involves the same restriction on effectiveness as does the employment of the engineer, that is, both are contracted to add the details to a preconceived concept. In addition, the application of social science methodology to health care delivery is being incorporated by a medical subspecialty (epidemiology and community medi-

cine), while established fields of social science are being redefined as new medical subspecialties—developmental psychology is becoming behavioral pediatrics and community pediatrics (*1*). This results in physicians being removed from the delivery of medical care, where there is an apparent shortage of such manpower, to administer social science research and evaluation, for which physicians require additional training. Thus, society pays physicians' salaries to reduce and retrain a scarce manpower pool, while the applied social sciences suffer from an oversupply of manpower similar to that of the engineering sciences.

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I certainly agree that I primarily presented the viewpoint of the developmental technologist (obviously a very frustrated technologist) without presenting an overall picture of the involvement of other elements essential to health care delivery. As mentioned in the article, the excellent presentation by Schwartz (*1*) puts these elements in better perspective. But even with the most optimum organizational mode and the best political solutions, all sections of our very heterogeneous society could not achieve and maintain an equally high level of health care delivery with existing technology. For example, much of the technology developed for the relatively large medical centers (most technological developments have been for this area) are not usable with a dispersed population such as that found in Appalachia or in remote areas in the southwestern United States, even if you could convince a sufficient number of health care personnel to serve those areas. Thus, the persistence of inequities among some population subgroups has resulted because of lack of technology. Also, as new advances occur in biomedical research, it would be fortuitous indeed if current technology alone could be used to ensure ultimate application to health care delivery.

As the social sciences become more extensively used in organizing our health care delivery effort, I hope that responsiveness to the needs of the individual will be considered as important as the operational efficiency of the system. Perhaps social scientists would be better equipped than physicians to objectively use both of these criteria.

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Safety and Efficacy of New Drugs

In the letter from C. Joseph Stetler of the Pharmaceutical Manufacturers Association (12 Jan., p. 127) taking issue with Muller's article (5 May 1972, p. 488) on the socioeconomics of drug therapy and the "overmedicated society," there is the oft-repeated rebuttal that "Advertising claims [for drugs] must be based upon FDA-approved labeling. . . ." This is a continual excuse by those in the drug industry to imply that all drugs on the market are both safe and efficacious. But this is simply not true. Drugs are still being advertised and sold that have not received FDA (Food and Drug Administration) approval (*1*). The following are excerpts from letters to me from D. N. Kilburn (*2*) of the FDA concerning Lipo-K, a drug that has been seized several times by the FDA since 1967 because it was shipped in interstate commerce without an approved new drug application.

. . . In our opinion, the Lipo-K capsule is a new drug subject to the new drug provisions of the [Federal Food, Drug and Cosmetic] Act. However, Marcen Laboratories, Inc., has not submitted a new-drug application to us pursuant to the new drug provisions of the Act.

. . . Despite a court order decreeing that each of the drugs seized in a legal action, including Lipo-K capsules, is a new drug without an approved new drug application. . . [u]ntil the determination of the new drug status of Lipo-K products has been finalized and as long as the products are marketed, they may be advertised.

Thus drugs for which claims have *not* been approved by the FDA may still be advertised and sold.

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1. U.S. Senate, Subcommittee on Monopoly, "Competitive problems in the drug industry," *Hearings before the U.S. Senate Subcommittee on Monopoly, Part 14* (Government Printing Office, Washington, D.C., 1969), p. 5723.
2. D. N. Kilburn, personal communications.

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28 September 1973, Volume 181, Number 4106

SCIENCE

Computing in Transition

The day of the large general-purpose, single facility computer center may be ending for many educational and research institutions. The centralized operation that tried to be all things to its broad spectrum of users within the institution is giving way to extrainstitutional approaches to providing and receiving information and computing services.

Born and reared in the middle of the Eisenhower years with a big boost from government seed money and the promotional discounts of computer manufacturers, the computer center enjoyed a dozen years of steady growth and expansion. But early in the Nixon years, a sharp drop-off in external support and funded usage compounded by some customers relations and credibility problems arrested its development. As deficits began to appear like warts on soaring computer budgets, institutional executives started searching for alternatives to the computer center.

Alternatives to the center do exist. Minicomputers, commercial time-sharing services, government subsidized facilities, and regional networks offer users others means of getting their work done. Indeed, the fact that users were already availing themselves of these options was partly responsible for the decline in revenue experienced at the computer center.

Some institutions relaxed restrictions on users' purchasing outside services or acquiring their own minicomputers. Some institutions formed or joined regional networks with government support or got together in other ways to share computing resources. Two of the approaches taken to solving the deficit problem are of special interest.

The first, call it "retailing" services, is exemplified by Harvard's approach. Harvard effectively shut down its main computer center and returned the large computer to the manufacturer. Simultaneously, it established an office to develop the substantive use of outside services in addition to on-campus resources.

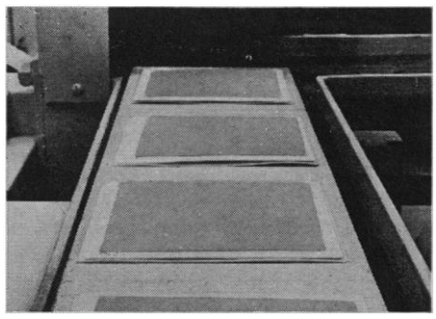
The second and complementary approach, call it "wholesaling" services, is exemplified by the centers at two campuses of the University of California: Los Angeles and San Diego. These centers have made their services generally available over the national computer network known as ARPANET at a charge to such customers as the RAND Corporation and the University of Illinois. The additional revenues gained by this means have made cutting back and returning computers at these campuses unnecessary.

What all this may be leading to is the development of a national marketplace for computing and information services. Users at one institution will be able to obtain a wide variety of services from other distant institutions as though they were being supplied by a local center. The division of labor, specialization, and refinement of services made possible and encouraged by such a development could mean a major advance in the quality and variety of services available. But there are interesting and important questions on the role of the government, participation of profit-making companies, and working relationships among users and the institutions involved. These questions need to be carefully formulated and explored.

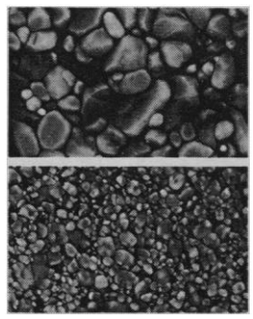
The essential first step is formation of a council of officers of interested institutions. This was the chief recommendation coming out of a series of seminars called by EDUCOM earlier this year to discuss the subject. Plans to organize the council are currently being discussed by EDUCOM with the American Council on Education, the Association of American Universities, and a number of colleges and universities.

—MARTIN GREENBERGER, *Department of Mathematical Sciences and Center for Metropolitan Planning and Research, The Johns Hopkins University, Baltimore, Maryland*

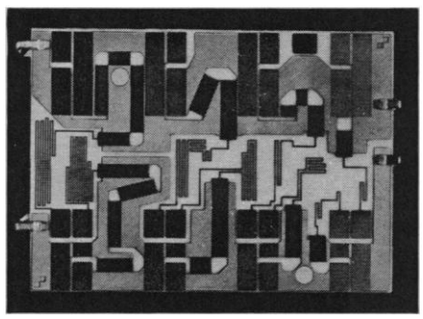
WESTERN ELECTRIC REPORTS



1500° C furnace was specially designed to fire these new substrates. The relatively low temperature results in smooth substrate surfaces for practically fault-free thin film bonding.



Electron micrographs show the great difference in grain size between new ceramic material (lower) and the previous material (upper).



Thin film integrated circuit shown here is part of a resistor network. It is one of many that benefit from the improved substrate. Metal leads on sides are bonded by thermocompression to tantalum nitride resistor film.

Smoothing the way for perfect thin film bonding.

Aluminum oxide, or alumina, is considered to have the best combination of properties for thin film circuit substrates. Until recently, however, the bonding of metal elements to gold-coated tantalum nitride resistor film on alumina was somewhat unpredictable.

Now, an advance at Western Electric has made it possible to get practically fault-free bonding of these materials.

This new perfection in bonding came through the development of finer grained alumina substrates.

The process has four basic steps: milling, casting, punching and firing.

During milling, alumina is combined with magnesium oxide, trichlorethylene, ethanol and a unique deflocculant. For 24 hours, this mixture is rotated in a ball mill. In a second 24-hour period, plasticizers and a binder are included.

The deflocculant plays a major role by dissipating the attraction forces that exist between the highly active alumina particles. This prevents thickening, which would ordinarily make an active alumina mixture unworkable.

The 48 hours of milling is followed by casting. When the material comes off the casting line, it is in the form of a flexible polymer/alumina tape, dry enough to be cut into easily handled sections.

After casting, a punch press cuts the material into the desired rectangles or other shapes. Holes can be punched at the same time.

Finally, because of the use of active alumina, the material is fired at an unusually low temperature which results in smooth substrate surfaces for reliable thin film bonding. The finished substrate is then ready for the various processes of thin film circuit production.

In developing this new process, engineers at Western Electric's Engineering Research Center worked together with engineers at the Allentown plant.

Conclusion: This new way to produce substrates is a truly significant contribution for thin film circuit production.

The ultimate gain from this smoother substrate is for communications itself. For through the achievement of nearly perfect bonding of metal leads to tantalum nitride, thin films can be produced with even greater reliability and economy.

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PRODUCTS and MATERIALS

Crystal Structure Analyzer

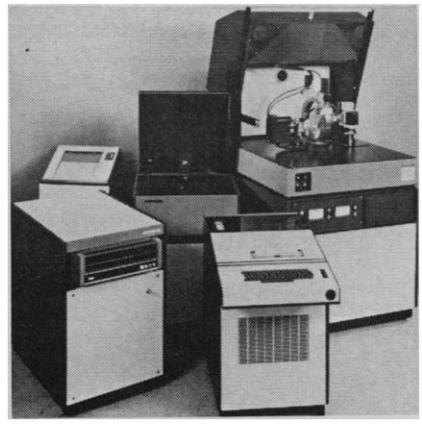
The XTL system (Fig. 1) combines hardware and software for the determination of molecular structure by x-ray diffraction. The system consists of a control console and three instruments, the $P2_1$ diffractometer, the AD-1 autodensitometer, and the XTL structure determinator. The diffractometer is a programmed four-circle, single-crystal model. The autodensitometer is an x-y stage microdensitometer that scans film or plates and collects data regarding intensity of transmission in areas determined by the operator or internally. The structure determinator features a 1.25-million-word moving head disk, fast floating point hardware, 24K memory, and a set of Fortran programs for structure determination. The console includes a tape drive, keyboard, thermal printer, and an 8K processor. Syntex Corporation. Circle No. 142 on Readers' Service Card.

Water Treatment with Ozone

Ozone is generated electrically and added to water to treat it for bacteria, turbidity, and impurities such as iron, manganese, hydrogen sulfide, and organic contaminants. The user can treat up to 8600 gallons per day with a standard unit (models WPCF or WP) or as much as 384 gallons per day with the portable model 45 (Fig. 2). The units are automatic, require little maintenance, and are powered by standard electric current. Alron Industries Incorporated. Circle No. 143 on Readers' Service Card.

Measurements and Chemistry

A five-part self-instructional series on *Measurements Basic to Chemistry* consists of either slides or a filmstrip, an audio cassette, and workbook in each subject area. Topics include the metric system of linear measurement, volume and mass, conversion from English to metric values, density and specific gravity, and temperature. The series is designed for student use and is easy to understand. Communication Skills Corporation. Circle No. 140 on Readers' Service Card.



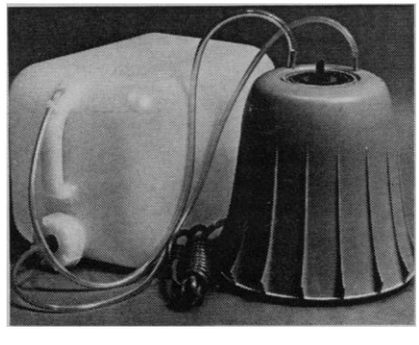


Fig. 1 (top). The components of Syntex Corporation's XTL crystal structure determination system including the $P2_1$ diffractometer and the AD-1 autodensitometer. Fortran programs and hardware implement the use of x-ray diffraction to study the crystal and molecular structure of compounds. Fig. 2 (bottom). The Alron model 45 portable water purifier generates ozone to treat up to 4 gallons of water in 15 minutes for impurities such as iron, manganese, sulfur, chlorine, and various organic substances.

Acoustic Radar

The model 300 is used to determine the thermal structure of the lower atmosphere. A monostatic acoustic sounder emits a short burst at 1600 hertz once every 6 or 12 seconds. A parabolic reflector 4 feet in diameter directs the sound vertically. Sound scattered back from small temperature variations up to 1 kilometer above is received by the antenna and recorded on a plot of time versus height. The device locates the top of a layer of fog or low clouds, height of inversion layers and mixing regions, wave motions, and changing formations of convective cells. Aerovironment Incorporated. Circle No. 141 on Readers' Service Card.

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Close tolerance filtering materials are available with or without frames in sizes from 159 mesh to 1270 mesh with either square or round holes from 100 to 5 microns. The base metal is nickel which may be finished with other metals such as gold or rhodium. These microsieves are provided with integral backing that adds strength and only marginally reduces passage. The holes are beveled to reduce blinding. Sieves are available in sizes up to 8 by 8 inches with or without the backing. Perforated Products Incorporated. Circle No. 144 on Readers' Service Card.

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