SCIENCE

12 January 1968

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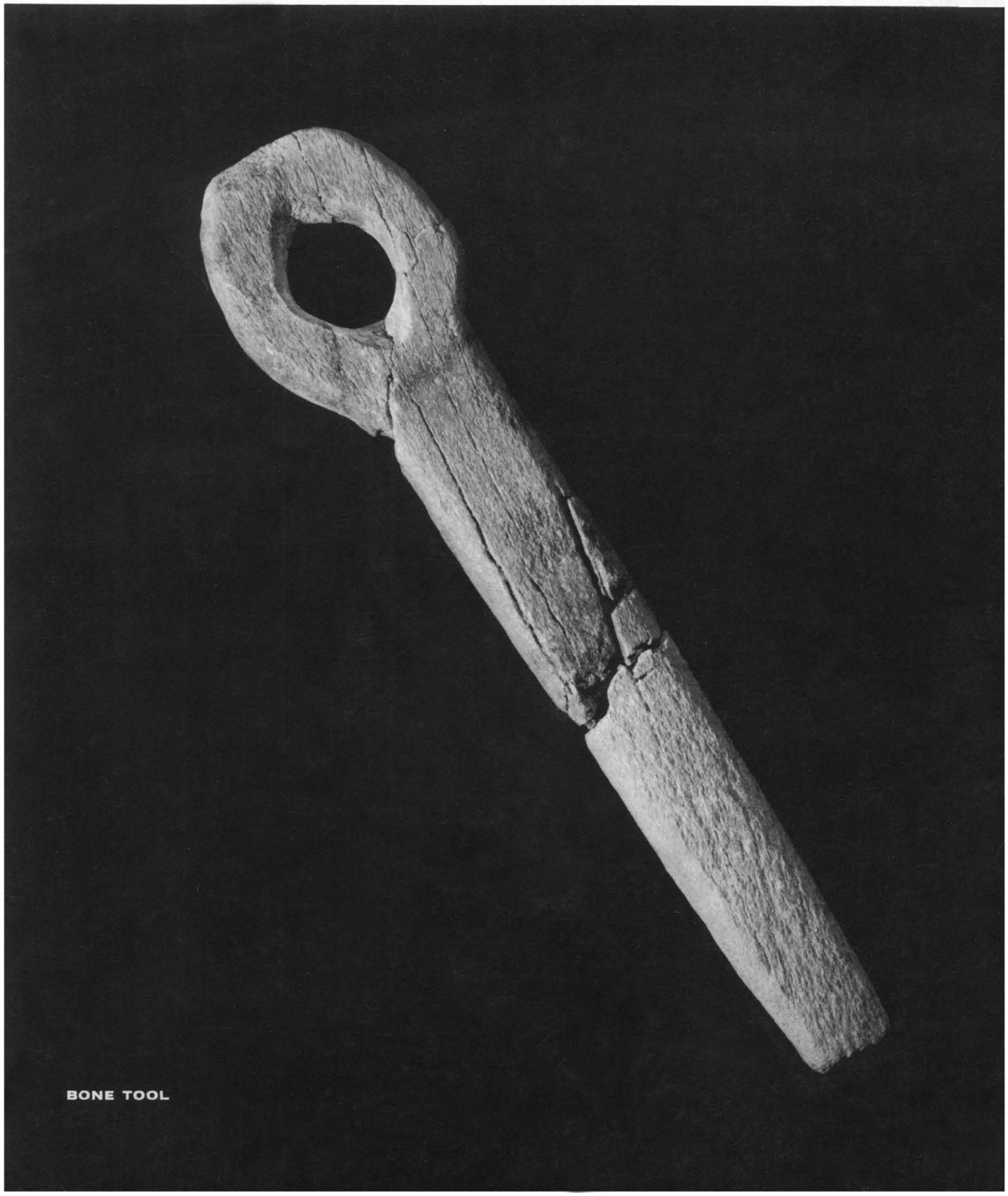
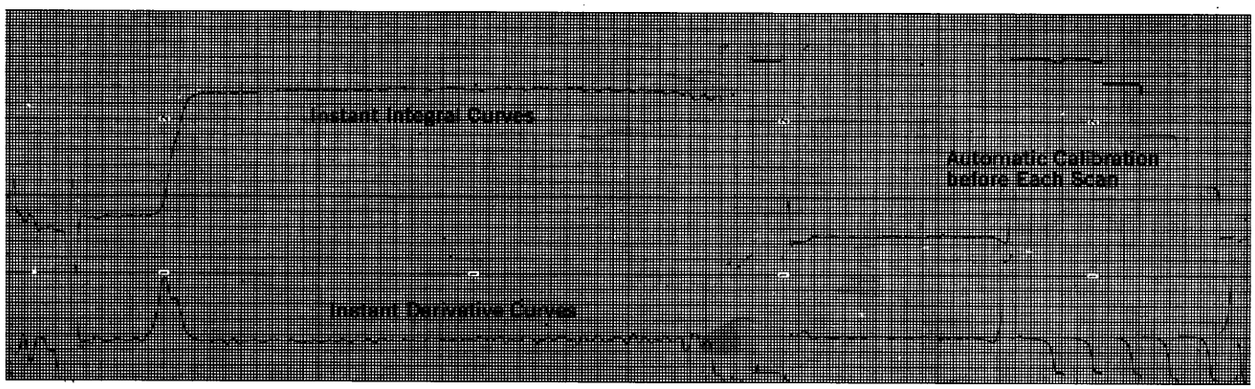
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



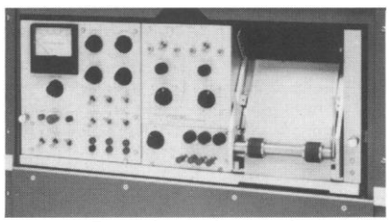
BONE TOOL



Boundary Velocity Experiment, two DNA's, 44,000 rpm, 265 mμ

Direct Scanning...the new era in analytical ultracentrifugation

The Photoelectric Scanner permits investigators, for the first time, to take full advantage of the highly discriminating absorption optical system of the Model E. It provides split-beam photometry—during centrifugation, at wavelengths selectable at will from 440 mμ down to 236 mμ. You can see what is happening in the cell as it happens because you get an immediate written record, and both integral and derivative curves are recorded simultaneously.



Recorder and controls for Photoelectric Scanner

Thus direct scanning frees you from the tedious procedures associated with the camera; provides "direct viewing" of sedimentation processes, electronic precision and discrimination in scanning the cell, and a variety of wavelengths at which to work. The precision and versatility that this new tool brings to biochemical research will inevitably open new areas of study. Already two investigators working with a scanner have been able to distinguish the catalytic and regulatory protein subunits of an enzyme in an association-dissociation study that augurs well for exciting work ahead.

What that work will be, what more will be accomplished in the era of direct scanning, only time and the ingenuity of investigators will tell.

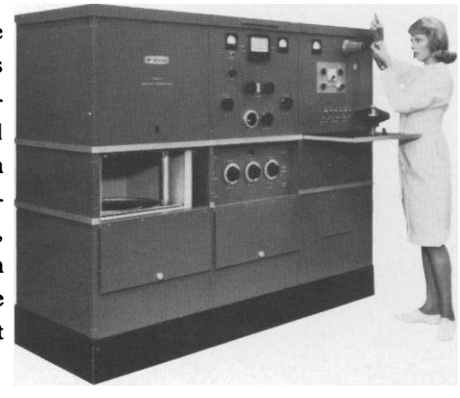
Inherent advantages of the Scanner

• Because the Scanner utilizes the split-beam principle, two samples in a double sector cell can be subjected to identical experimental conditions—an important factor in studying extremely small differences in sedimentation coefficients, for example. Or sample solution and solvent can be used in the double sector cell, with solvent reading automatically subtracted from the sample solution.

• With the Scanner classical sedimentation equilibrium measurements at extremely low concentrations in the UV are significantly easier to make. And they are more accurate because calibration steps are recorded before each scan.

• Having both curves simultaneously is a real advantage. For example: the derivative curve can show the presence of secondary components not readily recognizable from the integral curve; the integral curve can show heterogeneous material not revealed by the derivative curve.

For more information about the Photoelectric Scanner, write to Spinco Division at the address below.



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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Bone tool, 11,200 years old, from Murray Springs, Arizona. Tool appears to be well suited for straightening wood or bone used for shafts of spears. The tool is 259 millimeters long and 21 millimeters thick. See page 186. [Helga Teiwes, Arizona State Museum, Tucson]

New opportunities in physical and occupational therapy

1. College program for occupational therapy majors. If you want to become a professionally qualified occupational therapist, the Army will start helping in your junior year. You can receive a monthly education subsidy while you complete your undergraduate studies at your present school. Then you'll study at one of the Army's modern hospitals in Washington, San Francisco or San Antonio. There you'll receive clinical training in occupational therapy to fully qualify you for military or civilian practice.

2. Clinical affiliation for occupational therapists. Occupational Therapy Students may be selected for participation in the 36-week Army clinical affiliation. This unique program includes supervised training and experiences second to none. As a second lieutenant, you may accumulate creditable time towards pay and longevity while receiving your training.

3. Physical therapy program for college graduates. The Army offers college graduates one of the finest physical therapy programs in the Nation. As a commissioned officer you will attend the Medical Field Service School at Fort Sam Houston, Texas. After completing this curriculum you will be fully qualified for military or civilian practice.

4. Today's challenge gives therapists valuable new clinical experience. The challenge to professional occupational and physical therapists comes from wounded American soldiers. While serving in the Army Medical Specialist Corps, you can gain valuable professional experience on cases seldom seen in civilian practice. You will work on the finest professional staffs. You will have broad opportunities for continuing education, professional advancement and travel that are designed to meet your professional and personal interests.

Learn about all the opportunities waiting for you in the Army Medical Specialist Corps. Mail this coupon today.

Army S-5-35

Medical Specialist Corps
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Department of the Army
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Please send me full details on my opportunities in the Army Medical Specialist Corps.

( ) I am a college student in my _____ year.
My major is _____.
I expect to graduate in _____.

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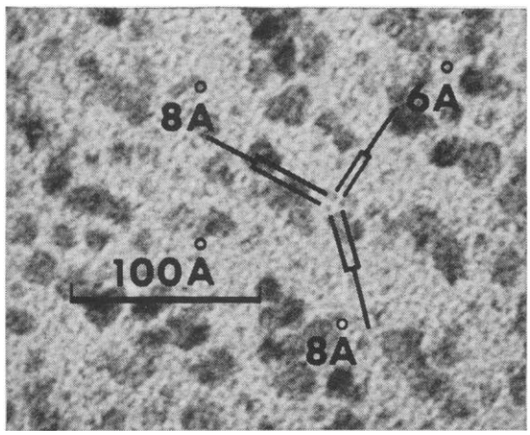
My major was _____.
I am interested in
( ) occupational therapy.
( ) physical therapy.

( ) I am a qualified physical therapist.
( ) I am a qualified occupational therapist.

Name _____
Address _____
City _____ State _____
Age _____ Zip Code _____

The new Model HS-8: The most electron microscope for your money.

If you need a high-performance instrument, the new Hitachi Perkin-Elmer Model HS-8 is for you. Its guaranteed resolution is 8 Angstroms, and it costs under $30,000.



Evaporated gold specimen shows a point-to-point resolution of 6 to 8 A. Magnification is 2,500,000X.

Here's an instrument that's so easy to align, so easy to use, so compact and reliable, that it far surpasses all other instruments in its price class. It offers high resolution and automatic operation.

Features you've been wishing for

The Hitachi Perkin-Elmer HS-8 is the only instrument in its price range that gives you two accelerating voltages—25 KV for high contrast and 50 KV for general purpose use—at the touch of a button.

It's the only instrument in its class that has a double condenser lens. The double condenser and objective-intermediate lenses are unitized and pre-aligned.

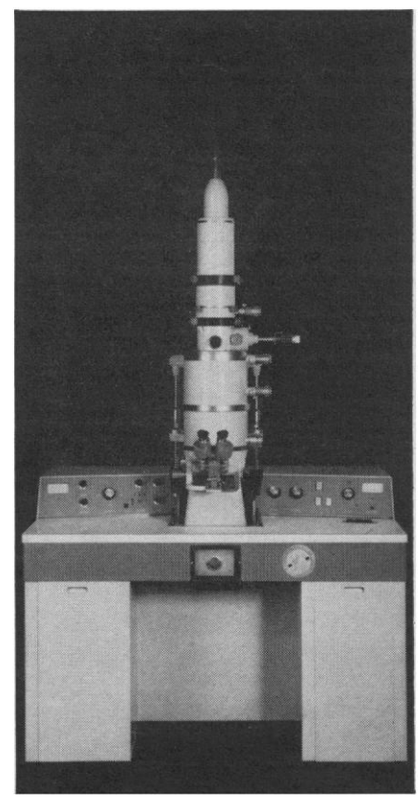
The HS-8 gives you 20 precalibrated steps of magnification with direct console readout —1000X to 100,000X direct . . . over 1,000,000 photographically. A special, small, fine-grain screen makes focusing easy.

The HS-8 has a new pushbutton vacuum system that practically eliminates specimen contamination. It uses a new non-backstreaming pump oil and a new built in anti-contamination device that traps contamination before it reaches the specimen.

The camera system is also pushbutton. Correct exposure is automatic. You get a pre-pump chamber that can keep 54 photo plates under vacuum, ready for use.

We'd like you to know more about this fine new microscope. In its price range, you won't find an instrument with more consistent high performance or more of the outstanding features you would expect only in high-priced electron microscopes. Write to: Perkin-Elmer Corporation, Instrument Division, 723 Main Avenue, Norwalk, Conn. 06852 or your nearest Perkin-Elmer sales office.

PERKIN-ELMER



The hope of doing each other some good prompts these advertisements

Kodak

Doesn't everybody know all this?

KODACHROME-X 135 Film and KODACHROME II 135 Film are for processing to 24 x 36mm transparencies. When you buy a KODAK Prepaid Processing Mailer PK36 for $3.40,* you are paying the same outfit that made the film to process 36 exposures of it, mount them ready for the slide projector, and mail them back directly to you.

Mailer PK20 costs $1.30 less because used only for 20-exposure cartridges or for the 20-exposure 126 size (28mm square format), such as you need for the KODAK INSTATECH Close-Up Camera.

PK36 and PK20 are also good for EKTACHROME-X 135 and 126 Film, which give a color rendition in the slides that some like better, and for High Speed EKTACHROME 135 and 126 Film.

If you should require a print from one of these transparencies, the dealer can have us make it in one of seven sizes up to 11 x 14" (which lists at $7.75).

KODACOLOR-X Film is primarily for color prints. Your purchase from the dealer at $4.40 of Mailer DP20-2R pays us to process a 20-exposure 135 magazine of it and send you the negatives with a 2½ x 3½" KODACOLOR Print from each. For other sizes there are other mailers at other prices. Later the dealer can have us make a projection-mounted KODACOLOR Transparency slide from any of these 35mm negatives for 30¢. KODACOLOR-X Film also comes in 36-exposure 135 magazines, in 126 form, and in roll film sizes. We can even make you 31mm square color slides from any of the roll-film negatives at 40¢ each. Also, KODACOLOR Enlargements are available in sizes to 11 x 14", cropped from standard masks the dealer should be able to show you.

*Prices peppered around here to provide a frame of reference are subject to change without notice. The dealer establishes the actual prices you pay, whether we do the work or you allow it to be sent to a plant that may offer quite different sizes, terms, and quality.

Clean windows in the ir and uv

If you have ever been delayed at a grade crossing while a tankcar of our ethyl acetate or our butyl acetate was being spotted into a siding, forgive us. If the car carried toluene, it wasn't ours. Whatever the names on the cars, you were seeing economic waste if the contents were purer than they needed to be for their purpose.

These same three compounds, when relieved of impurities, become quite different articles—useful in laboratories as spectrophotometric solvents. In 0.03mm path length they offer the following ir windows:

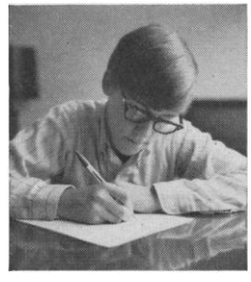
Ethyl Acetate	Butyl Acetate	Toluene
2.0-3.2μ	2.0-3.2μ	2.3-3.2μ
3.6-5.5μ	3.6-5.5μ	3.5-6.2μ
6.2-6.5μ	6.2-6.5μ	7.3-8.4μ
10.2-10.5μ	12.6-13.3μ	8.6-9.1μ
11.1-11.6μ	13.7-15.0μ	9.8-13.2μ
12.1-12.5μ		
13.0-15.0μ		

Uv energy absorption for 1cm path length exceeds ten times that of H_2O at:

255mμ	255mμ	285mμ

For this purpose there will be economic waste and possibly worse unless you can trust the bottler for the purity to keep those windows open. Because we have merited that kind of trust over the years, we can now add to our list of Spectro Grade solvents Ethyl Acetate as EASTMAN S300, Butyl Acetate as EASTMAN S710, and Toluene as EASTMAN S325. They join all the other laboratory necessities that stand out among the items of lesser known utility in the catalog of some 5300 EASTMAN Organic Chemicals.

Place orders for EASTMAN *Organic Chemicals with Allied, Curtin, Fisher, Howe & French, North-Strong, Sargent, Van Waters & Rogers, Walker, or Will—prominent laboratory suppliers all.*



Eastman Kodak Company
Rochester, N.Y.

Dear Sirs:

In only 7 years hence I expect to be 21 years of age and it will be legal for me to engage in investment and speculation without consent. I am now preparing for that time. It is therefore necessary for me to have certain information about scientific developments that will take place. As I have been interested in photography I would like to know what plans you have for bringing out new kinds of films to work with laser light instead of plain light. I also happen to understand how cathode-ray tubes work and would like to know why you don't make film where the electron beam works right on the film instead of making light on the tube face and then photographing that.

Yours very truly,
Herman Small
("Herman Small" is a composite.)

Dear Mr. Small:

You sound like the sort of person who is going to be taking charge of things in the comparatively near future and we had better not kid around with you.

As a matter of fact we have been working hard for years on film for direct electron recording of cathode-ray images. We have even sold a little of it, but not much. It seems to be a very good way to pack information at megacycle frequencies into far more compact form than magnetic recording permits. (We assume you are familiar with megacycles.) Sale is still small because there is as yet very little equipment around that can make use of such film. To the extent that this development is involved in the planning of the financial program that you intend to launch in 1975, we wish you luck. It may be big then or it may have died. If we knew, we'd be bolder now.

On films for use in the laser art, it is the same old question of how bold to be with funds such as you yourself might have already entrusted to us (if it had not been for the matter of consent). It seems fairly clear that by the time you settle down into the driver's seat, much more of what we have already learned in making the film that has kept you interested in personal photography will have moved from that area into the use of color film technology in dealing with modulated optical frequencies. We have the color film technology in pretty good shape, but we can't afford to bet it on every horse in the race. It costs an awful lot of money to make a few feet of new color film not made before, even if you have a pretty good idea of how to make it. Lots of ideas will doubtless be brought to us in hope of film. We too need a little luck in picking winners.

Very truly yours,
EASTMAN KODAK COMPANY

Investigate Random or Periodic Processes with Correlation Function Computers

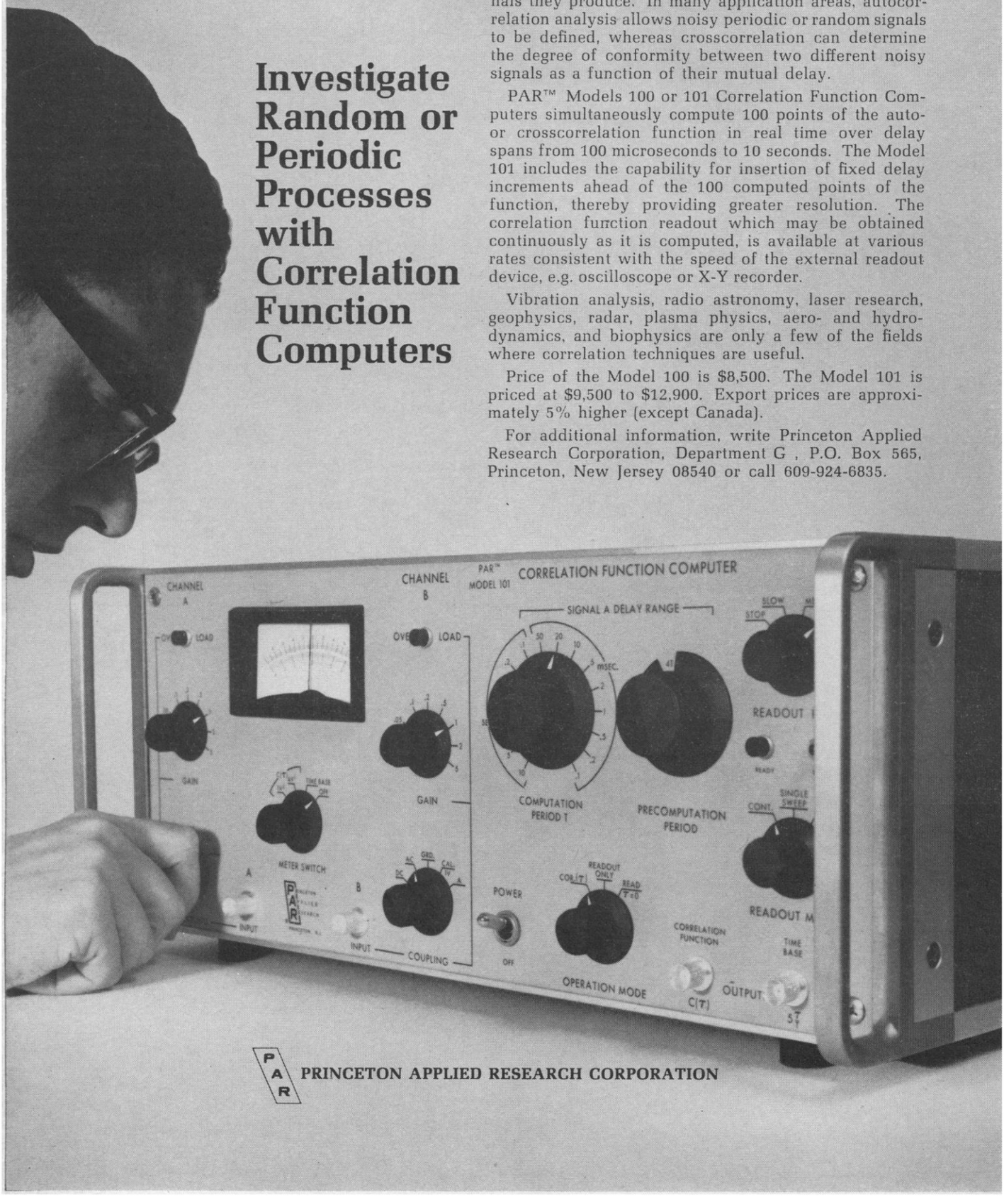
Correlation functions occupy a cardinal position in modern information theory and are basic to the analysis of random or periodic processes and the complex signals they produce. In many application areas, autocorrelation analysis allows noisy periodic or random signals to be defined, whereas crosscorrelation can determine the degree of conformity between two different noisy signals as a function of their mutual delay.

PAR™ Models 100 or 101 Correlation Function Computers simultaneously compute 100 points of the auto- or crosscorrelation function in real time over delay spans from 100 microseconds to 10 seconds. The Model 101 includes the capability for insertion of fixed delay increments ahead of the 100 computed points of the function, thereby providing greater resolution. The correlation function readout which may be obtained continuously as it is computed, is available at various rates consistent with the speed of the external readout device, e.g. oscilloscope or X-Y recorder.

Vibration analysis, radio astronomy, laser research, geophysics, radar, plasma physics, aero- and hydrodynamics, and biophysics are only a few of the fields where correlation techniques are useful.

Price of the Model 100 is $8,500. The Model 101 is priced at $9,500 to $12,900. Export prices are approximately 5% higher (except Canada).

For additional information, write Princeton Applied Research Corporation, Department G , P.O. Box 565, Princeton, New Jersey 08540 or call 609-924-6835.



PRINCETON APPLIED RESEARCH CORPORATION

killed and more cities leveled than occurred with the bomb on Hiroshima. The more basic, and difficult, problem therefore was why the nature of warfare changed at this time.

Research in the physical and biological sciences is not likely to cease. The use to which it is put will have far-reaching and usually unexpected consequences. It should be the task of the social scientist to develop a methodology that will permit predictive hypotheses rather than to make moral exhortations. This is not to say that all conflicting values and ideologies can be eliminated, but understanding is a step toward resolution by peaceful means. This basic point, I think, applies across the board. In international affairs, the first need is to understand the nature of free enterprise, communism, and all the intermediate ideologies rather than to deal in stereotypes, and, on the domestic scene, it is to comprehend the reasons for attitudes toward minority groups as well as the nature of these groups. Such understandings can best be achieved from a neutral position, no matter how deeply anguished the scientist may be.

JULIAN H. STEWARD
Department of Anthropology,
Center for Advanced Study,
University of Illinois, Urbana 61801

Can the Ends Justify the Means?

The goals of students in higher education are not the cause of unrest in our universities ("Student unrest," 27 Oct., p. 443). The real problem is the manner in which a minority of students, along with fellow travelers, seek to attain these goals, laudable or not. I am sure that the present-day student can, if he really tries, obtain freedom of thought and commitment, be treated as an individual, acquire the skill or art of learning, have a voice in establishing priorities for educational practices, and participate (to a reasonable degree) in policy-making. In every university that I know of, the student has ample opportunity to participate in making rules, in ways and means of enforcing them, and in becoming involved in activities that are important to him. Trouble comes when the vociferous minority, lacking parental and faculty experience, demands that its desires be realized by means which often disregard existing rules and laws and the rights of others. Yet these changes could, in a large part, be made if legitimate tactics were used in an intelligent manner. To many observers, it seems that the very tactics used to force a change demonstrate that those utilizing these tactics do not merit the goals they seek and that they do not have the intelligence to use, in a sane way, new freedoms and responsibilities.

In my opinion, the administrators of our universities would be remiss indeed if they allow students to have a greater say in their education without first making certain that the majority of the students really want the changes sought by the minority, and without having definite assurance, by past action, that the majority of them have the sense and ability to utilize greater freedom. In such "reforms," haste often leads to chaotic situations and little real progress, whereas deliberate action generally assures worthwhile gains.

LOUIS LYKKEN
Division of Entomology,
University of California, Berkeley 94720

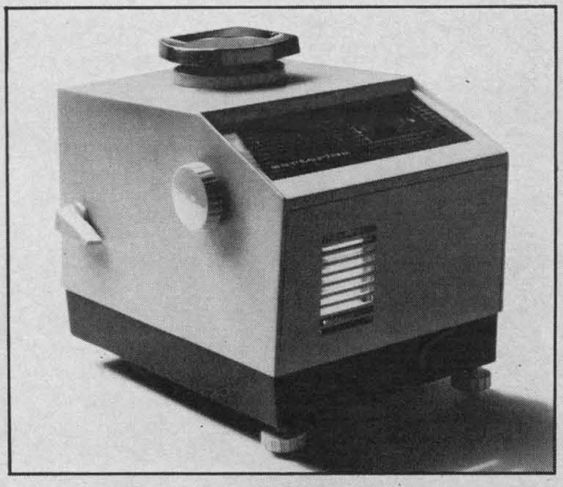
. . . Despite the universal appeal of such cliches as "freedom" and "democracy," the powers demanded by students are frequently neither reasonable nor constructive, nor do they enhance the quality or quantity of freedom on the campus. As a graduate student on the scene, I know that Wolfle's "bright, articulate, committed, influential, activist student leaders" want as much as they can get, and the educational process be damned. Many of them seek the power to impose a political position on the university from their position as self-appointed, but officially recognized, "spokesmen" of the student body. This is not democracy but a gross form of elitism.

The ultimate goal of "student power" would seem to be a North American equivalent of the 1918 University Reform Movement which swept Latin America from the University of Córdoba, Argentina. What has the URM accomplished? It has gravely impaired the quality of Hispano-American education; created a class of professional students subsidized by the government and a disproportion between "intellectuals" and technicians which is tragic for an underdeveloped region. It is largely responsible for the political volatility which has so hindered the improvement of the lives of the peoples of the countries affected.

The traditional purposes of the American university have been teaching and research. To surrender blindly

Wouldn't it be great if someone designed a 160 g top-loader with 1 mg accuracy and all-digital readout?

Someone has. Sartorius.



There are other top-loading balances with 160 g capacity, but none is as accurate and easy to read as the new Sartorius 2255... and none is as stable.

To eliminate interpolation error with 'between the line' results, the Model 2255 provides all-digital readout to 1 mg. To further insure accuracy, there is absolutely no discernible swing—this balance stays at the indicated weight. There's no need to squint, either. Its huge new optical scale is a pleasure to read, even under the most adverse lighting conditions.

At only $725, the above features alone would make the 2255 a great buy, but there are more. The Taramatic® single knob taring system and below-balance weighing accessories are included at no extra cost.

For research, quality control, student use, or any other application requiring 1 mg weighing accuracy at loads up to 160 g, this is the simplest, yet most advanced top-loading balance available.

Sartorius all-digital top-loaders also come with higher capacities. Our 40-page catalog describes them all. For your copy, just write: Sartorius Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

sartorius balances

to the changes now being urged in the structure of the academic community would mean far more than the expansion of faculty-administration committees to include student representatives. It would mean surrendering the institutional detachment from political controversy which is necessary to sustain a climate for objective, factual inquiry. It would mean the systematic alienation of an "intellectual" class from the body politic. . . . Certainly some of the student demands are justified, but those in a position to do so must have the courage to say "no" to those which are not.

ARTHUR M. SHAPIRO
Department of Entomology and Limnology, Cornell University, Ithaca, New York 14850

Care for Indigents in Bolivia

Our treatment of the Aymara Indians of Bolivia furnishes proof that the interprofessional approach toward meeting the needs of a developing people answers many of the multiple problems discussed by Taylor and Hall in their article, "Health, population, and economic development" (11 Aug., p. 651). Our patients see their problems as exclusively medical. Yet how could we persuade a mother of six who is suffering from rheumatic fever to have her infected teeth treated if we referred her to a dentist halfway across town? Or who would best relieve another patient, the victim of a heart attack, who has been locked out of her room with her rent several months in arrears—the doctor with an oxygen tank—or the lawyer who can help get her rent paid and home restored? A man is unable to buy medicine because he is unlawfully paid only in food and shelter instead of in cash—a woman and her children suffer from malnutrition because the husband has deserted—a mine worker with tuberculosis has not received his pension and cannot buy food—an ignorant teacher excludes a child from school because of a rash that according to the physician's diagnosis is not contagious—these are problems that require legal as well as medical help. During the Indians' early periods of acquaintance with the modern world, the lawyer also assists the physician in treating their psychosomatic illnesses—headaches and gastric ulcers—which occur when the techniques of daily living cannot be assimilated quickly enough. Immense relief comes when professional assistance shows them how to secure employment contracts, housing contracts, formalization of common law marriages, property settlements, divorces, alimony, and the substitution of lawsuits for personal methods of revenge.

Our dentists provide the care necessary to cope with the rapidly increasing rate of caries among the Aymaras, perhaps due to their changing diet which is now higher in refined carbohydrates and sugar—a trend that further aggravates a new tendency toward rheumatic and arthritic diseases caused by poor housing and flimsy city clothing.

Thus a patient who comes to the clinic for medical care may receive dental and legal care as well. We have 20 or more specialists available and communications are fast. Also results of x-ray and lab tests are quickly secured. Our publications naturally reflect the same interprofessional theme. Some recent titles are "Phases, physiology, and pathology of the cultural transition period" and "Violent aggression as a health hazard in La Paz, Bolivia." This service, now 21 years old, is recommended as a replacement of an exclusively medical service for developing populations.

RUTH W. TICHAUER
Casilla 483, La Paz, Bolivia

Computer Costs: A Reasonable Approach

Although I have not been involved in the matter personally, I understand that cost recovery for computer centers has been the subject of considerable controversy between universities and government representatives and that some universities have argued unsuccessfully that cost recovery on government contracts should be achieved through indirect-cost allowances. I understand that the government's position is that computer usage should be handled as a direct cost; that is, the cost of a computer center for a period should be divided by time used in order to get a billing rate to charge each user (government contracts included). I further understand that full utilization of computer centers is not expected to be the case. Given the high cost of centers, prohibitive time rates also are expected. If this is correct, I should like to point out that

Character Actor

Beckman's veteran DK® Spectrophotometer: fits a dozen UV roles, never type-cast, never obsolete, easily adaptable, no prima donna price.

Major credits for this double-beam ratio-recording performer of thirteen years' experience: Linear transmittance. Linear absorbance. Differential analysis. Direct energy recording. It's a past master at handling the lights—for analyses ranging from far ultraviolet to near infrared (160 mμ to 3500 mμ, a bonus talent unique to the DK alone). And it co-stars with Beckman accessories in other feature roles—flame photometry, fluorescence, spectroradiometry, reaction rate studies, and reflectance.

The DK works with minimum direction—one or two control adjustments for successive routine analyses—and works on single-beam as well. A special servo device delivers precise pen and wavelength alignment and registration—one of eleven up-dating modifications of the DK's original makeup since 1954.

To name just a few feature attractions: Automatic slit programming ...low stray light...high resolution ...wide choice of chart speeds (flatbed or strip-chart)...and computer compatibility. But why not see the entire picture? Contact your local Beckman Sales Representative for an audition...or write for Data File **101G.**

The people out front in background and back-up...

Beckman®

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this situation is not unique and that there is a reasonable alternative.

There is justifiable concern that a high rate for computer usage will drive potential users away from the computer with the effect that rates will go still higher. Not to be overlooked is the fact that contracts themselves may not be able to bear the cost of escalated rates for computer time. The problem is not unlike that of the apocryphal entrepreneur with idle capacity who prices on the basis of cost. Failing to sell his entire output, he cuts production in the future. This increases his unit cost, so, in turn, he raises his price only to find that he still does not sell his current output. Theoretically, and assuming that the entrepreneur had unlimited funds with which to pursue this fantasy, he would wind up at some future time producing one unit that he could not sell because he had long since priced himself out of the market.

In both situations idle capacity should be recognized. Cost for both the entrepreneur and computer centers should be based upon the future volume of business envisioned when facilities were acquired. A computer center should determine its monthly rate on the basis of normal expected usage. (In order not to jeopardize the concept, I shall not labor the problem of identifying normal expected usage.) Until a normal level is achieved, the resulting rate would, of course, be lower than the one currently authorized.

The difference between amounts billed to all users and the actual cost of a computer would be a measure of the cost of idle capacity. Assuming that there is not prima facie evidence that potential capacity is unreasonably high, the cost of idle capacity could then come under consideration for inclusion in the pool of indirect costs. There are valid grounds for so treating it, particularly during the formative period in the life of computer centers.

Again, I am handicapped by not having had personal involvement. However, I have dealt with representatives of government and I have found them to be fair in dealing with reasonable proposals. If the universities now find themselves saddled with an unsatisfactory ruling, I must wonder whether they put proposals to the government on an either-or basis and now must content themselves with the "or."

C. W. BASTABLE

Graduate School of Business, Columbia University, New York 10027

Farming Success in India

Your review of *The World Food Problem*, published by the President's Science Advisory Committee (News and Comment, 23 June, p. 1578), emphasizes the growing gap between world population and food supply. In India we have a family planning expert as our Health Minister, and the goal of family planning seems to be in sight. Our position regarding food production is a less happy one. Yet some facts related to increased food production in India and Pakistan are worth consideration: (i) crops can be grown all year round, compared with 6 months or less in developed countries; (ii) crops grow more quickly due to higher temperatures and more intense sunlight; (iii) during dry seasons, sufficient water is available for irrigation (if properly conserved) from local monsoon rains or Himalayan snow; and (iv) manpower is unlimited.

By taking advantage of these factors, we have proved on the small experimental farm attached to this institute (Davis Institute of Neuropsychiatry) that it is possible to grow at least ten times more food per acre than the average for this area on land which was considered so poor when we bought it that nobody wanted to cultivate it. Our techniques during the last 5 years have included:

1) Digging wide diameter wells and installing electric pumps of 1 to 2 horsepower (we have six pumps for 17 acres). At one point we pump water from a stream. As the stream serves to irrigate 4 acres, we require one well for about 2 acres. In this rocky area, tube wells are impossible and there are no canals, nor is there enough land to construct dams and reservoirs.

2) Use of high-yield seed.

3) Mixed farming so as to produce manure and utilize waste plant products for animal feed. Chemical fertilizers, correctly used, are added.

4) Hand digging. We should like to have a small tractor, a luxury which we cannot yet afford.

If most of the land in India now under cultivation were cultivated only half as effectively as we have proved it possible, we Indians should be able to close the world food gap for many years to come, and banish the specter of famine. All we need is a vision of this goal, good leadership from within, and some outside help with fertilizers.

ROBERT B. DAVIS
Boreya Road, Kanke, Bihar, India

12 January 1968, Volume 159, Number 3811 **SCIENCE**

The Only Earth We Have

The AAAS Board of Directors has established a major new committee for the purpose of conducting a continuing review and evaluation of the intrusions man makes into the environment on which life depends. With dams, pesticides, bulldozers, cities, chemical fertilizers, noise, defoliants, power plants, garbage dumps, automobiles, huge construction projects, and other means, man changes the land, the waters, and the atmosphere, in ways he intends and often in ways he does not intend. Widespread realization that man's intrusions into the environment sometimes bring results that are clearly undesirable and often bring results that are not understood has led a number of recent committees, commissions, and planning groups to consider the problems of improving the quality of life and of protecting our planet from the ravages of man. It is not because no other group is actively studying these problems that the Board of Directors decided to create the new AAAS committee, but rather because the problems are of such widespread importance that many groups must be involved.

Part of the background of the new committee is related by Luther Carter in the News and Comment section of this issue of *Science*. Because of the previously expressed concern of the AAAS Council over the unknown amount and persistence of ecological damage, in Vietnam and elsewhere, which results from the use of chemical and biological agents that alter the environment, the new committee is being asked to give initial attention to these questions.

The committee's reponsibility is wider, however. It is expected to keep under review the various and changing technological developments and proposals that are likely to lead to substantial changes in the environment. The two most recent expressions of concern within the AAAS are two resolutions adopted by Council at the 1967 annual meeting. One called for restudy of the plan to dam the Red River of Kentucky. (A New York *Times* editorial entitled "Dam Nonsense in Kentucky" damned the project in it entirety.) The other deplored the loss of productive agricultural land, precious mineral and water resources, and sites of unusual scenic beauty or of rare geological, botanical, or zoological significance that are being gobbled up by highways, airstrips, suburbs, and industrial buildings when, with more careful planning, less valuable or less rare land could be employed for these purposes.

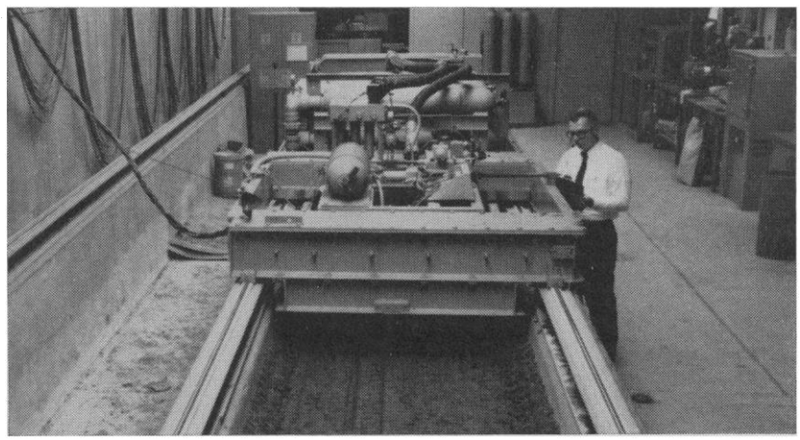
David Goddard, University of Pennsylvania, will be chairman of the new committee. Serving with him will be Barry Commoner, Washington University; Rene Dubos, Rockefeller University; Athelstan Spilhaus, Franklin Institute; and several other members still to be appointed. The members of the committee themselves, or the staff that will be appointed to aid the committee, may be given responsibility for some studies. In other instances the committee may establish special commissions to analyze particular problems, as the Association did in 1961 in appointing the Commission on Air Conservation.

One of the most significant aspects of the committee's prospective work is its commitment to consider environmental problems and population problems together. Some problems of population and some problems of environmental change can be studied in isolation, but the interactions are so intimate that many must be studied together. Man is the major creator of pollution, the only species likely to destroy the only Earth we have, or capable of planning its preservation. Problems of environmental change and problems of population size, growth, and quality will therefore be considered together.—DAEL WOLFLE

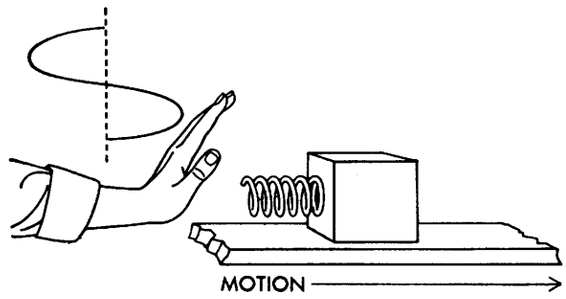
Report from

BELL LABORATORIES

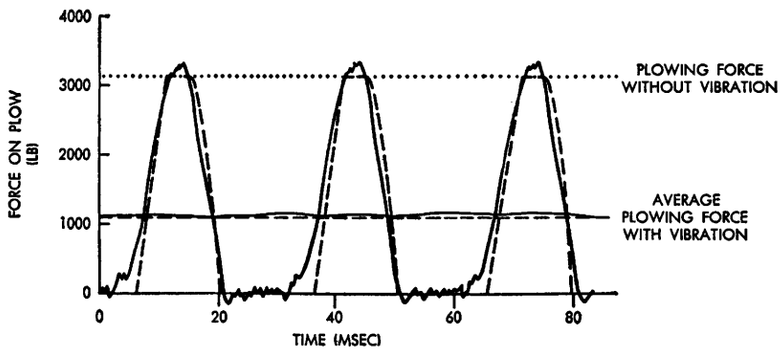
Equations for plowing



Soil dynamics laboratory at the Bell Telephone Laboratories location in Chester, N. J. Test soils of various kinds are placed in the long bin (foreground). A plow blade, not visible in this photo, rides under the carriage frame. The blade can be vibrated over a wide range of frequencies and amplitudes as the carriage is driven along the length of the bin.



According to Bell Laboratories' mathematical model, soil reacts to a vibrating plow blade much like an elastic object being pushed against friction over a surface (sketch above). The hand moves sinusoidally and, during part of each cycle, contacts the spring. The resulting theoretical force-time plot (dashed line in the graph below) shows how vibration reduces plowing force. Superimposed is a solid line showing typical test results with a vibrating blade in a test bin (photo above) filled with silty sand. The blade vibrates front to back 30 times per second. The mathematical model, based on the above analogy, has allowed computer simulation of such soil-plowing systems.



It has long been known that vibrating a plow blade makes it easier to force through soil. But what kind of vibration is most effective? That is, how much power should be applied to the blade and in what manner should the blade be vibrated?

We at Bell Telephone Laboratories are accumulating considerable information on this subject because we need a small, highly efficient plow that will bury telephone wires across lawns and up to houses with minimum drawbar pull. Unlike agricultural plows, which are built for maximum disturbance of the earth, Bell System plows must bury cable and wires with least possible marring of the property.

Recently, this work has been aided by a mathematical model of plow blade-soil interaction. Bell Laboratories engineers R. J. Boyd and C. L. Nalezny found that forcing a vibrating blade through the ground is analogous to pushing periodically on a spring, attached to a block on a frictional surface (left).

This simple model has helped us design a prototype plow that buries telephone wires two feet deep at speeds up to 75 feet per minute. With most of its power applied to the blade, it can cut through rocky soil and tree roots where conventional machines might stall.

Bell Telephone Laboratories
Research and Development Unit of the Bell System

that a new journal in this field (and such an appearance seems imminent) should be one of the highest scientific standard.

O. J. Kleppa served as general chairman of the meeting; local arrangements were handled by W. V. Johnston (NAA Science Center). There are no published proceedings of the conference, but much of the reported material will appear later in scientific journals.

The Twenty-third Calorimetry Conference will be held in August 1968 in Midland, Michigan, with the Dow Chemical Company serving as host. Inquiries about program and attendance should be directed to the program chairman: C. E. Vanderzee, Department of Chemistry, University of Nebraska, Lincoln, Nebraska 68506.

D. L. HILDENBRAND

Douglas Advanced Research Laboratories, Huntington Beach, California 92646

Calendar of Events

National Meetings

January

20–25. American Academy of **Orthopaedic Surgeons,** annual mtg., Chicago, Ill. (J. K. Hart, AAOS, 29 E. Madison, Chicago 60602)

22–23. **Industrial Research,** 3rd annual, Chicago, Ill. (V. H. Disney, IIT Research Inst., 10 W. 35 St., Chicago 60616)

22–24. **Aerospace** Sciences mtg., New York, N.Y. (Meetings Manager, American Inst. of Aeronautics and Astronautics, 1290 Ave. of the Americas, New York 10019)

22–24. **Coal and Coke,** Philadelphia, Pa. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia 19103)

22–24. **Radioisotopes and Radiation Effects,** New Orleans, La. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

22–26. **Basic Electronics,** Hopatcong, N.J. (Saul Gordon Associates, Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)

22–26. **Marine Sciences Instrumentation,** 4th natl. symp., Cocoa Beach, Fla. (M. Reed, Instrument Soc. of America, 530 William Penn Pl., Pittsburgh, Pa. 15219)

22–26. **Powder X-Ray Diffractometry,** Austin, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

22–27. **Air Conditioning** Principles and Practices, Austin, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

23. **Industrial Associates** Research Review, Houston, Tex. (D. E. Griffith, Program Director, Taylor Hall 153, College of Engineering, University of Texas, Austin 78712)

23. Preventive and Therapeutic Aspects of **Coronary Heart Disease,** conf., New York, N.Y. (Conference Planning Committee, New York Heart Association, 10 Columbus Circle, New York 10019)

23–26. Council on **Social Work Education,** Minneapolis, Minn. (P. Stickney, Council on Social Work Education, 345 E. 46 St., New York 10017)

23–26. **Water,** Technical Committee mtg., West Palm Beach, Fla. (American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

23–27. American **Mathematical** Soc., 74th annual, San Francisco, Calif. (G. L. Walker, American Mathematical Soc., Box 6248, Providence, R.I. 02904)

24–25. **Health Physics,** 2nd midyear symp., Augusta, Ga. (C. M. Patterson, E. I. duPont, Savannah River Lab., Aiken, S.C. 29801)

25–27. **Mathematical** Assoc. of America, 51st annual, San Francisco, Calif. (H. M. Gehman, MAA, Executive Director, c/o SUNY at Buffalo, N.Y. 14214)

25–27. **Symmetry Principles** at High Energy, 4th conf., Coral Gables, Fla. (Conference on Symmetry Principles at High Energy, Center for Theoretical Studies, University of Miami, Coral Gables)

27–1. American Group **Psychotherapy** Assoc., conf., Chicago, Ill. (M. Schiff, AGPA, Room 702, 1790 Broadway, New York 10019)

28. Fourth **Mössbauer** Symp., Chicago, Ill. (P. A. McNulty, New England Nuclear Corp., 575 Albany St., Boston, Mass. 02118)

28–2. Institute of **Electrical and Electronics Engineers,** winter power mtg., New York, N.Y. (J. W. Bean, American Electric Power, 2 Broadway, New York 10008)

28–2. **Testing and Materials,** winter mtg., Atlantic City, N.J. (T. A. Marshall, Jr., American Soc. for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103)

29–31. National Assoc. of **Private Psychiatric Hospitals,** 35th annual mtg., Miami Beach, Fla. (The Association, 353 Broad Ave., Leonia, N.J.)

29–31. Society of **Thoracic Surgeons,** annual mtg., New Orleans, La. (F. X. Byron, Executive Secretary, Society for Thoracic Surgeons, City of Hope Medical Center, 1500 E. Duarte Rd., Duarte, Calif. 91010)

29–1. American Assoc. of **Physics Teachers,** annual mtg., Chicago, Ill. (S. S. Ballard, Univ. of Florida, Gainesville 32603)

29–1. American **Meteorological** Soc., 48th annual, San Francisco, Calif. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass. 02108)

29–1. American **Physical** Soc., annual mtg., Chicago, Ill. (R. G. Sachs, Box 344, Argonne, Ill. 60440)

29–3. **Bio-Physical Techniques,** Hopatcong, N.J. (Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)