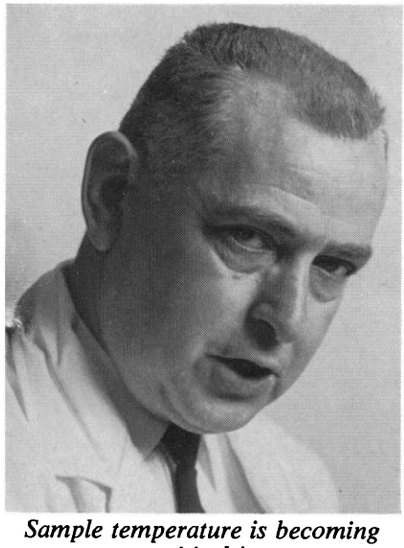
SCIENCE

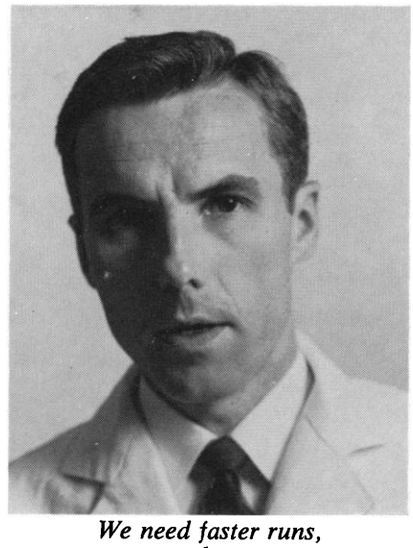
7 April 1967
Vol. 156, No. 3771

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

GIANT PANDA

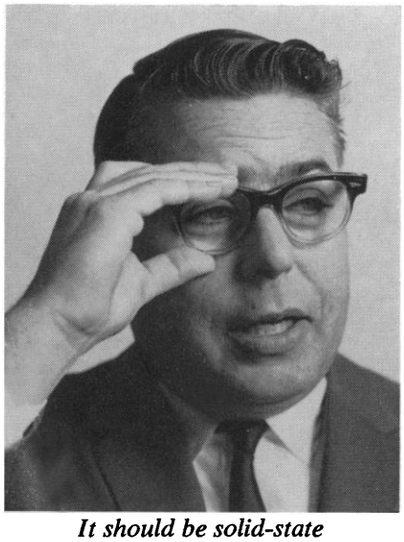


Sample temperature is becoming a more critical factor...



We need faster runs, more sample per run...

A way to tell that everything is running smoothly...



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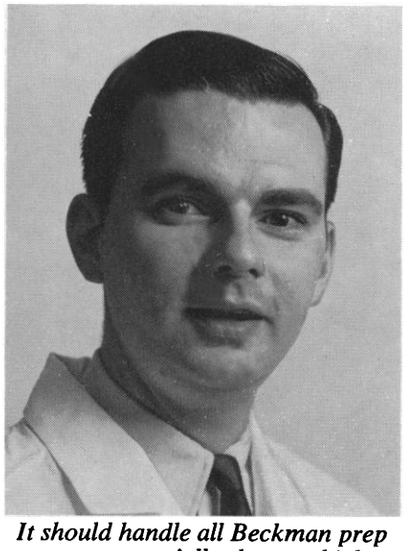
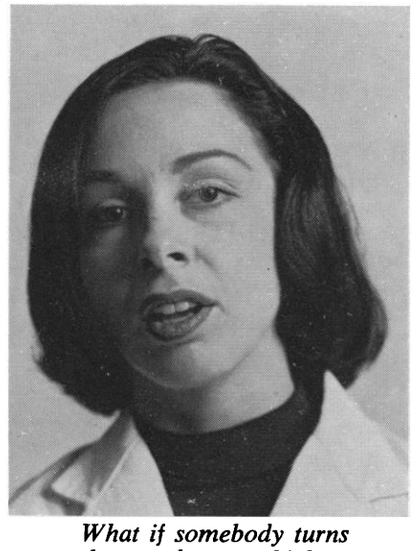
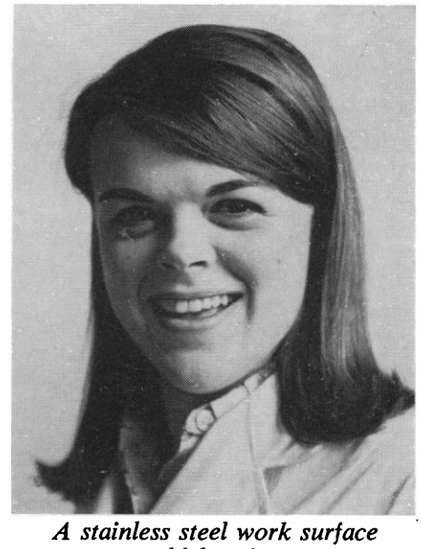
It should keep the rotor steady as it slows down to protect the separations...



It should handle all Beckman prep rotors, especially the new high performance and zonal rotors...



What if somebody turns the speed up too high...



A stainless steel work surface would be nice...

7 April 1967
Vol. 156, No. 3771

SCIENCE

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"Discovered less than a century ago, [the panda] is as much loved as it is little known. It has never been seriously studied in the wild and no more than seventeen live specimens have been seen outside China. Thirty years ago the western world had encountered nothing more than stuffed specimens in a few museums. Then . . . the giant pandas arrived. . . . The public saw them and were conquered." [From *Men and Pandas*. See page 53]

CONCENTRATE
proteins 100x in 30 minutes?

DESALT
them in 10 minutes more?

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cellular suspensions?

FILTER
gooey messes without clogging?

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differently-charged ionic components?

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- *concentrate ten 20 ml aliquots* to 10x in only 15 minutes! Or up to ten of 200 ml each in 150 minutes! Or larger volumes at 3 liters per hour!
- *continue to concentrate* to 100x in 15 minutes more!
- *recover* 80 to 100 percent of starting protein!
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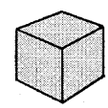
- *and wash* less-charged from more-charged components (like extra-cellular enzymes from bacteria, or glycerol from red cells) at comparable rates!



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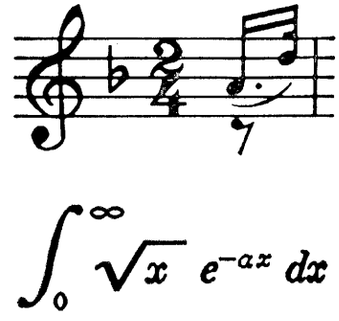
ELECTRONIC GRAPHICS BY COMPUTER

Computer information is most useful when it is displayed in an easily usable form. For this reason, much effort is currently being directed toward finding better visual outputs from computers — graphs and "pictures" instead of numbers. And an important aspect of this problem is improving the graphic quality of the images.

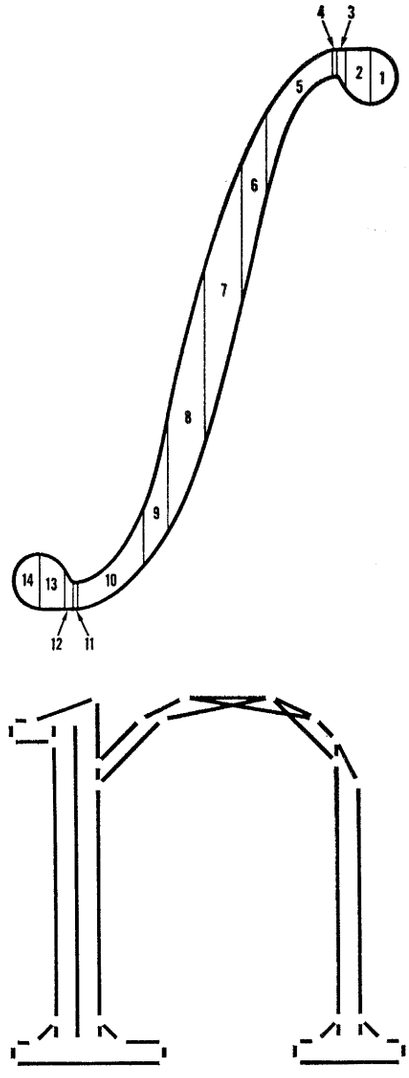
At Bell Telephone Laboratories, researchers M. V. Mathews and H. S. McDonald have devised an efficient and versatile method of "drawing" any conceivable shape or graphical design on the screen of a cathode-ray tube. For example, entire pages of text matter can be drawn on the screen in any desired type font, and then photographed. As a demonstration, the above headline, these words, and the sample mathematics and music below were produced by this experimental method.



$$\int_0^\infty \sqrt{x}\, e^{-ax}\, dx$$

At present, information describing the shapes of each of about 450 letters and symbols is stored numerically in a computer. No masks, negatives or other physical forms of the graphics are used. An operator tells the computer what text and/or other matter is to be produced. The computer calls upon its memory and directs the motions of the electron beam in the cathode-ray tube needed to trace out the images.

Preparing material with this technique offers the advantages of current mechanical methods plus the opportunity to correct while writing, change letter style and symbol forms, arrange lines with an even right-hand margin (justification), and vary type size — all with a heretofore unattainable ease and speed.



Two programming methods used to generate graphical material: An integral sign (top) is formed by the "patch" method, whereby the image is divided into a number of constituent areas or patches (fourteen patches in this case). After the areas are specified, the electron beam fills each one in. In another method, used here to form the letter "n", the electron beam follows the paths of the vector lines shown. Beam is wide enough to fill in areas between vectors.

Bell Telephone Laboratories
Research and Development Unit of the Bell System

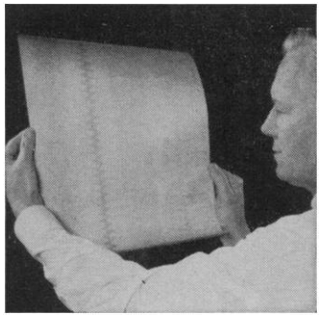
The hope of doing each other some good prompts these advertisements

Restoring the traces

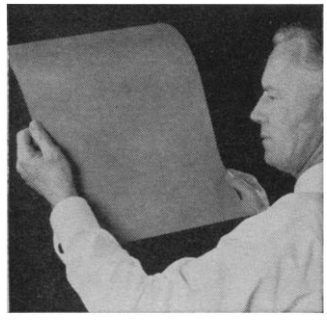
Much technical information on the way from sensing devices to men's minds passes through the conveniently visible form of analog traces on paper. So great is the volume of information passing through this form that the full working time of a score of our men is required to call on places that need the papers and other products we make for the purpose.

Most of our paper for this application is no longer dipped in chemicals to make the traces visible after light beams from oscillograph mirrors have drawn them at around 80,000 inches/sec, which is faster than the old-fashioned needle on the old-fashioned smoked drum. Such is the state of the emulsion-making art that mere ambient light suffices nowadays as the developer. Eventually, after receiving a great deal more ambient light, the traces do become indistinguishable.

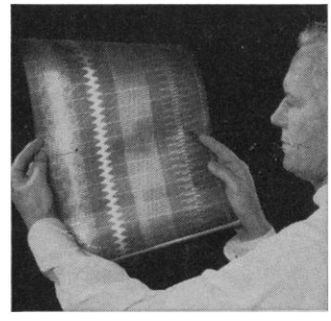
Once in a while this loss causes distress. On those unhappy occasions it would be nice if one could do something that would restore the traces. Now one can. It's very simple. There are two steps: 1) always make sure that oscillographs are loaded with a paper identified as KODAK LINAGRAPH 1843 Paper (1855 if extra-thin stock is desired); 2) then to restore faded traces simply dip for a minute or two in conventional developer like KODAK DEKTOL Developer. Back they come as white on black! Stop bath, fix, and wash then make up the frosting on the cake.



What light creates . . .



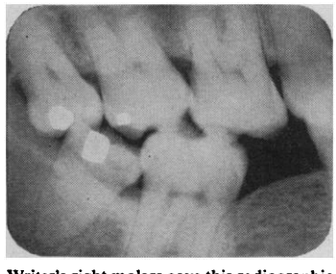
light may spoil . . .



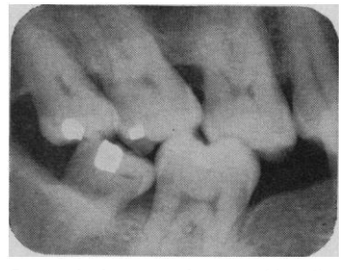
. . . but nothing is lost.

One of those men should perhaps drop in on you occasionally. You might want to ask him whether the same emulsion is available on film. Or about equipment to dispense with the undignified dipping. Or for a free gimmick that calculates writing speed on paper as a function of frequency and amplitude, as well as spatial wavelength on mag tape. Leave a call for him through Eastman Kodak Company, Instrumentation Products, Rochester, N. Y. 14650. Phone 716-325-2000, extension 3170.

The writer's favorite teeth



Writer's right molars gave this radiographic image on September 24, 1952.



Same writer's same molars gave this radiographic image on April 6, 1965, but with less than 1/25 the radiation dose required in 1952. Reason: writer's employer had increased the sensitivity of x-ray film.

Same molars on August 22, 1966. This time it was even comfortable. No more of those wretched hard, sharp edges on the x-ray film packets that make the gums feel as though being cut to ribbons. Furthermore, the new film needed much less darkness for processing, so that the gal didn't have to spend time dark-adapting her eyes, which kept things moving more briskly in the waiting room. Improvements signified by additional trademarks "Poly-Soft" and "Morlite" after the basic trademark "Kodak" on dental x-ray film.

Never tell your dentist what kind of products to put in your mouth, but see him regularly and be friendly.

Still doing paper chromatography?

Toward the close of each winter, large numbers of analytical chemists foregather in Pittsburgh to apprise one another of the past year's progress. Papers aren't the only means by which they communicate. Commercial exhibits further inform the chemists of developments that have reached a stage where strenuous effort is justified to put them to work for the benefit of all. We chose this route to make known our desire to share with all a new form of cellulose which our chemists have developed for partition TLC with aqueous solvents.

No longer fibrous, cleansed of impurities and most amorphous components to make it more homogeneous than paper, with the right particle size distribution to maximize speed and degree of resolution—this cellulose we offer coated some 160μ thick, *tight without resort to a binder substance*, on scissorable 20cm x 20cm sheets of poly(ethylene terephthalate). It's a good medium for electrophoretic migration in the cross-direction to the partition-TLC migration. Available either with or without $CaSiO_3(Pb,Mn)$ incorporated in the sorbent as a fluorescent indicator, this product joins four types of precoated EASTMAN CHROMAGRAM Sheet for adsorption TLC: silica gel and alumina, each with or without the indicator.

Small sample and further information about cellulose-coated CHROMAGRAM *Sheet from Distillation Products Industries, Rochester, N.Y. 14603 (Division of Eastman Kodak Company). (Another* CHROMAGRAM *Sheet for partition TLC, this one bearing microporous polyamide, is imported from our French affiliate for resale here at $25.30 for twenty 20cm x 20cm sheets to those who wish to experiment with it, but no samples and not much information can be supplied.)*

Price subject to change without notice.

Kodak

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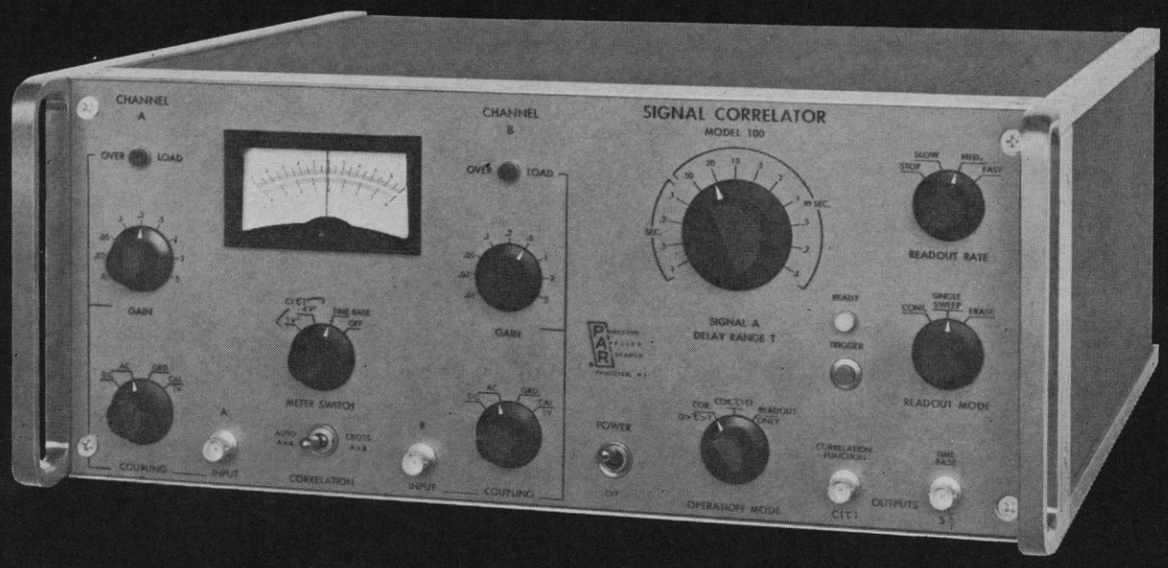

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Correlation analysis — an extremely powerful signal processing technique in many areas of science and engineering — has heretofore been neglected, largely due to a lack of availability of suitable equipment. The PAR Model 100 Signal Correlator will be useful in such diverse fields as aero- and hydrodynamics, plasma physics, vibration analysis, radio astronomy, radar, lasers, medical physics and geophysics.

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Correlator Gain Factor: At gain of 1 in each channel, 1 volt into each input will give 1 volt of correlated output. Gain for each channel is .01 to 5, in 1, 2, 5 sequence.

Noise and Dynamic Range: Base line noise with no signals, 10^{-3} volts peak-to-peak. Maximum correlated output, ± 3.5 volts.

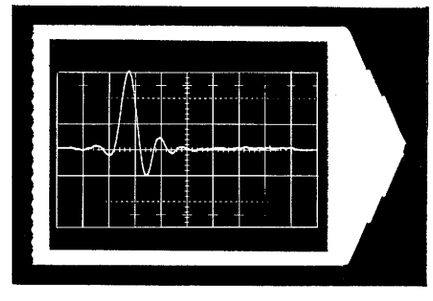
Frequency Response and Resolution: Channel amplifiers flat to 1 megacycle. Resolution: 100 sampling points on output function.

Averaging Time - Constant: Nominally 20 seconds: May be changed to any value from 0.1 to 100 seconds.

Accuracy: Better than 1%.

Readout: 0-3.5 volts at sweep rates of 20 per Sec, 1 per 10 Sec, 1 per 50 Sec.

Price: $8500.00. Export price approximately 5% higher, except Canada.



Typical Photograph of Crosscorrelation Function of Input and Output Signals of Complex Passive Network Driven by White Noise.

For more information call (609) 924-6835 or write Princeton Applied Research Corp., Dept. G, P.O. Box 565, Princeton, N. J. 08540.

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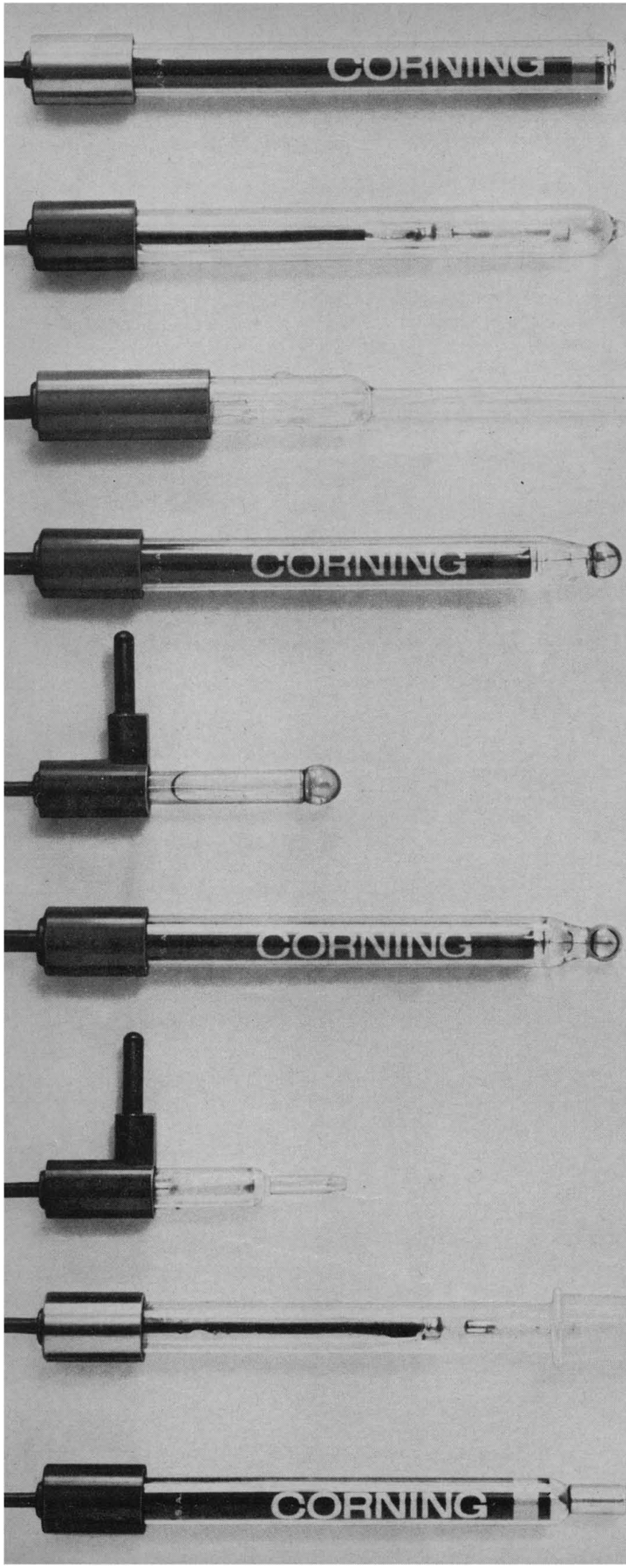

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life, we may be working against tremendous odds in trying to change his thinking later on.

At least two major curriculum projects are now operating with this possibility in mind. One, based on the work of Gagné (*2*), is organized around a sequence of processes; the other is based on the work of Piaget, and stresses developmental levels. If we can reach the child early enough, this type of approach may be of great use in developing scientific thinking in non-Western cultures.

GUILFORD H. BARTLETT, JR.
Science Education-210, Teachers College, Columbia University, New York 10027

References

1. J. H. Flavell, *The Developmental Psychology of Jean Piaget* (Van Nostrand, Princeton, N.J., 1963), esp. pp. 15–40. "Piaget Rediscovered: Selected Papers from a Report of the Conference on Cognitive Studies and Curriculum Development, March, 1964," R. E. Ripple and V. N. Rockcastle, Eds. *J. Res. Sci. Teaching* **2** (3), 168 (1964).
2. R. M. Gagné, "Contributions of Learning to Human Development," address given at the AAAS annual meeting, 30 Dec. 1966, Washington, D.C. Also *Science* **151**, 49 (1966) and *Amer. Psychologist* **17**, 83 (1962).

Pesticides: Overstated Dangers

The plague of Rachel Carson's *Silent Spring* continues to infest the minds of scientists, despite the cures offered by more sophisticated investigations.

Wolff, in his review of Kihlman's new book, *The Actions of Chemicals on Dividing Cells* (27 Jan., p. 443), states that geneticists should be warned against the indiscriminate use of radiation, which presents a clear-cut genetic hazard. He writes, "Any arguments about whether or not geneticists should heed this advice have become academic since the publication of Rachel Carson's *Silent Spring*. The lay public is now acutely aware of the hazards attendant on the indiscriminate use of chemical agents."

Many articles, papers, and books have become available to both lay people and scientists which refute the general theme of *Silent Spring* and Carson's interpretation of "indiscriminate." The most notable are the findings of the Ribicoff Committee (*1*). After 3 years of intensive study of the use of pesticides the committee reached several conclusions on the benefit-risk equation. Senator Ribicoff (Connecticut) summed up the findings with the statement, "The committee concluded that no significant human health hazard exists today when the great benefits of disease control and food production are weighed against known hazards." Senator Pearson (Kansas) added, "The exhaustive investigations of the Subcommittee conclusively establish that the present use of chemical pesticides do not constitute an environmental health hazard." These conclusions were reached despite Carson's personal testimony to the committee.

A concurrent investigation was conducted by the House Appropriations Subcommittee on Agriculture, chaired by Congressman Jamie L. Whitten (Mississippi). Over 185 outstanding scientists and 23 physicians were interviewed, as well as officials of the American Medical Association and university medical school faculties. Also included were biologists, chemists, entomologists, nutritionists, pharmacologists, plant pathologists, toxicologists, zoologists (including a geneticist), as well as experts in agriculture, conservation, and public health. Whitten's book, *That We May Live*, is a result of the remarkable investigation (*2*). Those who would use *Silent Spring* as a reference should force themselves to read the opposite conclusions in *That We May Live*. . . .

PHILIP H. MARVIN
2015 Sunnymeade Road, Manhattan, Kansas 66502

References

1. *Pesticides and Public Policy*, report of the Subcommittee on Reorganization of the Senate Committee on Government Operations, No. 1379 (Government Printing Office, Washington, D.C., 1966).
2. J. L. Whitten, *That We May Live* (Van Nostrand, Princeton, N.J., 1966).

Are There Inoffensive Weapons?

I note that the American Anthropological Association condemned four weapons of warfare, including napalm and chemical defoliants, as "offending human nature." I presume they also passed an antithetical resolution recommending a series of weapons, such as battle-axes, swords, guns, artillery, and others as being pleasing to human nature. Why such selectivity in serving the instincts of Cain?

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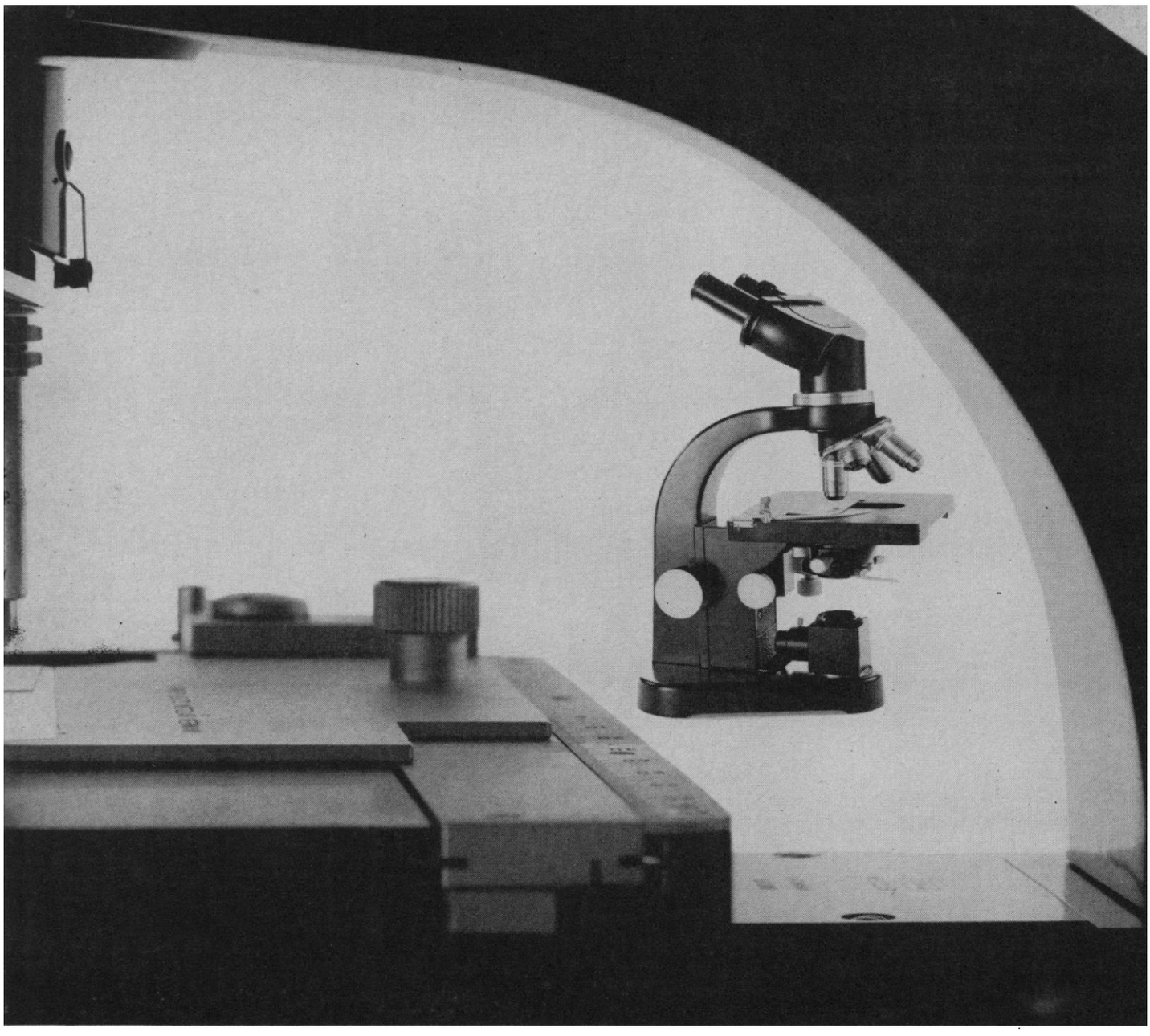

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7 April 1967, Volume 156, Number 3771 **SCIENCE**

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Educational Equality

A new report* by James B. Conant reviews changes in the American high schools since the publication in 1959 of his influential *The American High School Today*. This time he concentrated on "widely comprehensive" high schools, those which provide both academic and vocational education for from 750 to 2000 students and which send from 25 to 75 percent of their graduates on to college. Among such schools, which enroll about half of all public high school students, Conant rated only a few as highly satisfactory. Nevertheless, he reports, there has been substantial progress in teaching modern foreign languages, science, and mathematics. (Another recent study shows, however, that the U.S. lags behind several other countries in effectiveness of teaching mathematics.)

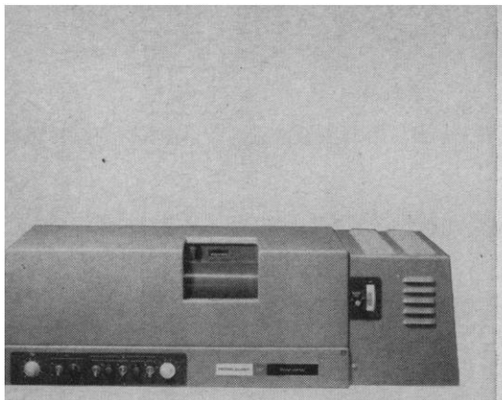
The most striking finding was the great variability on all standards of quality. In terms of what a high school offers its students, there are inequalities both among the states and within individual states. These inequalities will persist so long as school budgets—and hence staffing ratios, course offerings, libraries, shops, laboratories, and other aspects of school quality—are determined by local attitudes and financial resources. Conant's conclusion—he calls it a prejudice—is that states rather than local communities must become responsible for school support and that large amounts of federal money will be needed before we can approach equality of opportunity in what is offered to high school students.

What is offered, however, only partly determines what is learned. James S. Coleman, in his *Equality of Educational Opportunity* (reviewed in *Science*, 9 December 1966), presents massive support for the generalization that differences in school achievement are so closely related to differences in family background that changes in school facilities and curricula have little effect in overcoming deep-seated environmental handicaps. He reaches the dismal conclusion that "schools bring little influence to bear on a child's achievement that is independent of his background and general social context; and that . . . the inequalities imposed on children by their home, neighborhood, and peer environments are carried along to become the inequalities with which they confront adult life at the end of school."

Studies of children and young animals are producing increasingly strong evidence that early environment is crucial in determining the course of development. However good an infant's genetic potentialities may be, a stimulating early environment is essential for satisfactory intellectual development through childhood and adolescence. We have started to recognize this principle in the Head Start program. But that effort is too small to be more than a demonstration. It probably starts too late in life. And it is surely supported by too little understanding of how children learn and are motivated.

Equality of educational opportunity is one of our fundamental national ideals. The deeply entrenched principles of parental responsibility for the preschool years and local responsibility for the schools perpetuate so much bad practice as to make attainment of the ideal impossible. Only when we acquire and disseminate widely a much better understanding of how young children learn and how one may help them learn can we hope to approach the ideal. At best, this will require more than a generation. For the immediate future, Conant's book, like his 1959 report, is a plea to interested citizens to bring about improvements we already know how to make.—DAEL WOLFLE

* James B. Conant, *The Comprehensive High School* (McGraw-Hill, New York, 1967), vi + 95 pages; $3.95 ($1.95 in paper covers).



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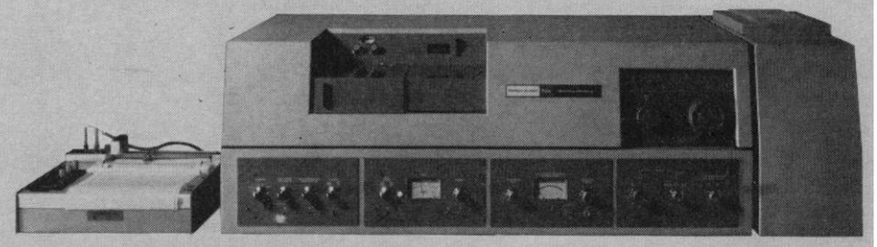

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The illustrated spectrum of L-tyrosine demonstrates the characteristic Cotton-effect ORD curve in the energy-limited region near 250mμ. In the 300mμ region, the P-22 can tolerate a sample absorbance of 4.

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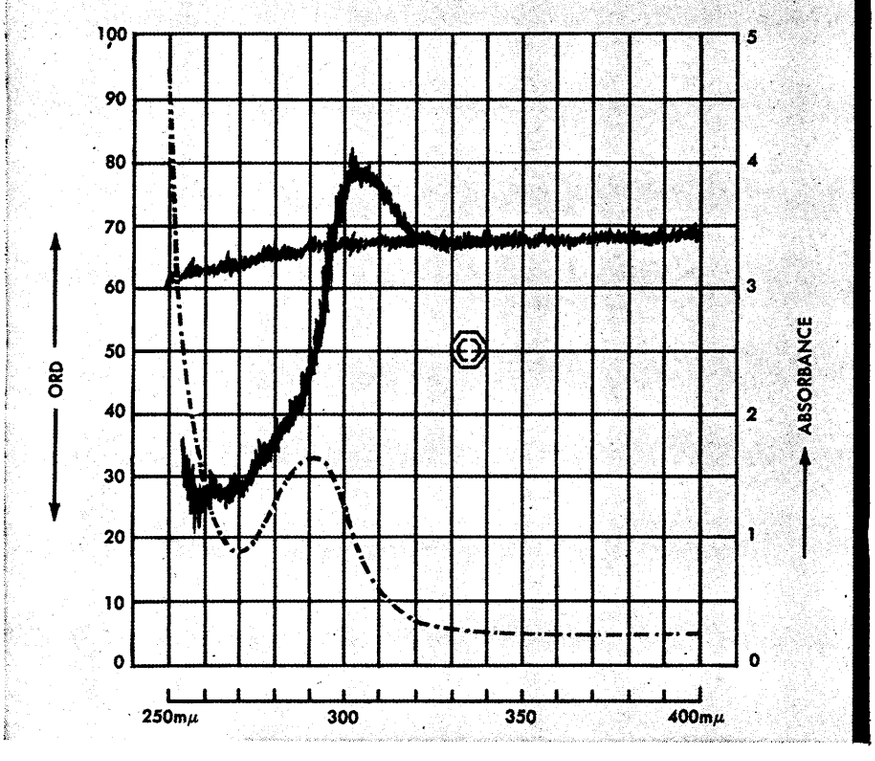

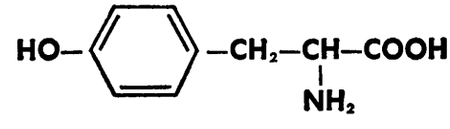

SAMPLE : **L-Tyrosine**

CONCENTRATION: **0.1g/100 ml 0.1 N NaOH**

ORDINATE : **0.04°/100 div.**

CELL THICKNESS : **0.1cm**

SPEED : **10(4)mμ/min**

——— **ORD SCAN**

·-·-·- **ABSORBANCE SCAN**

A comprehensive review of the sarcoplasmic reticulum (SR) by L. Peachey covered many species from many phyla. He stressed the progressive increase in the structural complexity of the system and in the regularity of SR-sarcomere relationships, and showed that these changes can be correlated with a progressive increase in the speed of the contraction-relaxation cycle. For reviewing fine structural details, Peachey chose the amphibian fast muscle (frog sartorius). In addition to the now familiar features of this system (T tubes, terminal cisternae, connecting tubules, and central collar, which were interpreted in terms of excitation-contraction coupling and subsequent relaxation), he stressed the presence of a granular content in the terminal cisternae and of a constricted passage between these cisternae and the longitudinal tubules. On the basis of these and other findings (see Ebashi), he postulated that during relaxation Ca^{2+} is pumped into the longitudinal tubules and subsequently accumulates in the terminal cisternae, presumably by complexing with their granular content.

S. Ebashi reviewed the development of current concepts concerning the function of SR from the initial finding of a muscle Mg^{2+}-activated adenosine triphosphatase by Kielley and Meyerhof, through the relaxing factor, to in vitro experiments with SR fractions isolated from muscle. The main conclusion of this line of work—that is, the ATP-dependent ability of SR fractions to accumulate Ca^{2+} in vitro—could lead to an understanding of the physiological role of the system in vivo provided that: (i) the accumulation of Ca^{2+} be extensive enough to reduce concentration in the cell sap below a critical value for relaxation; (ii) the movement of Ca^{2+} be fast enough to account for the known rapidity of relaxation; and (iii) the release of accumulated Ca^{2+} be induced by a change in electric field related to the arrival of a depolarization wave in the adjacent T tubules. Evidence obtained in Ebashi's and Weber's laboratories indicate that requirements (i) and (ii) are fulfilled; requirement (iii) is not yet satisfied by unquestionable evidence. Ultraviolet, microbeam irradiation carried out by Endo leads to contraction only when applied to the Z-band region in amphibian muscle. Since ultraviolet irradiation is known to affect SR permeability in vitro, the finding suggests that Ca^{2+} accumulation takes place in the terminal cisternae and that the SR is

functionally compartmented. Ebashi mentioned that cell membrane excitability is dependent on Ca^{2+} concentration in the cell sap; he postulated that Ca^{2+} accumulation in SR may have a double function: control of the relaxation-contraction cycle, as well as of cell membrane excitability. In this respect, he showed recent results indicating the presence of an ATP-dependent Ca^{2+} accumulation by brain microsomes.

K. Hama presented two new examples of sarcoplasmic reticulum in muscle fibers of the heart. His work may challenge current interpretations of the role of the T system in excitation-contraction coupling. The first example was found in the neurogenic muscle fibers of the heart in the mantis shrimp, and is characterized by two T systems for every sarcomere: one system is part of a triad at the Z-band level, while the other occurs in a dyad facing the middle of the A band. The second example is the myogenic muscle fiber of an avian myocardium in which no T system can be identified, although the equivalent of a terminal cisterna is recognized at the Z-band level.

D. Fawcett considered the biogenesis of ER membranes induced by drugs. His experiments, carried out in collaboration with Jones, confirm and extend to another species (the hamster) results obtained by Remer and Merker and by Orrenius and Ericsson on rats and rabbits. The main finding is the massive increase in smooth ER that follows the administering of drugs. The event has already been correlated with an increase in the activity of the enzymes of the detoxifying system of the liver; Fawcett reported that cholesterol synthesis is also increased under such conditions. The broad implications of the main finding (that is, the drug-induced proliferation of smooth ER) were discussed in terms of cellular pathology as well as in terms of a morphologically justified, basic distinction between smooth and rough ER.

G. Palade reported on work, carried on in collaboration with Dallner and Siekevitz, on a critical phase in the differentiation process of the rat hepatocyte. The phase occurs within a few days before and after birth and is characterized by: (i) the appearance (usually immediately after birth) of enzyme activities typical of the ER (microsomal) membranes of fully differentiated hepatocytes; (ii) asynchronous increase in activity even for enzymes which are

part of a common multienzyme system; and (iii) rapid proliferation of ER, primarily smooth ER membranes. Experiments with actinomycin D and puromycin indicated that these events reflect the synthesis of new proteins. Experiments which changed the lipid composition of the membranes (by dietary changes, or by the addition of various lipids to defatted membranes) suggested that these lipids do not play a critical role in the differentiation process. Kinetic experiments showed that the activity of the microsomal constitutive enzymes appears first in the rough and then in the smooth ER. Pulse-labeling experiments revealed that the same applies for total, newly synthesized membrane proteins. The results were considered in terms of a series of models which assume that new membrane is produced in the cell either in a one-step operation or in a multistep operation. In the latter case, a "primary" membrane is presumably laid down in a first step and various enzymes are added to it in subsequent steps. Each of these models could apply to a homogeneous membrane within which all constitutive proteins are randomly distributed, or, alternatively, to a mosaic membrane in which each tessera represents a multienzyme system or an aggregate of identical enzymes.

More recent results, which may narrow the choice between these various models, were reported by T. Omura. He showed that in fully differentiated hepatocytes the turnover of microsomal membrane lipids, as followed by regression of labeling with ^{14}C-glycerol, is much faster (half life ~ 40 hours) than the half life of the total membrane proteins (half life ~ 100 hours). Two constitutive enzymes which at present can be isolated and purified from microsomal membranes also proved to have different half lives. Hence, ER membranes appear to be continuously synthesized, even in the fully differentiated hepatocytes of the adult animal. The general turnover rate is relatively high and appears to be different for some of the membrane components. In this situation, it is possible to check on adult animals, under more favorable experimental conditions, some of the results previously obtained in newborns. For instance, kinetic studies on labeled membrane proteins can be carried out at the level of individual, satisfactorily purified enzymes (cytochrome b_5 and NADPH-cytochrome *c* reductase). The results show that these enzymes are produced in the rough ER, presumably by attached ribosomes, and subsequently transferred to the smooth ER. They also suggest a superimposed and relatively rapid process of membrane exchanges between the rough and the smooth ER, which leads in time to an equilibrium of the label.

So far, the findings exclude the existence of a homogeneous membrane in which all components turn over in synchrony, and favor a multi-step assembly model, probably of the mosaic version.

G. PALADE
K. PORTER
Rockefeller University, New York,
and *Harvard University,*
Cambridge, Massachusetts

Forthcoming Events

April

11–13. **Nursing Service and Hospital Administration**, American Hospital Assoc., Chicago, Ill. (E. J. Lanigan, AHA, 840 N. Lake Shore Dr., Chicago 60611)

12–14. **Optical Soc.** of Amer., Columbus, Ohio. (Miss M. Warga, OSA, 1155 16th St., NW, Washington, D.C. 20036)

12–14. **Shock Tube** Symp., 6th intern., Freiburg, West Germany. (R. G. Fowler, Dept. of Physics, Univ. of Oklahoma, Norman 73069)

13–14. **Teaching of Mathematics to Physicists**, Inst. of Physics and Physical Soc. and Inst. of Mathematics and Its Applications, conf., Exeter, England. (Meetings Officer, Inst. of Physics and Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

13–15. American Assoc. for **Cancer Research**, 48th annual mtg., Chicago, Ill. (Secretary-Treasurer, The Association, 7701 Burholme Ave., Philadelphia, Pa.)

13–16. **British Medical Assoc.**, annual clinical conf., Londonderry, Northern Ireland. (Secretariat, Tavistock Sq., London, W.C.1, England)

14–15. **Echoencephalography**, intern. symp., Univ. of Erlangen-Nurnberg, West Germany. (W. Schiefer, 8520 Erlangen, Krankenhausstrasse 12, West Germany)

14–21. **French Physical Soc.**, 61st exhibition, Paris. (The Society, 33 rue Croulebarbe, Paris 13°)

15–16. American Soc. for **Artificial Internal Organs**, annual mtg., Atlanta, Ga. (P. M. Galletti, Dept. of Physiology, Emory Univ., Atlanta)

15–16. **Histochemical** Soc., 18th annual mtg., Chicago, Ill. (G. M. Lehrer, Div. of Neurochemistry, Mount Sinai School of Medicine, 11 E. 100 St., New York 10029)

15–16. **Nucleic Acids** Symp., Santa Monica, Calif. (M. S. Dunn, 9325 Venice Blvd., Culver City, Calif.)

17–19. **Elementary Particles**, Inst. of Physics and Physical Soc., conf., London,

England. (Meetings Officer, Inst. of Physics and Physical Soc., 47 Belgrave Sq., London, S.W.1)

17–19. Technical Assoc. of **Pulp** and **Paper Industry**, 4th annual water conf., Philadelphia, Pa. (Technical Secretary, 360 Lexington Ave., New York 10017)

17–19. Institute of **Electrical** and **Electronics Engineers**, Jackson, Miss. (J. E. May, 1120 Auburn Dr., Jackson)

17–19. **Urban Transportation**, 2nd intern. conf., Pittsburgh, Pa. (W. H. Shepard, P.O. Box 1291, Pittsburgh 15230)

17–20. American **Geophysical Union**, annual mtg., Washington, D.C. (F. R. Boyd, Eastern Natl. Mtg. Committee, AGU, 1145 19th St., NW, Washington, D.C. 20036)

17–21. American Assoc., of **Immunologists**, Chicago, Ill. (Executive Secretary, Massachusetts General Hosp., Boston)

17–21. American Inst. of **Nutrition**, annual mtg., Chicago, Ill. (Secretary, The Institute, Dept. of Foods and Nutrition, Michigan State Univ., East Lansing)

17–21. American Soc. of **Biological Chemists**, Chicago, Ill. (Secretary, The Society, c/o Harvard Univ., 12 Oxford St., Cambridge, Mass.)

17–21. Central **Service Management**, American Hospital Assoc., Miami Beach, Fla. (E. J. Lanigan, Conv. and Mtg. Bureau, 840 N. Lake Shore Dr., Chicago, Ill. 60611)

17–21. Use of Isotopes and Radiation in **Plant Pathology** Studies, Intern. Atomic Energy Agency and Food and Agriculture Organization, symp., Vienna, Austria. (J. H. Kane, Chief, Conf. Branch, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

18–2. International **Hydrographic** Bureau, intern. conf., Monte Carlo, Monaco. (Contre-Amiral Charles Pierre, Quai des Etats Unis, Monte Carlo, Monaco)

18–19. Applications Related Phenomena in **Titanium Alloys**, American Soc. for Testing Materials, symp., Los Angeles, Calif. (The Society, 1916 Race St., Philadelphia, Pa. 19103)

18–20. **Computer** Conf., Atlantic City, N.J. (American Federation of Information Processing Societies, 211 E. 43 St., New York 10017)

18–20. **Space Instrumentation for Industry**, southeastern instrument conf., Cocoa Beach, Fla. (A. L. Keith, 1127 S. Patrick Dr., Satellite Beach, Fla. 32935)

18–21. National Council of **Teachers of Mathematics**, 45th annual, Las Vegas, Nev. (J. D. Gates, NCTM, 1201 16th St., NW, Washington, D.C. 20036)

19. Intensity of **Casual Relationships in Schizophrenia**: Living in Imagination, Assoc. for the Advancement of Psychoanalysis, New York, N.Y. (The Association, 329 E. 62 St., New York 10021)

19. **Oral Cancer** Symp., 5th, St. Francis Hospital, Poughkeepsie, N.Y. (M. A. Engelman, 1 E. Academy St., Wappingers Falls, N.Y.)

19–20. 1967 **Electronics** and **Instrumentation** Conf. and Exhibit, Cincinnati, Ohio. (G. McVey, Procter & Gamble Co., Ivorydale Technical Center, Cincinnati 45227)

19–21. Extended **Care Facilities in General Hospitals**, American Hospital Assoc., Miami Beach, Fla. (E. J. Lanigan, Conv.