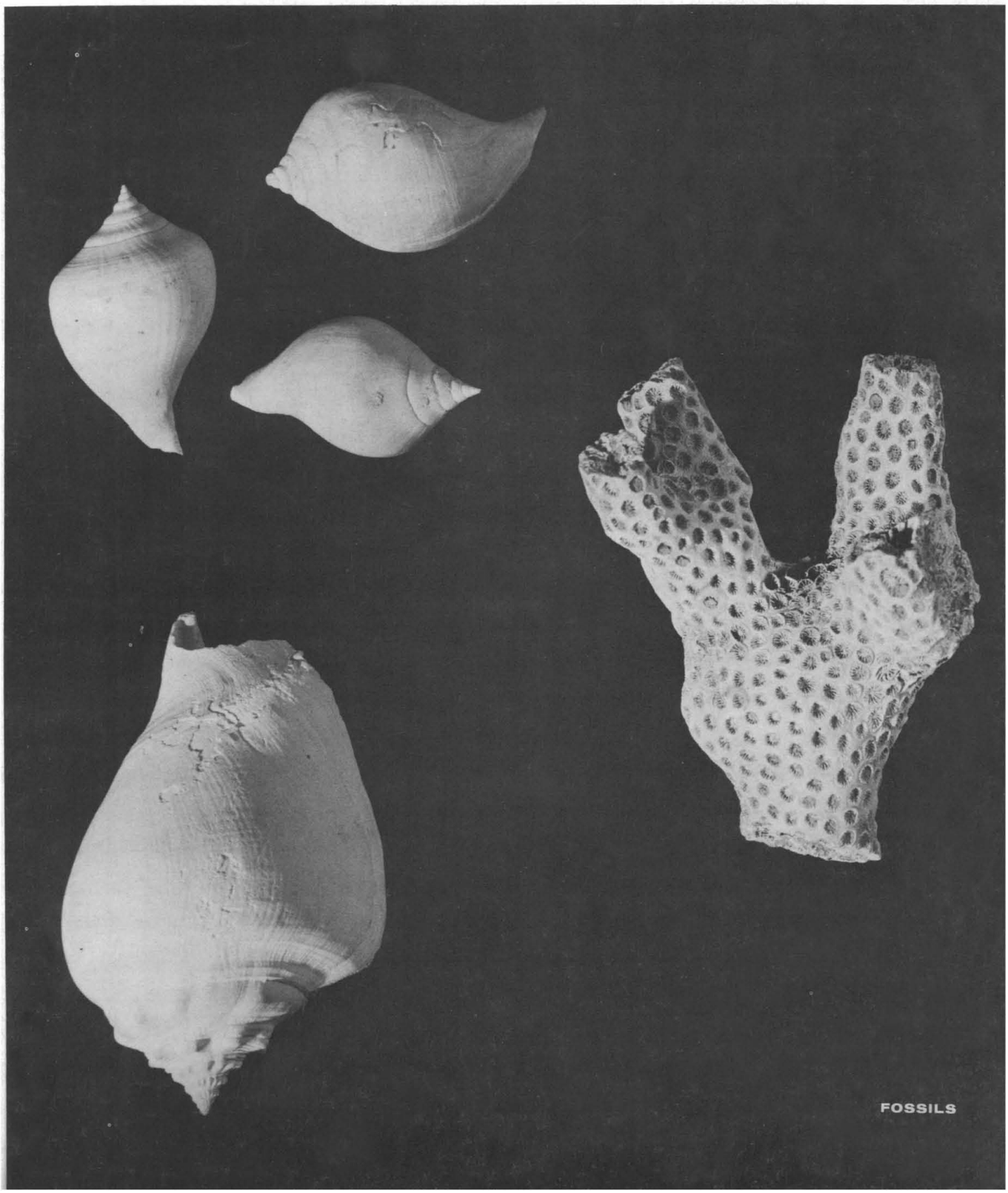
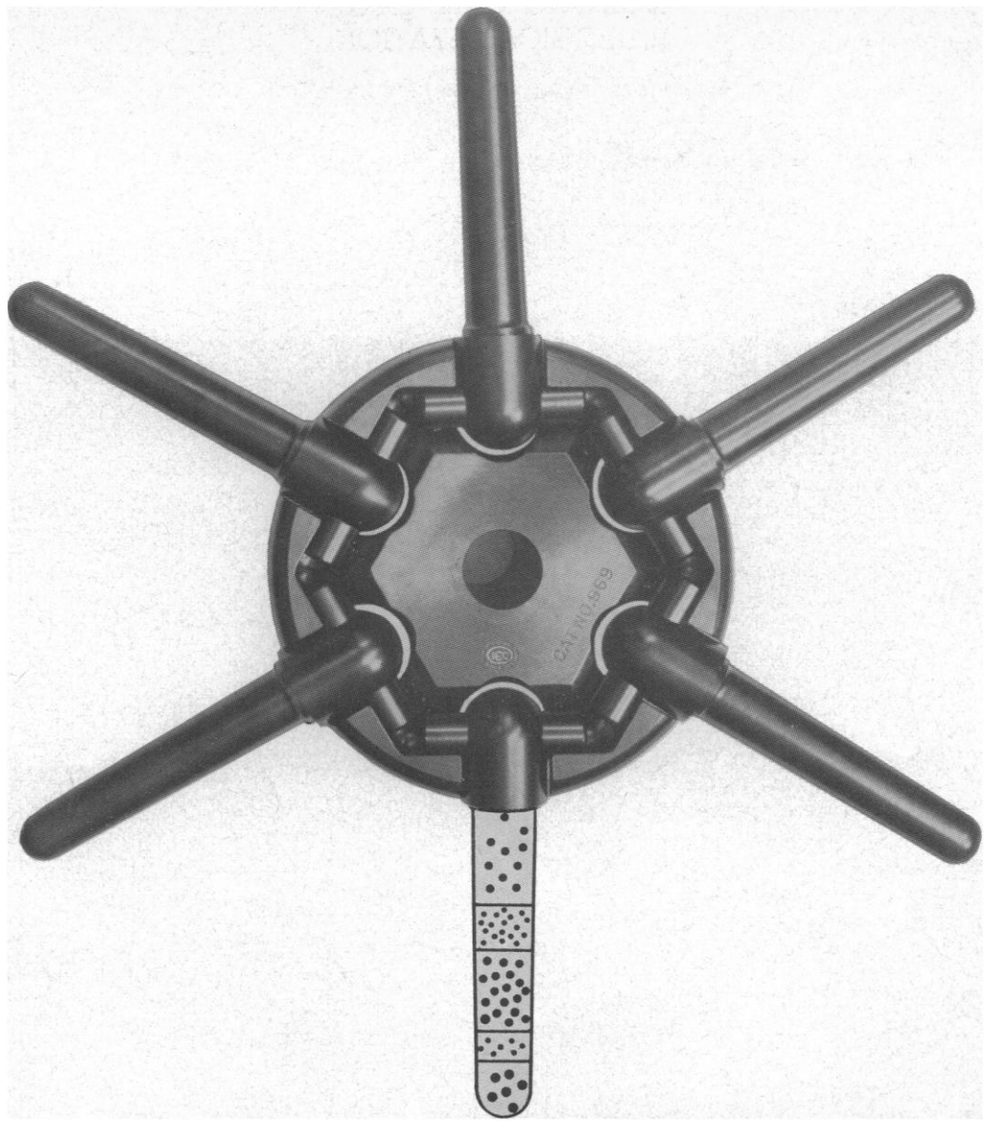
SCIENCE

16 July 1965
Vol. 149, No. 3681

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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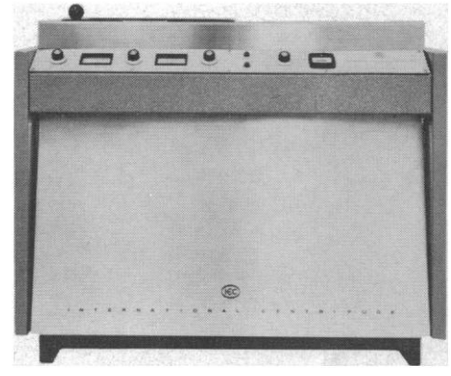

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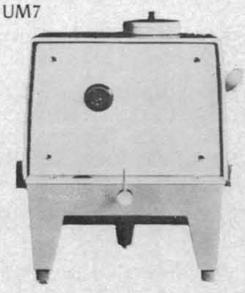
M5

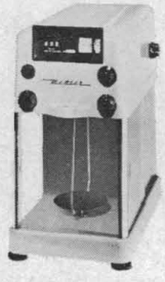
Cap: 20 g Prec: ±0.001 mg

UM7



Cap: 2 mg Prec: ±0.1 mcg

H6



Cap: 160 g Prec: ±0.05 mg

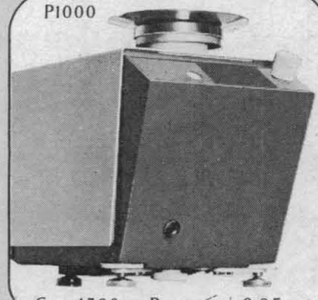
P120

Cap: 130 g Prec: <±0.5 mg

H15

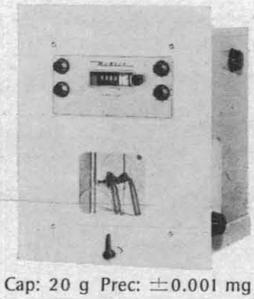
Cap: 160 g Prec: ±0.03 mg

P1000



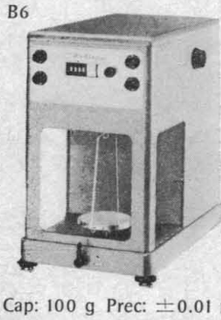
Cap: 1300 g Prec: <±0.05 g

M5 S/A



Cap: 20 g Prec: ±0.001 mg

B6

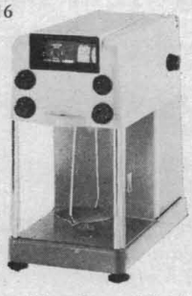


Cap: 100 g Prec: ±0.01 mg

P10

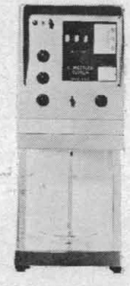
Cap: 13 kg Prec: <±0.5 g

H16



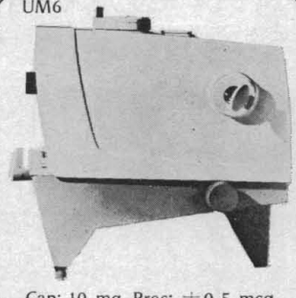
Cap: 80 g Prec: ±0.01 mg

W5



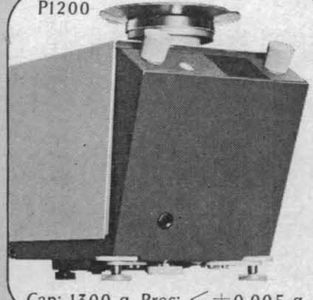
Cap: 5000 g Prec: ±1 mg

UM6



Cap: 10 mg Prec: ±0.5 mcg

P1200

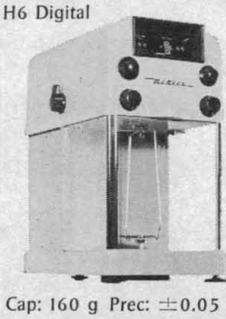


Cap: 1300 g Prec: <±0.005 g

S5

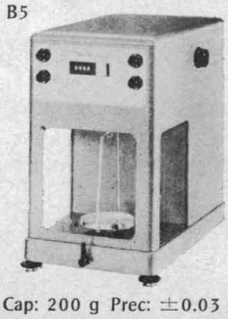
Cap: 160 g Prec: ±0.05 mg

H6 Digital



Cap: 160 g Prec: ±0.05 mg

B5



Cap: 200 g Prec: ±0.03 mg

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16 July 1965
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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Fossil gastropod shells and coral ranging in age from Pleistocene to Eocene. The fossils are so well preserved that the biogenic aragonite ($CaCO_3$) is not significantly recrystallized to the stable polymorph calcite. Uranium contents of these shells can exceed 10 parts per million. Absolute ages of such shells can be determined from the accumulation of helium-4, or from the relation of thorium-230 activity to transient equilibrium with uranium-234. See page 312. [Brookhaven National Laboratory]

Kodak reports on:

color vision instead of brain strain . . . getting a project off the ground by lightening the budget . . . how to duplicate the ubiquitous

When many channels vex the mind

Avoid brain strain. Why waste high-powered deductive reasoning on tasks just as well accomplished through mere color vision? Primates like you generally have use of color vision free of charge. We (Instrumentation Products Division, Eastman Kodak Company, Rochester, N. Y. 14650) can supply name of nearby dealer who now accepts orders for KODAK LINAGRAPH 705 Paper. Comes in widths 3⅝-in. to 12-in., lengths to 400 feet.

Blue light, as through a KODAK WRATTEN Filter No. 34, falling on this paper leaves a red trace; green light, as through WRATTEN No. 12, a blue-green trace; white light (or an overlap of the blue and green light), a nearly neutral black one—after running the paper through an oscillogram processor wherein the four regular baths have been replaced from a KODAK LINAGRAPH 705 Processing Kit that you had better order from the dealer while you are at it.

We mention oscillogram processors. If the place where you work takes much interest in physical phenomena at frequencies above one cycle/sec, there may well be an oscillogram processor around. Take it over. Tell them to have it replaced with a new KODAK EKTALINE Processor, which will get them out of their hole by at least quadrupling the speed at which they handle the paper pouring out of the oscillographs that abound on the premises.

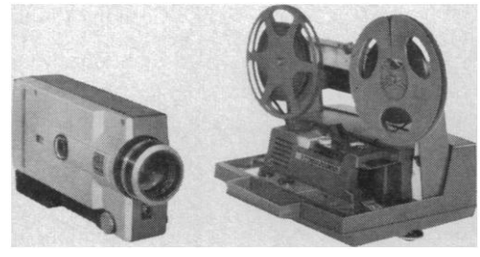
Now then, for your own case. Clearly, with many channels overlapping often, the untangling of them can tax the mind to distraction if they're all black all over. From that address parenthesized three paragraphs back, counsel can be struck forth as from a flowing spring on problems of feeding facts to the mind by permitting this product to exploit the indescribable distinctions of color. It's so sensitive you can draw a red line on it at 4,000 feet per second. Oscillography may even be farthest from your thoughts.

This is another attempt by Eastman Kodak Company to probe at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

Tourists adore it

This is a 5× enlargement of 8mm movie film in the format in which it has served admirably to bring joy to the grandparents of a significant fraction of the population now 30 years of age or under. Do not scoff at the importance of bringing joy to grandparents.

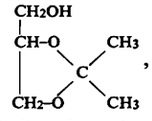
Right now the most up-to-date families scooting across the land on vacation are making their 8mm movies on this format. This spring we introduced a line of KODAK INSTAMATIC Movie Cameras and Projectors which, thanks to the precision with which inexpensive items can now be manufactured in great quantities, can devote far more of the film to picture. The 50% increase in picture area, coupled with today's sharper KODACHROME Film, has markedly upgraded the quality of 8mm movies. This fact deserves the attention of scientific workers who would sooner swallow three pounds of marshmallows than serve as official photographer for a post-kindergarten birthday party but who want to use movies for data-gathering in work where the new "Super 8" quality level and the lightening effect of 8mm on the film budget (as compared with professional-grade costs) might get the project off the ground.



A properly stocked camera shop offers this KODAK INSTAMATIC *M6 Movie Camera and M70 Projector for "Super 8." This model camera does both its viewfinding and its automatic exposure control through the lens, which can also zoom and accept close-up attachments. Drop-in loading. No threading. The whole 50 feet of film in the* KODAPAK *Movie Cartridge can be battery-driven through the film gate (which is in the camera, not the cartridge) at one run, or frames can be exposed as few as one at a time. This model projector affords a choice of seven speeds—forward, backward, and zero. Other camera and projector models are available at less than half the prices of these. To this writing nobody has yet discovered how to load any of them wrong, but lots of people are working on it.*

Pure fat stuff

In many pleasing ways do food processors control the physical behavior of their wares with monoglycerides. Not only are monoesters of glycerol ubiquitously present in living tissue but so are the monoethers. It's when we purify the esters by molecular distillation that they show their full commercial merit. We can also suggest some ways to prepare them (and the ethers) far purer than makes sense for food.

To make one of the α-esters, get your glyceryl moiety from 

, where only the desired position is exposed. We call it *2,2-Dimethyl-1,3-dioxolane-4-methanol* (EASTMAN 4300). It also goes by the name "1,2-O-isopropylideneglycerol." React with the acid chloride of your fatty acid and hydrolyze the product in acidic methanol. For the ethers you first make the methanesulfonate of your fatty alcohol and condense EASTMAN 4300 with either potassium in absolute benzene or KOH in xylene before running the main reaction. Instead of EASTMAN 4300, you can use *2-Phenyl-1,3-dioxolane-4-methanol* (EASTMAN P9382).

For β-monoesters we offer an isomer of the latter where only the middle hydroxyl is exposed, namely *2-Phenyl-m-dioxan-5-ol* (EASTMAN 9318).

Procedural abstracts on request from Distillation Products Industries, Rochester, N. Y. 14603 (Division of Eastman Kodak Company). This is the fountainhead of all those EASTMAN *Organic Chemicals that the world shouldn't be asked to get along without.*

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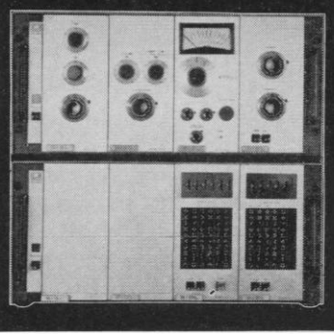


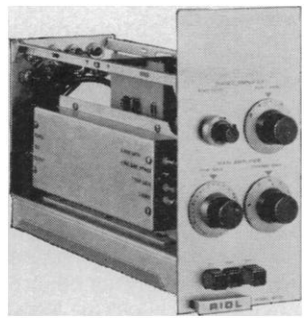
Today you can fulfill your experimental needs with the most complete, useful, and versatile system of modular nuclear instruments currently available — RIDL's Designer Series.* And tomorrow, when those needs change or new ones arise, you will find they are still being met as the series is expanded.

The benefits of totally integrated modular design are therefore always yours in the Designer Series. One of these benefits is the precise matching of your particular requirements. You are also assured of compatibility among modules, both existing and planned.

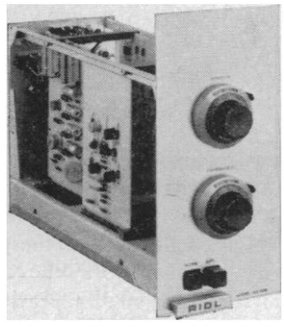
The adaptability and growth potential of the Designer Series helps you overcome the threat of system obsolescence. You can protect your initial investment and budget new purchases knowing that your changing needs will always be met.

The modules illustrated at right are representative of the classes within the Designer Series family. Rounding out the series are detectors, preamplifiers, stabilizers, coincidence equipment, spectrometer sweep units, printers, and programmers. We also offer a wide range of cases and cabinets, as well as kits for your own construction of one-of-a-kind, special-purpose modules.

To investigate the unique adaptability of the Designer Series, consult your RIDL sales engineer or write us.



AMPLIFIERS. Single or dual. Also amplifier-discriminators, mixer amplifiers, and double delay line amplifiers.



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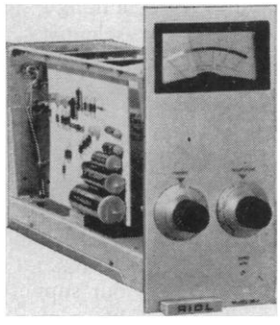
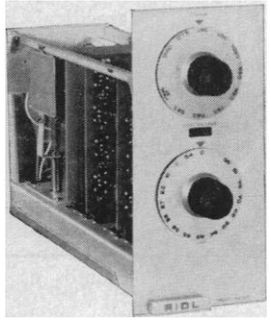
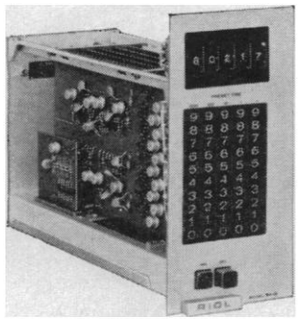


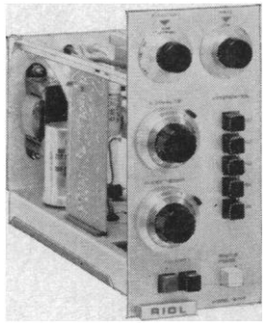
COUNT RATE METERS. Linear or linear/log. Eight linear ranges cover 0 to 10^6 cpm. Log ranges cover 10 to 10^6.



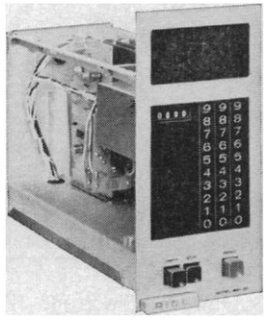
HIGH-VOLTAGE POWER SUPPLIES. Cover range of 0 to 6000 volts. Output adjustable continuously or in increments.



TIMERS. Five-decade, printing or nonprinting, with ranges from 0.1 to 10,000 minutes or seconds.



PULSE GENERATORS. Offer variable pulse amplitude and polarity, selectable rise and decay times, fixed or variable pulse repetition rates, and exponential or rectangular pulse shapes.



SCALERS. With or without preset count in count capacities from 10^1 to 10^{12}. Accept pulse inputs to 10 mc/sec continuous with pulse-pair resolution less than 10 nanoseconds.

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chological (unresolved oedipal complex, conditioned anxiety reaction) to the narrowly sociological (effects of socioeconomic status, class, urbanization). However, over the past few years these ruling theories have been recognized by more sophisticated workers primarily as working hypotheses. Gradually there is accumulating a body of literature to support the argument that many of the data of psychopathology (and of behavior in general) can be explained only as the interactions among several causal factors. (Freudian psychoanalysts have recognized that behavior has multiple determinants, but they seem to have looked for these determinants within a narrow range of possibilities.)

A parallel situation exists with regard to the practice of psychotherapy. Therapists are still being trained to be advocates of single ruling hypotheses—Freudian, behavioristic, and so forth. If one is to believe what these therapists write of their work, they manage to fit all their patients, all their observations, into the procrustean bed of their own theories. This probably gives the practitioners a feeling of self-confidence—the illusion that they know what they are doing. And there is a growing body of evidence to suggest that this confidence, communicated to the patient, rather than the technique or practice based on theory may be the primary therapeutic agent. . . .

It is possible to do psychotherapy making use of the method of multiple working hypotheses. The patient brings some aspect of his experience to the therapist—a problem, a memory, a feeling, a dream. The therapist, drawing from the many possible interpretations and practices offered by a variety of theories, says or does what is most applicable—as dictated not by a particular theory or technique but by what he already knows about the patient. (In Chamberlin's words, "The investigator armed with many working hypotheses is more likely to see the true nature and significance of phenomena when they present themselves . . . and more appropriately applies the methods which the case calls for.") A therapist who is able to "more readily recognize the actuality of the situation," because he has many hypotheses open to him, is more apt to see his patient "as he really is.". . . As Chamberlin points out, there may be some danger to this approach, particularly the danger of vacillation. But if the therapist is free to explore his own indecision with his patient, this, too, may encourage the human "encounter" so valued by some therapists of the "existential" school.

Some training institutions are teaching their therapy students a broad range of theories and techniques. But I do not know of any institution that uses the method of multiple working hypotheses as an explicit approach to psychotherapy. Possibly because of the fervor with which the adherents of various ruling theories tend to write, or because the students tend to model themselves after teachers who themselves are adherents of one theory or another, or because, as Chamberlin suggests, it is easier and more interesting for the young "to argue a theory or accept a simple interpretation than to recognize and evaluate the several factors which the true elucidation may require," one finds beginning students in therapy leaning towards one theory or another in their therapy. The fault may lie with the teachers; as Chamberlin has pointed out, the method is difficult if not impossible to communicate in words, and "there is therefore a certain predisposition on the part of the practitioner of this method to taciturnity."

Perhaps the student must get a feeling of confidence in his use of a single theory before he can become broad-minded enough to accept the possible partial validities of other theories. Perhaps the method advocated by Chamberlin can be applied only by the worker who has reached a certain level of experience and maturity. But it is to be hoped that ways can be developed to teach the method, not only to psychotherapists but to scientists and to users of science in all areas, in more explicit fashion than is now being done. Rather than rely on apprenticeships, internships, clerkships, and other traditional methods of teaching which depend to some extent on chance encounters, perhaps more direct methods can be devised. . . .

I can see one problem: The history of science suggests that great advances are made through the development of theories which are held to and fought for in almost irrational fashion by their inventors and followers. If everyone in science becomes as clear-headed and as rational as Chamberlin seems to have been, where will our new theories come from?

NATHANIEL H. EISEN
Department of Psychology,
University of Illinois, Urbana

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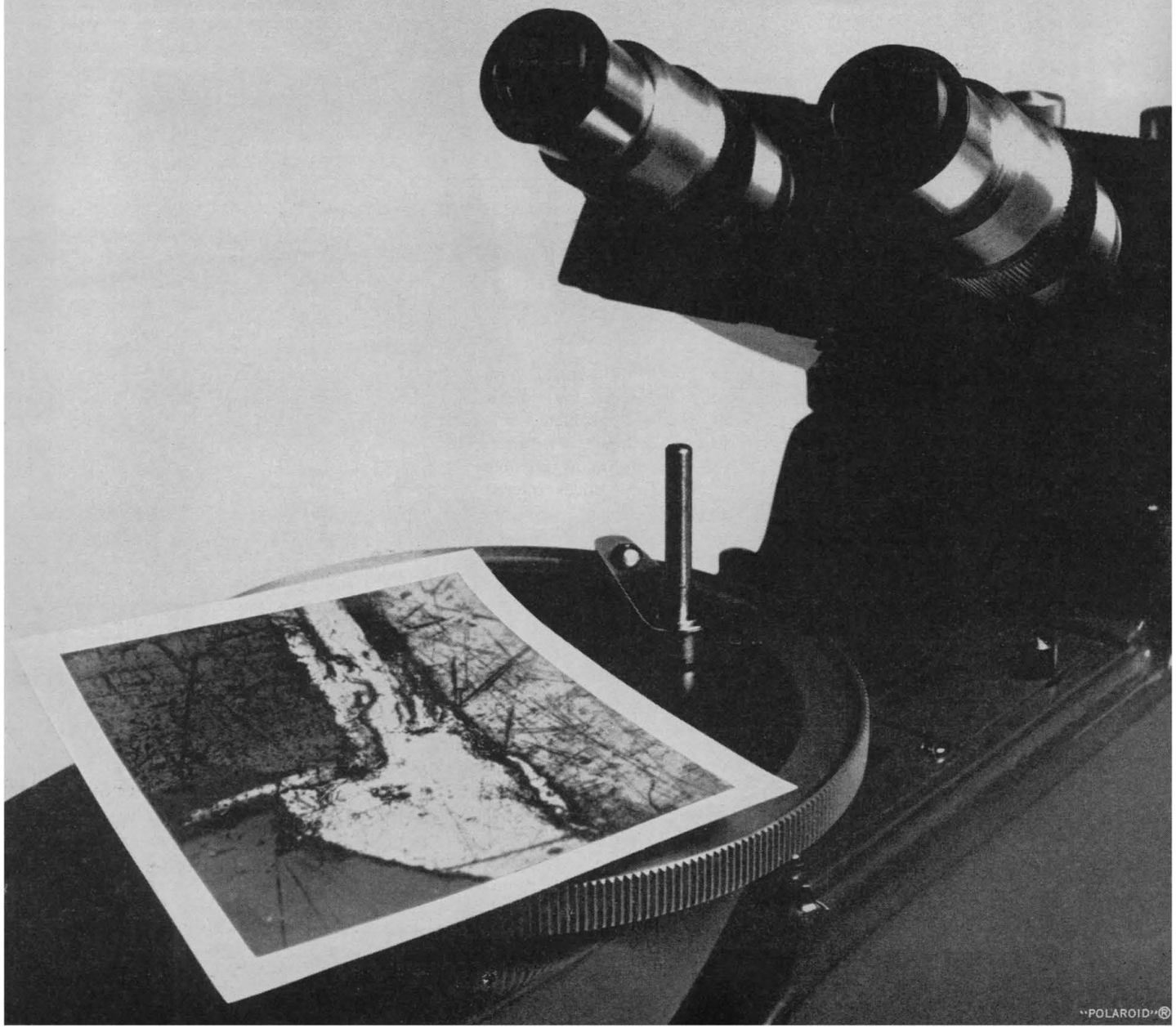

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Fruit from the Tree of Knowledge

Twenty years ago today, a group of scientists watched a mushroom cloud ascend. They had discovered knowledge from which had come a power that would shape much of man's destiny. As the significance of the release of nuclear energy became understood, qualms arose in the minds of those who had participated in making the device possible. For the briefest of moments atomic scientists might have had some influence in decisions with respect to the use of their creation, but soon control resided elsewhere.

Now science is producing the basis for other great developments, the consequences of which are likely to overshadow those of atomic energy. The new potentialities were phophesied by Aldous Huxley shortly after the first nuclear explosions. He said, "The release of atomic energy marks a great revolution in human history, but not . . . the final and most searching revolution. The really revolutionary revolution is to be achieved, not in the external world but in the souls and flesh of human beings."

We have been provided with a glimpse of the progress of that revolution in a recent book edited by Tracy Sonneborn, *The Control of Human Heredity and Evolution* (*Science*, 18 June). The volume is a lucid record of a symposium attended by outstanding geneticists who reviewed advances in their subject and discussed possible applications.

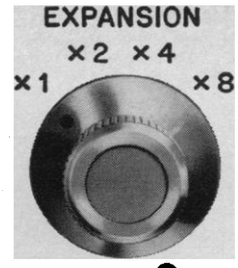
Knowledge of genetics is evolving rapidly. The basis of inheritance and the mechanisms by which the genetic code is transcribed are fairly well understood. Progress in studies of microorganisms has been especially fast. It is possible to alter the genetic makeup of bacteria in an increasing number of precise ways. Eventually many applications of biological engineering to microorganisms will be made. Controlled laboratory change of human genetic DNA seems at the moment some distance off. However, the quality of the research talent available makes further dramatic advances inevitable. Two applications have been described as being almost feasible. One is control of the sex ratio in humans. A second is the production of parthenogenetic offspring.

At present the most practical means of controlling human heredity and evolution is that advocated with evangelical zeal by H. J. Muller. He proposes the establishment of sperm banks of germ cells derived from outstanding persons. Professor Muller is optimistic about the likelihood of general acceptance of his scheme. He says, "With the coming of a better understanding of genetics and evolution the individual's fixation on the attempted perpetuation of just his particular genes will be bound to fade. . . . [He] will condemn as a childish conceit the notion that there is any reason for his unessential peculiarities, idiosyncrasies, and foibles to be expressed generation after generation."

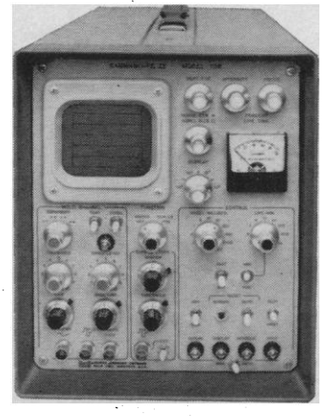
Not all the participants at the symposium were so optimistic that the new knowledge of genetics would be applied in an idealistic manner. R. D. Hotchkiss, commenting on recent developments in changing DNA constitution, said, "Many of us feel instinctive revulsion at the hazards of meddling with the finely balanced and far-reaching systems that make an individual what he is. Yet I believe it will surely be done or attempted. The pathway will . . . be built from a combination of altruism, private profit and ignorance."

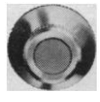
I agree. Geneticists will create new knowledge and will have high ideals for its proper application. In practice, power to apply that knowledge, as was the case in atomic energy, will come to rest in other hands.

—PHILIP H. ABELSON



this one knob may justify the entire cost of this new TMC Gammascope II®





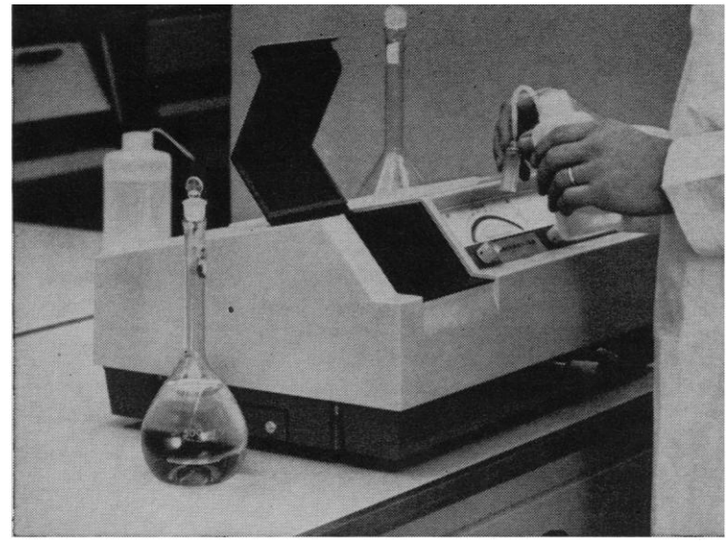
Digital scale expansion provides resolution equivalent to that of an 800-channel analyzer in any selected region of a spectrum.

It isn't easy to put a price tag on just one function of an instrument. But if you've ever wanted to conduct a particular experiment and found that the equipment you own doesn't have that capability, you know what we're driving at. That's why TMC crams so much versatility into every piece of equipment it produces. We want to cover your present needs, *plus* the inevitable expansion.

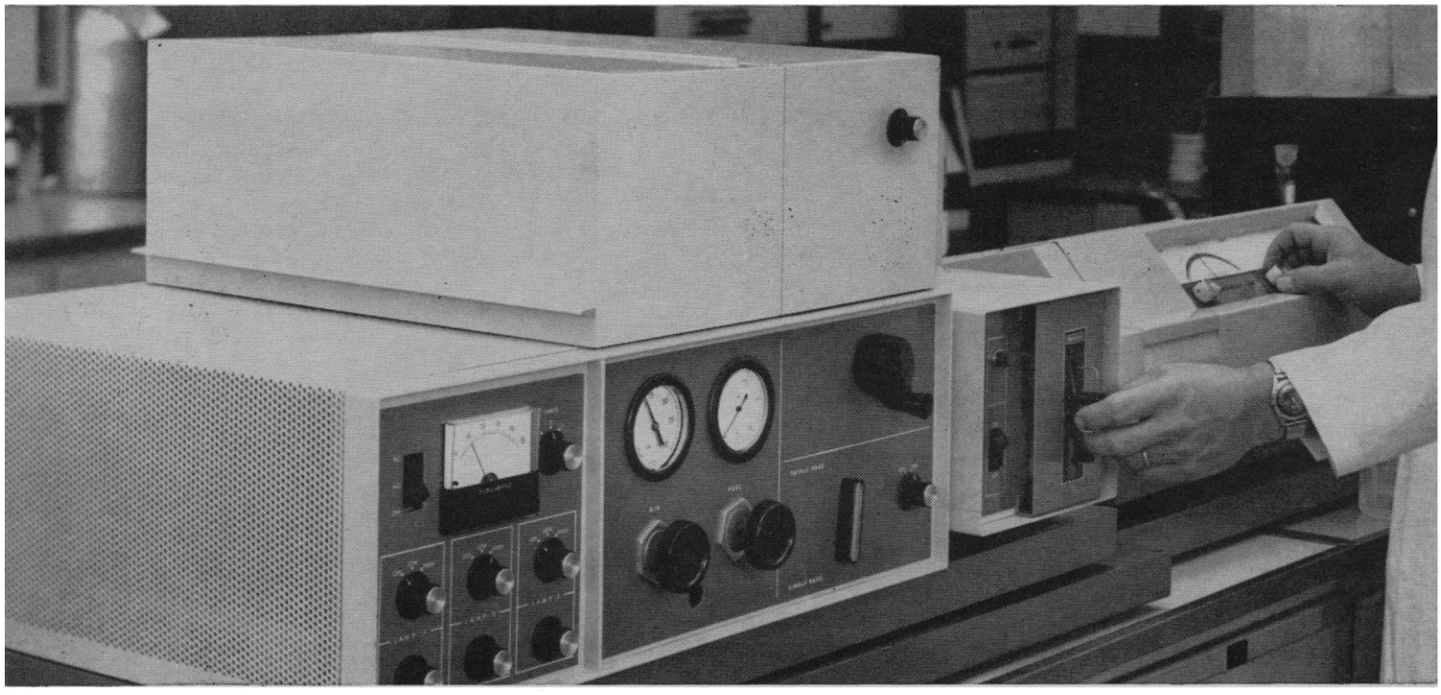
Take TMC's new Gammascope II, for instance. The basic concept of the original Gammascope . . . that of a low-cost, self-contained, 100-channel pulse height analyzer . . . has been retained. But into the compact new Gammascope II has gone new output circuitry to provide you with readout on virtually every type of analog and digital equipment . . . new input circuitry for multiscaling capability and analog sampling . . . and, of course, the digital scale expansion knob shown above. But still that's only part of the story.

Coincidence and anti-coincidence capabilities, a dependent or independent single-channel analyzer and a linear CRT display (live or static) are all built-in features. Front panel threshold, upper lever, baseline and gain controls are also included. Count up all the knobs on a Gammascope II, and the capability they represent, and we know you'll be convinced that it's one of the soundest instrument investments you can make today. For complete details, contact the nearest TMC office, or write: Nuclear Division, Technical Measurement Corporation, 441 Washington Avenue, North Haven, Connecticut.

TMC TECHNICAL MEASUREMENT CORPORATION



Perhaps you already own half of an Atomic Absorption Spectrophotometer



Here's the other half.

If your lab is equipped with a Beckman DU®, DU®-2, or DB® Spectrophotometer this new Atomic Absorption Accessory is the second half of the finest and most sensitive atomic absorption analytical system. It costs but half of what you would expect.

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Grants, Fellowships, and Awards

The Life Insurance Medical Research Fund invites applications for **medical research grants and fellowships** to be available 1 July 1966. Grants to institutions will aid basic research, with preference given to the cardiovascular area. Deadline for receipt of applications: *15 September*. (Scientific Director, Life Insurance Medical Research Fund, 1030 East Lancaster Ave., Rosemont, Pennsylvania 19010)

The Fund offers a maximum of 6 years of full fellowship aid to medical students willing to work toward both the M.D. and Ph.D. in preparation for careers in teaching and research. A medical school may nominate one person for a fellowship. Deadline for receipt of applications from the deans' offices: *1 October*. Further information is available from medical school deans.

The James Picker Foundation offers grants and fellowships for advanced study in **radiological research and nuclear medicine.** The program is administered by the Division of Radiological Sciences, National Academy of Sciences. Requests for additional information and for applications should be sent to the division's Committee on Radiology, 2101 Constitution Avenue, NW, Washington 20418. Deadline for receipt of applications: *1 October*. The awards will be made in the following categories:

Advanced *fellowships in academic radiology*: to M.D.'s who have completed their 3-year residency in radiology and wish to prepare for teaching careers in a medical school radiology department. The fellowships are for 2 years and are renewable; preference will be given to persons under 34 years old. Stipends are $12,000 to $15,000, plus dependents' allowances.

Research fellowships: for M.D.'s with some training in radiology or nuclear medicine and Ph.D.'s in radiological sciences or related fields; the age limit is 30. Grants are for a year, renewable for up to 3; appointments may begin between 1 March 1966 and 1 January 1967. The institution at which the fellow works will supply necessary facilities and equipment. Stipends are $6000 to $7500, plus dependents' allowances.

Grants for *scholars in radiological research*: for institutions to help support the work of specified individuals who have recently completed their postdoctoral work. Scholar candidates

must have completed the requirements for specialty board certification or the equivalent, and be nominated by a department head, with indication of the candidate's acceptance as a staff member on a trial basis. The grants are $6000 annually for 2 years, renewable for a third, to pay the scholar's salary or research expenses, or both; the institution may supplement this amount. Candidates must submit outlines of their proposed research program.

Research grants: to institutions for specific research which aims to improve methods in diagnosis or treatment of disease. The grants will be for the amount of an approved budget, from $1000 to $10,000 a year for 2 years, renewable to 4 years. The work must be carried out by an established investigator. Applications should include the proposed project, and the institution should indicate the availability of necessary facilities.

Meeting Notes

An international conference on **liquid crystals** will take place at Kent State University, Ohio, 16–20 August. About 100 U.S. and foreign scientists will meet to discuss recent developments in the field. (G. Brown, Liquid Crystals Institute, Kent State University, Kent, Ohio)

An international symposium on **microchemical techniques** will take place 22–27 August at Pennsylvania State University, University Park. It will cover new methods, techniques, and applications in microchemistry and the program will include plenary lectures, seminars, presentation of original papers, technical films, and a commercial exhibit. The meeting is being organized by the American Microchemical Society and sponsored by the International Union of Pure and Applied Chemistry, commission on microchemical techniques, division of analytical chemistry. (H. J. Francis, Jr., Pennsatt Chemical Corp., 900 First Avenue, King of Prussia, Pennsylvania)

The call for papers has been issued for the 18th annual conference on **engineering in medicine and biology**, 10–12 November in Philadelphia. Emphasis will be on mathematical and diagnostic models for electrocardiography, processing of biological data in real time, control theory probabilistic models for neural events, artificial membranes,