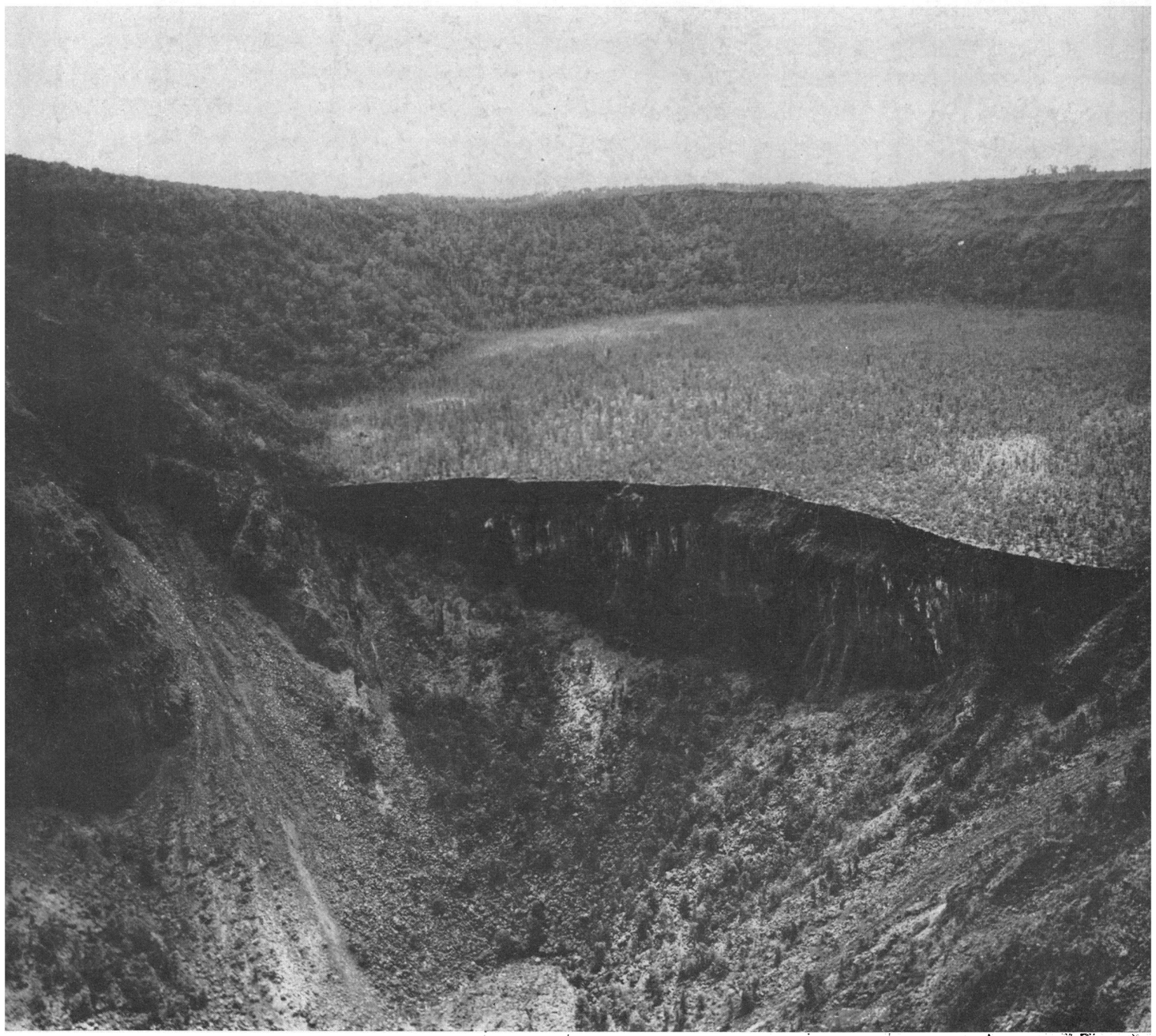
# SCIENCE

7 October 1960

Vol. 132, No. 3432

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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7 October 1960, Volume 132, Number 3432

# SCIENCE



**Cover**

Makaopuhi crater, Hawaii, from the west. See page 925. [R. T. Haugen, National Park Service]


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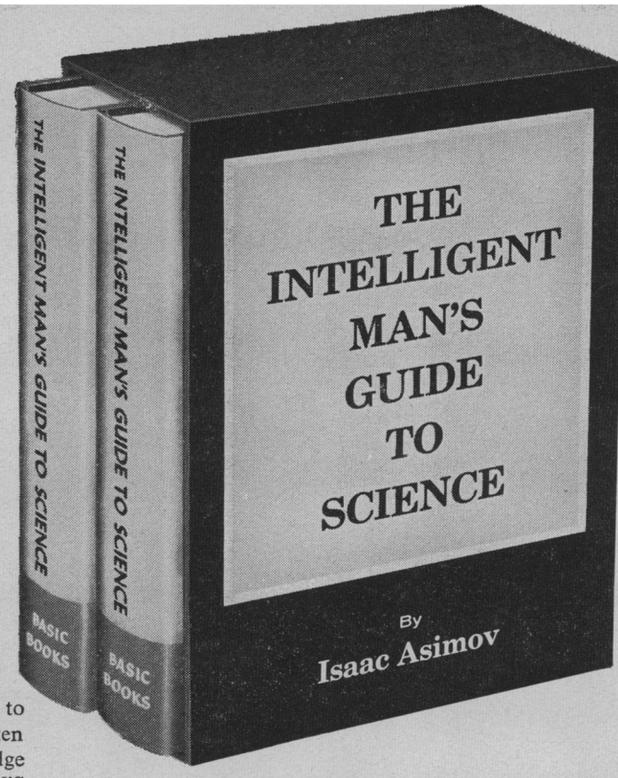


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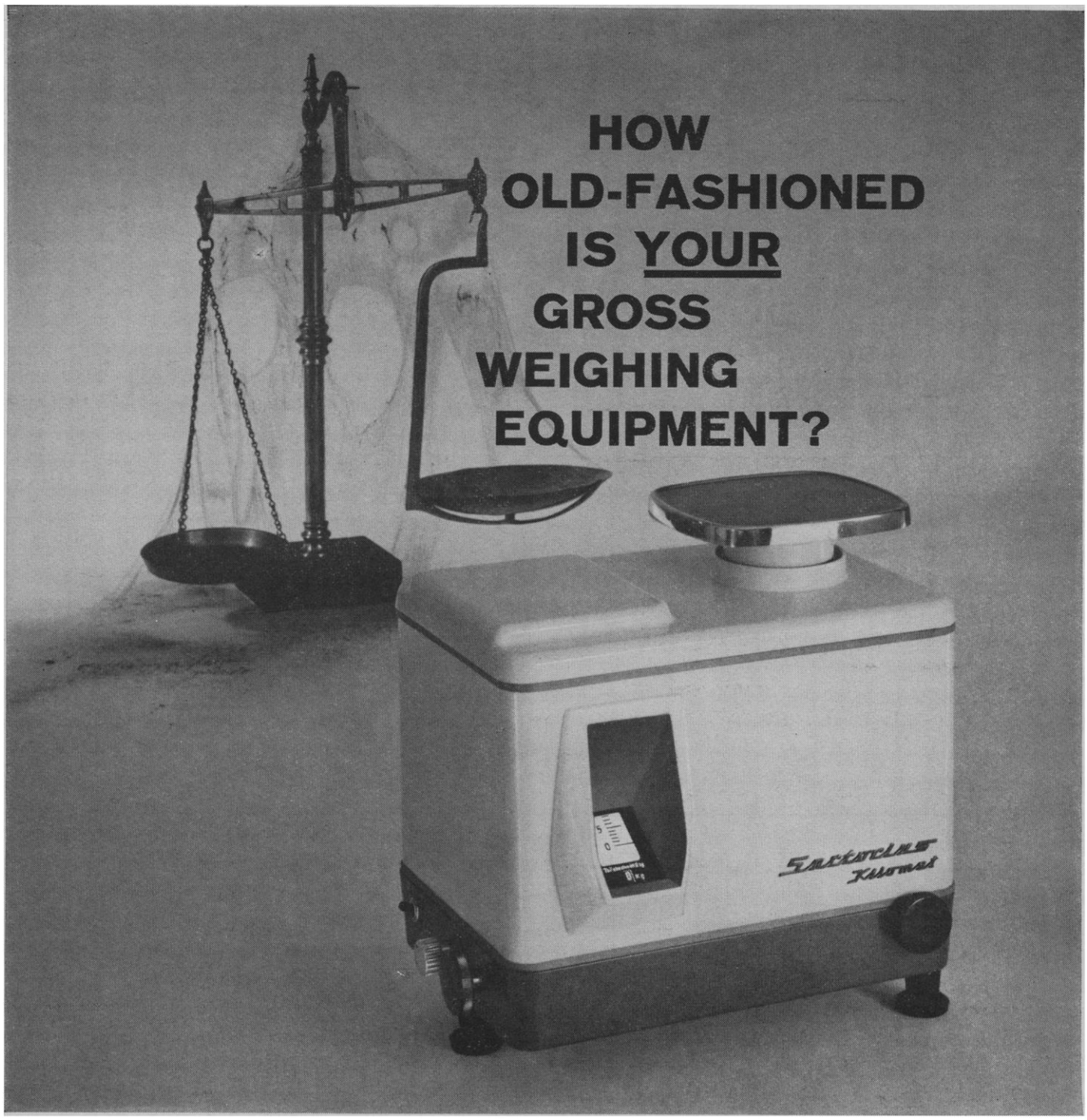


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## EXAMPLE

**Tetracene positive ion free radical.**

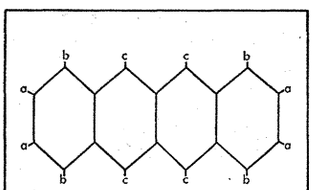


FIG. A TETRACENE

Tetracene, Figure A, when dissolved in concentrated $H_2SO_4$ forms a positive ion free radical, which has been investigated with EPR by Weissman and others[1]. We recently reëxamined this radical[2] using the high sensitivity Varian 100 kc EPR spectrometer. Figure B shows the total spectrum and Figure C, the seven central lines obtained with a slower scan of the DC magnetic field. The temperature was 65°C and the concentration, $10^{-4}$ molar.

The resonance saturates easily, and the V-4500-41A low-high power bridge was therefore necessary to permit observation at 30 db attenuation of the klystron power (0.20 mw at the sample). All lines are 60 milligauss peak-to-peak, and the line width is independent of temperature. When using 100 kc field modulation one expects resonance sidebands to occur at ± 30 milligauss from the line center, and it is felt that these sidebands determine the observed line width. Work of this type requires good magnetic field homogeneity and magnet power supply stability. A Varian 12" rotating magnet and regulated power supply were used.

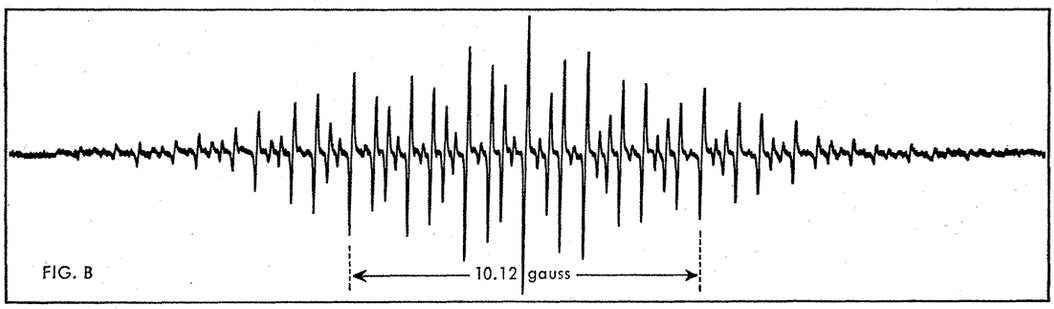


FIG. B

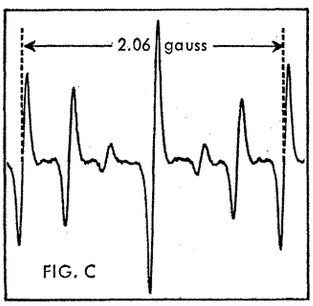


FIG. C

The spectrum may readily be reconstructed. From Figure A it can be seen that there are three classes of protons, a, b and c, with four protons in each class. Four identical protons give rise to five energy levels with degeneracies of 1, 4, 6, 4, 1, and three such groups of 4 give rise to $5^3$, or 125 lines with easily determined relative intensities. In fact, we find one of the splittings is within 1% of being three times another, which results in 85 lines, 81 of which can be seen in the figure. The three splittings are 1.03 gauss, 1.69 gauss, and 5.06 gauss. Calculated intensities agree closely with experimental values.


[1] *S. I. Weissman, E. DeBoer and J. J. Conradi, J. Chem. Phys. 26, 963 (1957); E. DeBoer and S. I. Weissman, J. Am. Chem. Soc. 80, 4549 (1958); A. Carrington, F. Dravnieks and M. C. R. Symons, J. Chem. Soc. 947, (1959).*

[2] *H. W. Brown and J. S. Hyde, (to be published).*


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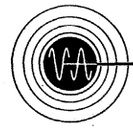

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## Donna

Property damage in the continental United States: $1 billion; lives lost: 17. Such is the estimate of the damage wrought by Donna, last month's major hurricane. What is most remarkable is that a storm so destructive of property claimed so few lives even though it hit heavily populated regions. Diane, in 1955, did half the damage and killed ten times as many people.

The difference is no chance variation. It is rather the pay-off on cooperative scientific and community efforts in the intervening years. Late in 1955 the National Hurricane Research Project was organized in the U.S. Weather Bureau. This project has had the close cooperation of all government agencies concerned and of several universities and other institutions working under contract with the bureau. In addition, the United States operates eight upper air stations cooperatively with other nations in the Caribbean Sea.

When Donna was first spotted on 2 September 1200 miles ESE of San Juan, Puerto Rico, an extensive network of weather stations, many equipped with special radars of 200-mile range, was ready to go into action. Navy, Air Force, and Weather Bureau planes were dispatched to fly into the hurricane. The data provided enabled forecasters both to make continuous predictions of Donna's course as she moved slowly westward across the Lesser Antilles and to correct these predictions as minor deviations occurred. The accurate prediction in Donna's course was a major factor in reducing the loss of life: precise warnings were given hours before she struck Miami on 10 September. But other factors played a part. The Weather Bureau, thanks to research about the way people react to emergencies by the Disaster Study Committee of the National Academy of Sciences –National Research Council, has developed more effective reports for the public. A person in the pathway is not so much interested in the exact position of the eye of the hurricane as in whether his house is likely to be wrecked, whether he is likely to be cut off or drowned by floods, and what steps he can take to protect himself. This kind of information was provided, but to do so it was necessary to predict which roads would be flooded by swollen streams or high tides. Studies of previous hurricanes in cooperation with the Coast and Geodetic Survey and the Army Corps of Engineers made it possible to predict high water with more precision than in the past.

So much for the scientific effort, which provided accurate information. Public cooperation also played an important role in saving lives. Broadcasts of information were effective, and the Red Cross and Civil Defense organizations as well as state and local governments worked together to evacuate people from hazardous places.

The whole episode is a gratifying example of cooperation—scientific, international, state and municipal, public and private. What of the future? Not much more can be expected from cooperation—it is hard to improve on near-perfection. The answer, if there is one, lies in further research. Why did a subsequent hurricane, Florence, which looked like Donna's twin sister at first, peter out? Will it be possible to predict the time and place of hurricane formation? Perhaps Donna, the most intensively studied hurricane in history, will suggest some answers as the vast mass of data gathered about her is analyzed during the coming months and years.—G.DuS.

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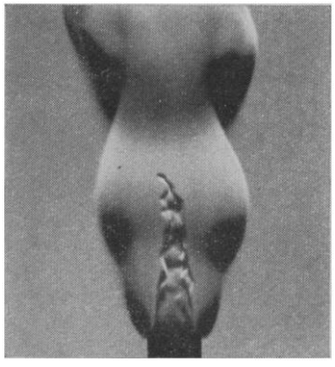
## Thin air can be photographed

The technique of schlieren photography has now been debased to the point where a man can send in to Kodak for a free booklet on how to do it, can carefully read all 19 pages, and can set himself up as a schlieren man. Yes, and perhaps a case can be made that it is not necessarily immoral to go at it just that way.

Though the schlieren method of photographing refractive index gradients in gases and liquids has been around for quite a while, general literature about it is scant; most of what has been published about it dwells on some particular application. You can find packaged schlieren outfits advertised, but the advertisements are low-pressure. Everybody who is doing schlieren now learned the hard way and is entitled to respect. One such savvy schlieren group works at Battelle Memorial Institute and another at Cornell Aeronautical Laboratory, Inc.



Here is an enchanting display item from Battelle's gallery —a turbulent Bunsen flame, frozen in a 13-microsecond schlieren portrait. Areas lighter than background represent decreasing index in an arbitrary direction within the plane of the picture; darker areas represent change in the opposite direction. To measure the quantitative rate of change with distance demands the very considerable elaboration of interferometric technique. A third method, called shadow photography, delineates the second derivative of refractive index with distance. Our slim volume merely hints at the existence of these other methods. Given enough encouragement to expand it some day, we might cover them in useful detail.

*To start encouraging us, send for "Schlieren Photography" to Eastman Kodak Company, Sales Service Division, Rochester 4, N. Y.*

## Rapid-access photography

The silver halide crystal of suitable size and suitable dislocations, with a suitable organic compound or two clinging to it, makes the sweetest little old solid-state amplifier and transducer known to man. It is doing just fine, despite a few misconceptions that have arisen due to the following circumstances:

1) The idea was developed by artists before words like "solid-state physics," "amplifier," and "transducer" were coined and even before science was recognized as profitable.

2) The crystal is employed in very large numbers, dispersed in a dried-down broth from hides and bones. Superficially regarded, this seems archaic. By referring to the preparation as a "photographic emulsion," the notion is dispelled.

3) Memories from childhood suggest that after a photographic emulsion is exposed, one must wait until Dad brings the results home from downtown the week after next. This is no longer true.

Purpose of this message is to make it perfectly clear that today the delivery of photographic results within virtually any desired time interval after exposure is wholly feasible technologically. There are many ways of accomplishing quick delivery, some currently on the market and others on the way. The manufacturer wagers on what the public will buy. As far as goods for the general public are concerned, that's the way it has to be. But on goods for the professionally technical public—rational, organized, deliberate, articulate—*must* the betting be so blind?

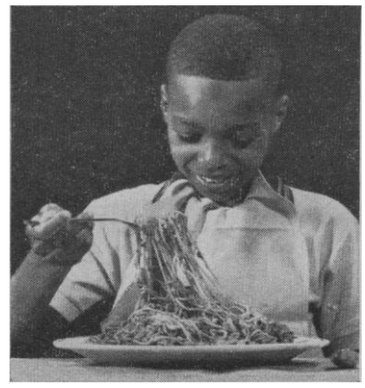
We have had a flash of genius. Let's ask them first what they want! Then, as patterns appear in the answers, markets can be defined and gauged. If this works, rapid-access and simplified technical photography will encounter fewer custom problems to be solved at custom prices or else given up for less satisfactory alternatives.

*Responsible organizations confronted with technical problems, major or minor, where rapidly or instantaneously available photographic images would be helpful, are invited to describe their wants to Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.*

## Amylose and culture

Spaghetti and macaroni are basic.

The idea of making wheat flour up into a paste and drying it for future use must have come very early. Enter esthetics. The human spirit must be nourished along with the human body. For reasons apparently unrelated to biological metabolism, the paste must be dried in certain shapes, *and the integrity of these shapes must be preserved right to the pearly portal of the alimentary tract.* This principle is ancient: the ancient Romans ate spaghetti with cheese; the ancient Japanese ate macaroni pressed from a paste of cooked rice.



When spaghetti or macaroni is cooked for too long or allowed to stand cooked, the human spirit is offended. The morsels of *pasta* revert to a sticky paste, millenia of cultural advance undone because amylose has gone into solution and then has loosely hydrogen-bonded itself into a net of slime. But for this unfortunate tendency, the world's food supply would be less dependent on specialized durum wheats. Without them, the spaghetti and macaroni would get even stickier even faster.

The problem now appears to be as soluble as the amylose itself.

First fruits of the victory can already be tasted. Try any of the up-to-date dehydrated potato-flake brands. See how the dish instantly prepared from it compares with freshly and expertly cooked home-whipped potato.

*Whatever the future holds for spaghetti and macaroni, the reason the instant-potato thing works out so well is that the processors add a very small percentage of pure monoglyceride. It complexes the dissolved amylose so securely that even the familiar iodine-blue test can scarcely find it.*

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# Letters

## The Incorrect Use of "Base"

The ions of calcium, magnesium, and potassium, especially when they are held as exchangeable ions on colloids, are often referred to collectively as "bases" by workers in soils and some related subjects. This absurd mistake is made by men of some repute and extends to recent textbooks, which must thereby confuse the next generation of students. The offenders may excuse themselves by saying that they want to distinguish calcium and magnesium ions (which produce trivial acidity on interaction with water) from aluminum and ferric ions (which produce much acidity), and that *base* is the only word they can think of for the former.

It is apparently useless in dealing with such people to point to the work of Brønsted of over 30 years ago, so perhaps we should make it easier for them to reform. In fact, no short term exists for "rare-earth cations of charge one or two other than beryllium." "Nonhydrolyzing cations" (which comes closer to the intention) is also too long. The word *alkalon* has been suggested, by analogy with *lanthanon*, which could replace the clumsy "elements of the rare earths." Whether or not *alkalon* is acceptable, it is important that a short alternative term be invented, in order to put an end to the present misuse. Editors might then be bold enough to refuse to print the word *base* when it is used, as it commonly is, to mean "very weak acid."


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## Blood Typing of Aged Material

Madeleine Smith's article on "Blood groups of the ancient dead" [*Science* **131**, 699 (1960)], published under the heading "Current problems in research" and summarizing the work done to date in blood typing of aged bone or tissue, gives the impression that paleoserology presently provides a useful tool for research into the history and genetics of ancient populations. Unfortunately, this is not the case, at least at present.

Smith, in summarizing the developments in technique and reports of typings since the beginning work of Boyd in 1933, fails to include in her bibliography the paper by F. P. Thieme and C. M. Otten entitled "The unreliability of blood typing aged bone" [*Am. J. Phys. Anthropol.* **15**, No. 3 (1957)],

which is crucial to the subject under discussion. To summarize briefly the results reported in that paper, tests were conducted on aged samples of bone from individuals of known blood type, on stains made from blood of known type, aged and then dried; and on antigens of known blood type that had been subjected to the action of bacterial enzymes. Forty-seven percent of the 19 bone samples buried over 2 years and tested gave incorrect results. Results were incorrect from 37 percent of blood samples aged three weeks, then dried on paper and tested; from 53 percent of samples aged two months; and from 100 percent of blood samples polluted with 0.5 gram of soil and aged 2 weeks before the dried stains were tested. Each of the known ABO types later tested as another type in at least one case. Furthermore, the established effect which bacterial enzymes have on blood-group antigens was confirmed. In the presence of certain enzymes one antigen may be changed so as to behave in the inhibition test like another type.

A variety of factors may combine or act singly to cause the observed unreliability of conclusions about the blood type of aged material. The inhibition test itself is not a direct and reliable method and gives frequent nonspecific reactions in tests of ABO or other antigens which are not fresh. The frequent unreliability of tests also results from the presence of adventitious antigenic elements indistinguishable from blood-group substances, or from the influence of bacterial enzymes in transforming or destroying the specificity of blood-group substances. Under such conditions, the positive reactions obtained with traditional techniques should be regarded as far from reliable.

Possibly the future will bring direct and reliable tests of the antigens, as indicated by findings suggestive of group-specific features. When this is accomplished, it may then be possible to get reliable evidence which can be used in studying the blood types of ancient populations.

F. P. THIEME
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I must offer Thieme my regrets that in my review I do not quote his 1957 paper. My bibliography was not exhaustive; however, I believe that I did discuss the major points mentioned in his paper and gave some idea of what progress had been made in their study.

I note that on the basis of the results quoted in his paper, Thieme considers my views too optimistic. I would suggest, with all courtesy, that those re-

sults are open to some criticism. Thieme has himself attacked the techniques used but does not seem to make due allowance for technical error in estimating the accuracy of his own results. There is much to question in the methods he describes; for instance, I have discussed elsewhere the inadvisability of using AB serum as a diluent in inhibition tests on bone, and in my own laboratory have found that results obtained with this method are never clear or reliable. Perhaps it is permissible to suggest, also, that percentages based on a series of eight A's, three B's, one AB, and seven O's cannot be used to finalize an argument. Thieme's paper is a significant contribution to the subject, but it would be disappointing if, at a stage in research when all workers are agreed as to the technical inadequacies, further study should be abandoned and a pessimistic attitude taken on such scanty evidence.


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## Not Cooking with Gas

After reading in your editorial [*Science* **132**, 113 (15 July 1960)] that it is impossible to cook potatoes by boiling at 11,000 feet, "even boiling overnight," I drove up to Climax, Colorado, a town of about 2500 which flourishes at 11,320 feet altitude. There I made a door-to-door survey, asking housewives how long it takes to boil potatoes in Climax. All of them said the same: *1 hour*; with a pressure sauce pan, 10 minutes.


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*This was Darwin's statement, not ours* [*see* A Naturalist's Voyage in the Beagle, *Publ. 104 (Everyman's Library, reprinted 1930, Dent, London; Dutton, New York), pp. 310-311*]. *Darwin's relevant comments are that the elevation "was probably not under 11,000 feet, and the vegetation in consequence exceedingly scanty. The root of a small scrubby plant served as fuel, but it made a miserable fire, and the wind was piercingly cold . . . the potatoes, after remaining some hours in the boiling water were nearly as hard as ever. The pot was left on the fire all night, and the next morning it was boiled, but yet the potatoes were not cooked." These conditions are far from comparable to those obtaining in modern kitchens in Climax, Colorado, but at any rate, Darwin was right in principle.*— Ed.

# Meetings

## Forthcoming Events

### October

*24–26.* Medical and Biological Aspects of the Energies of Space, symp. (School of Aviation Medicine, USAF Aerospace Medical Center), San Antonio, Tex. (J. Harmon, Symposium Coordinator, Southwest Research Inst., P.O. Box 2296, San Antonio 6)

*26–28.* Society for Industrial Microbiology, Conf. on Antimicrobial Agents, Washington, D.C. (SIM, 2000 P St., NW, Washington 6)

*27–28.* Cellulose Conf., 3rd, Syracuse, N.Y. (Cellulose Research Inst., State Univ. College of Forestry, Syracuse Univ., Syracuse 10)

*27–28.* Electron Devices, 6th annual, Washington, D.C. (J. Hornbeck, Bell Telephone Labs., Murray Hill, N.J.)

*27–29.* American Soc. for Aesthetics, Brooklyn, N.Y. (J. R. Johnson, Cleveland Museum of Art, Cleveland 6, Ohio)

*27–29.* International Assoc. of Milk and Food Sanitarians, Chicago, Ill. (V. T. Foley, Kansas City, Missouri, Health Dept., City Hall, Kansas City)

*28–29.* Society for the Scientific Study of Religion, 20th, New York, N.Y. (W. H. Clark, Hartford School of Religious Education, Hartford 5, Conn.)

*29–3.* Photoelasticity, intern. symp., Chicago, Ill. (P. D. Flynn, ISP, Illinois Inst. of Technology, Chicago 16)

*31–2.* Association of Military Surgeons of the U.S., Washington, D.C. (R. E. Bitner, Suite 718, New Medical Bldg., 1726 Eye St., NW, Washington)

*31–2.* Electrical Techniques in Medicine and Biology, 13th annual conf., Washington, D.C. (G. N. Webb, Room 547, CSB, Johns Hopkins Hospital, Baltimore 5, Md.)

*31–2.* Geochemical Soc., Denver, Colo. (K. B. Krauskopf, Geology Dept., Stanford Univ., Stanford, Calif.)

*31–2.* Geological Soc. of America, Denver, Colo. (F. Betz, Jr., 419 W. 117 St., New York 27)

*31–2.* Society of Economic Geologists, Denver, Colo. (H. M. Bannerman, U.S. Geological Survey, Washington 25, D.C.)

*31–2.* Society of Rheology, annual, Pittsburgh, Pa. (J. H. Dillon, Textile Research Inst., Princeton, N.J.)

*31–4.* American Public Health Assoc., San Francisco, Calif. (B. F. Mattison, APHA, 1790 Broadway, New York 19)

### November

*1–3.* International Cong. on Experimental Mechanics, New York, N.Y. (R. Guernsey, Jr., Soc. of Experimental Stress Analysis, General Engineering Lab., General Electric Co., Schenectady 5, N.Y.)

*1–16.* International Electrochemical Commission, New Delhi, India. (American Standards Assoc., 70 E. 45 St., New York 17)

*2–4.* Plasma Physics, 2nd annual, Gatlinburg, Tenn. (A. H. Snell, Oak Ridge Natl. Lab., Oak Ridge, Tenn.)

*2–4.* Society for Experimental Stress Analysis, Berkeley, Calif. (W. W. Murray, Massachusetts Inst. of Technology, Cambridge)

*2–5.* American Soc. of Parasitologists, Los Angeles, Calif. (F. J. Kruidenier, Zoology Dept., Univ. of Illinois, Urbana)

*2–5.* American Soc. of Tropical Medicine and Hygiene, Los Angeles, Calif. (R. B. Hill, 3573 St. Gaudens Rd., Miami 33, Fla.)

*2-5.* American Speech and Hearing Assoc., Los Angeles, Calif. (K. O. Johnson, 1001 Connecticut Ave., NW, Washington 6)

*3–4.* Electrostatic Propulsion, conf., Monterey, Calif. (J. M. Sellen, Thompson Ramo-Wooldridge, Inc., 8433 Fallbrook Ave., Canoga Park, Calif.)

*3–4.* Muscle as a Tissue, conf., Philadelphia, Pa. (Division of Research, Lankenau Hospital, Philadelphia 31)

*4–5.* West-Central States Biochemical Conf., Lincoln, Neb. (J. H. Pazur, Dept. of Biochemistry and Nutrition, Univ. of Nebraska, Lincoln)

*4–6.* Assoc. of Clinical Scientists, Washington, D.C. (R. P. MacFate, 54 W. Hubbard St., Chicago 10, Ill.)

*5.* Society for Industrial and Applied Mathematics, Philadelphia, Pa. (G. Kaskey, Remington Rand Univac, 1900 W. Allegheny Ave., Philadelphia)

*7–10.* Society of Exploration Geophys-

icists, 30th annual intern., Galveston, Tex. (C. C. Campbell, Box 1536, Tulsa, Okla.)

*8–10.* Forensic Sciences, 2nd symp., Washington, D.C. (Director, Armed Forces Inst. of Pathology, Washington 25)

*9–10.* Use of Secondary Surfaces for Heat Transfer with Clean Gases, symp., London, England. (Secretary, Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1)

*9–11.* Clinical Chemistry Methods, symp., Cleveland, Ohio. (A. Hainline, Cleveland Clinic, 2020 E. 93 St., Cleveland 6)

*10–12.* Geological Soc. of America, 73rd conv., Denver, Colo. (H. R. Aldrich, GSA, 419 W. 117 St., New York 27)

*10–12.* National Assoc. of Geology Teachers, Denver, Colo. (F. Foote, Dept. of Geology, Williams College, Williamstown, Mass.)

*10–13.* Pacific Coast Fertility Soc., Las Vegas, Nev. (A. C. Wineberg, 3120 Webster St., Oakland, Calif.)

*11–12.* Paleontological Soc., Denver, Colo. (H. B. Whittington, Harvard Univ., Cambridge 38, Mass.)

*13–16.* Society of American Foresters, 60th annual, Washington, D.C. (H. Clapper, SAF, 825 Mills Bldg., Washington 6)

*14–17.* Magnetism and Magnetic Materials, 6th annual conf., New York, N.Y. (L. R. Bickford, Jr., I.B.M. Research Center, Yorktown Heights, N.Y.)

*14–18.* American Soc. of Agronomy, Chicago, Ill. (L. G. Monthey, 2702 Monroe St., Madison 5, Wis.)

*14–18.* Nuclear Ship Propulsion, symp., Taormina, Sicily. (International Atomic Energy Agency, 11 Kärntner Ring, Vienna 1, Austria)

*15–16.* Engineering Application of Probability and Random Function Theory, symp., Lafayette, Ind. (J. L. Bogdanoff, School of Aeronautical and Engineering Sciences, Purdue Univ., Lafayette)

*16–19.* Society of Naval Architects and Marine Engineers, annual, New York, N.Y. (W. N. Landers, SNAME, 74 Trinity Pl., New York 6)

*17–19.* Extrapyramidal System and Neuroleptics, intern. symp., Montreal, Canada. (J.-M. Bordeleau, Dept. of Psychiatry, Univ. of Montreal, Montreal)

*17–19.* Surgery of Endocrine Organs, symp., New York, N.Y. (Office of the Associate Dean, New York Univ. Post-Graduate Medical School, 550 First Ave., New York 16)

*17–20.* American Anthropological Assoc., Minneapolis, Minn. (B. J. Meggers, 1530 P St., NW, Washington 5)

*17–20.* Southern Thoracic Surgical Assoc., Nassau, Bahamas. (H. H. Seiler, 517 Bayshore Blvd., Tampa 6, Fla.)

*18–19.* American Medical Writers' Assoc., Chicago, Ill. (H. Swanberg, 510 Maine St., Quincy, Ill.)

*21–23.* Fluid Dynamics, annual, Baltimore, Md. (R. J. Emrich, Div. of Fluid Dynamics, APS, Dept. of Physics, Lehigh Univ., Bethlehem, Pa.)

*24–25.* American Physical Soc., Chicago, Ill. (K. K. Darrow, APS, 538 W. 120 St., New York 27)

*24–26.* Central Assoc. of Science and Mathematics Teachers, 60th annual conv., Detroit, Mich. (L. A. Conrey, School of Education, Univ. of Michigan, Ann Arbor)

*(See issue of 16 September for comprehensive list.)*