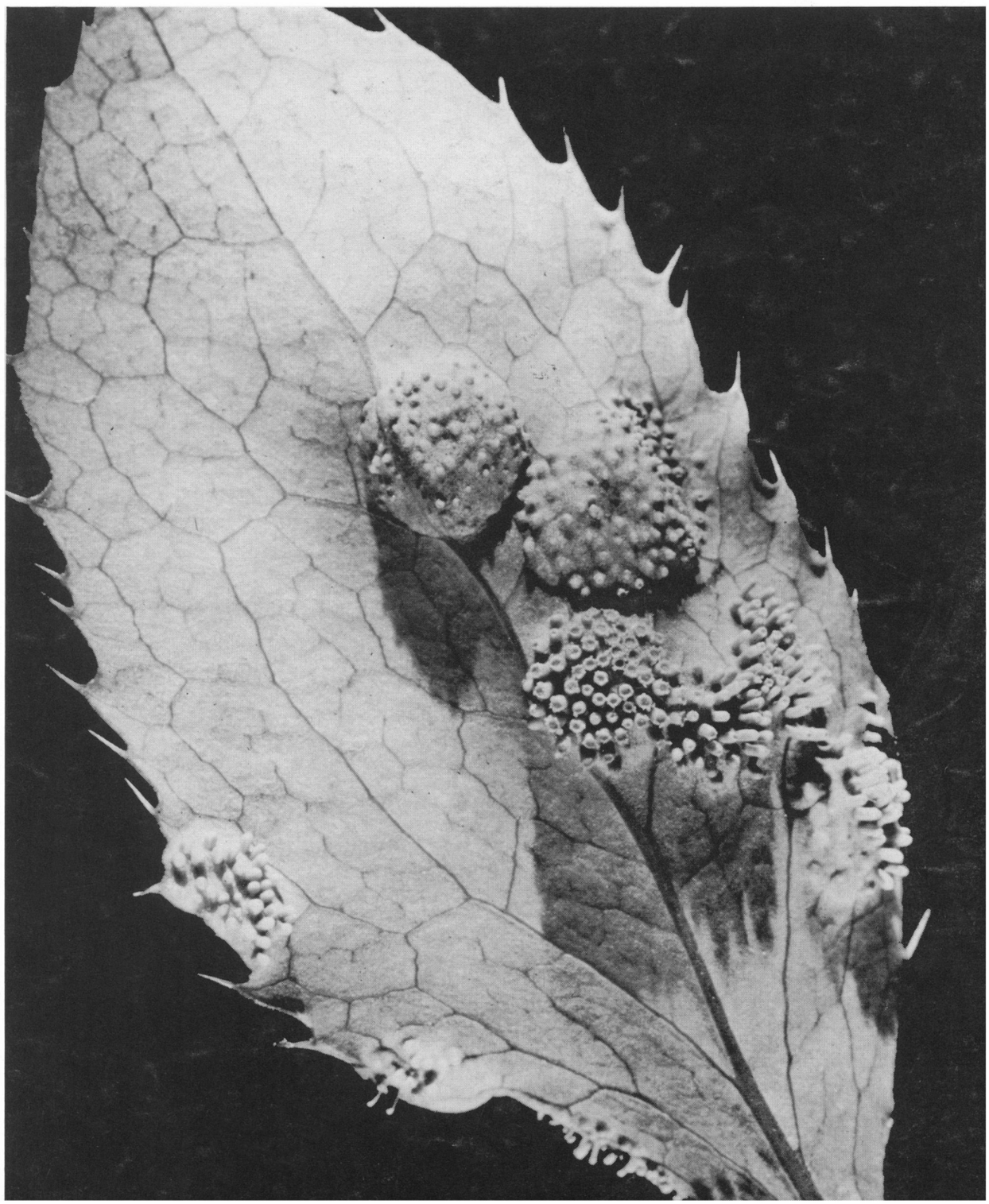
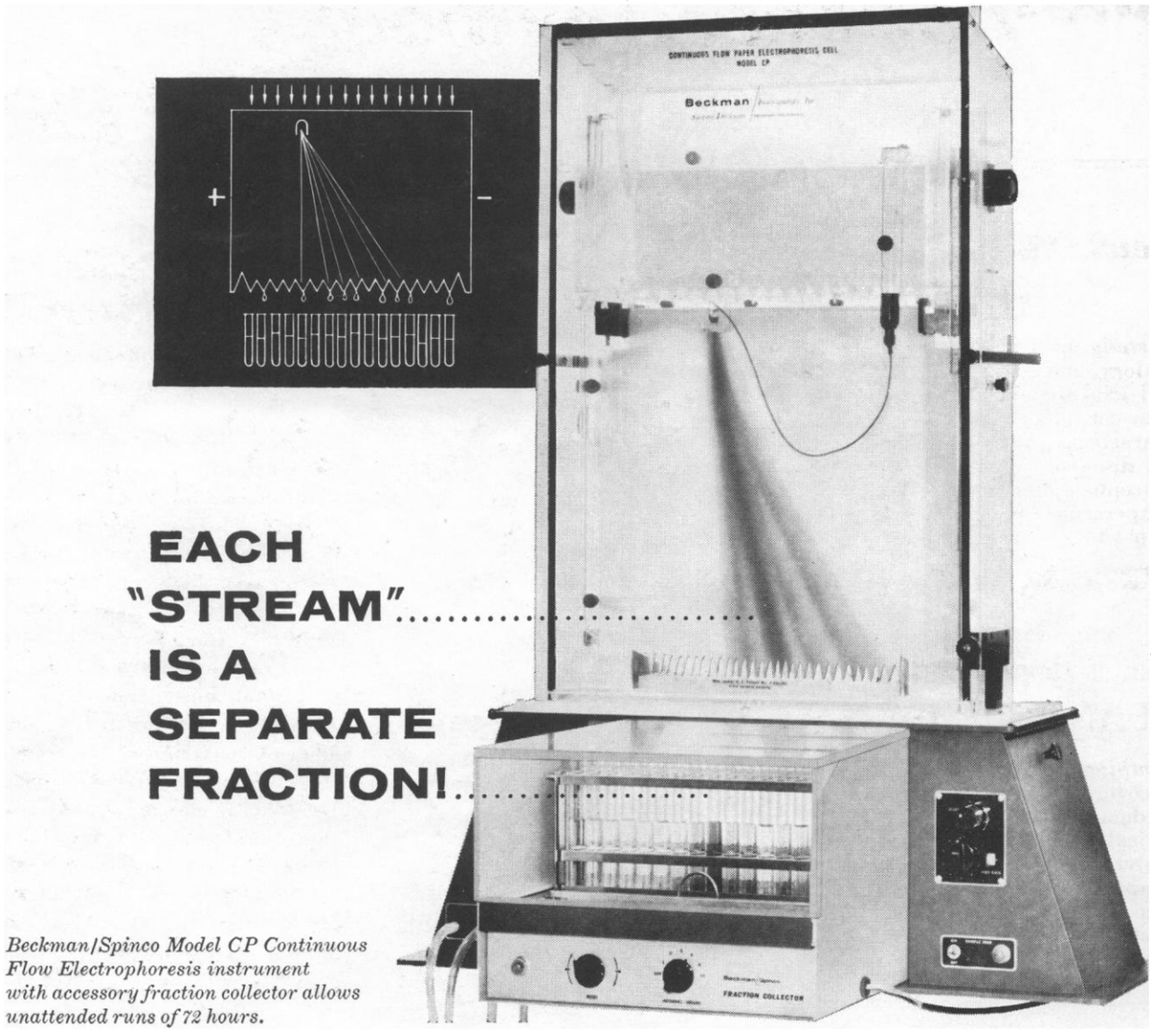
SCIENCE

10 February 1961

Vol. 133, No. 3450

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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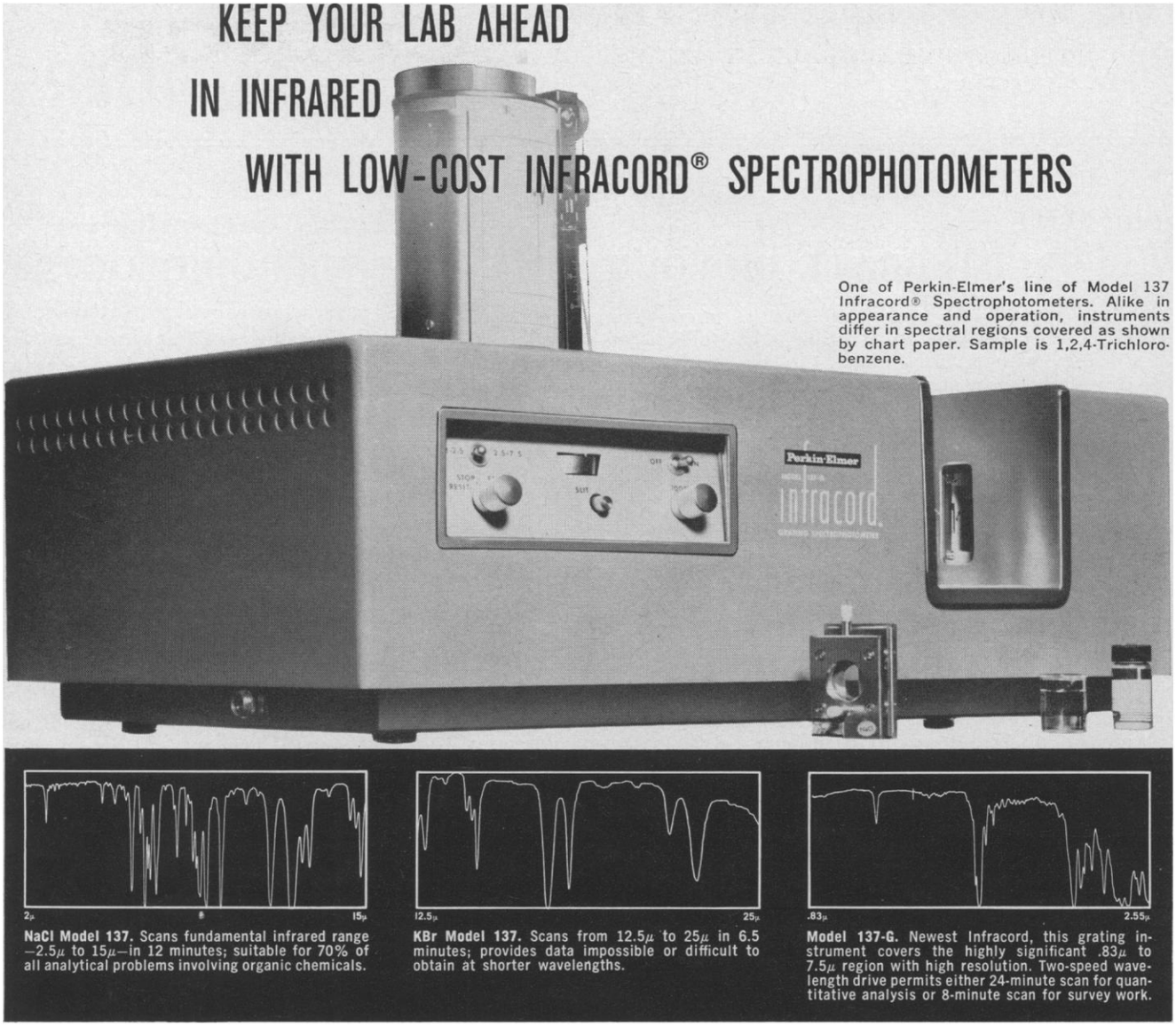

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10 February 1961, Volume 133, Number 3450

SCIENCE

Cover Leaf of barberry, *Berberis vulgaris*, showing the aecial or cluster-cup stage of stem rust which is a factory for the production of new rust races of which only the best adapted gain wide distribution. See page 357. [W. E. Clark, Research Station, Canada Department of Agriculture, Winnipeg, Manitoba]

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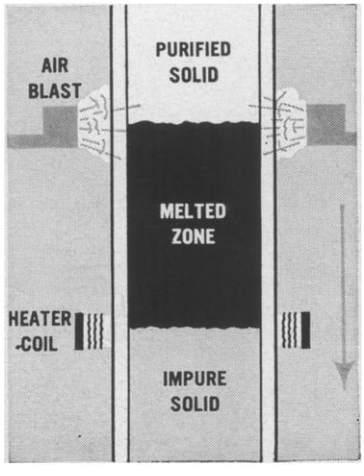

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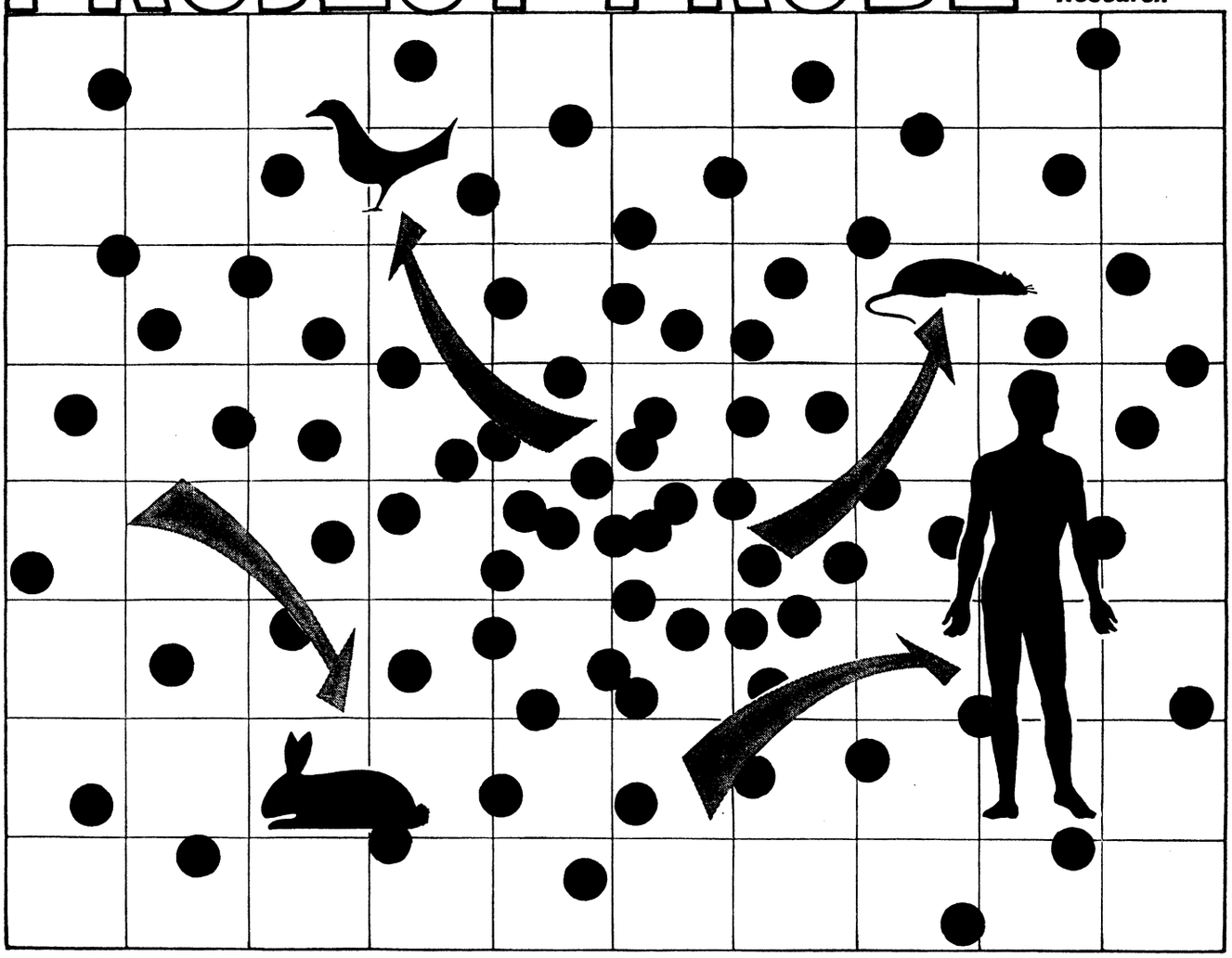

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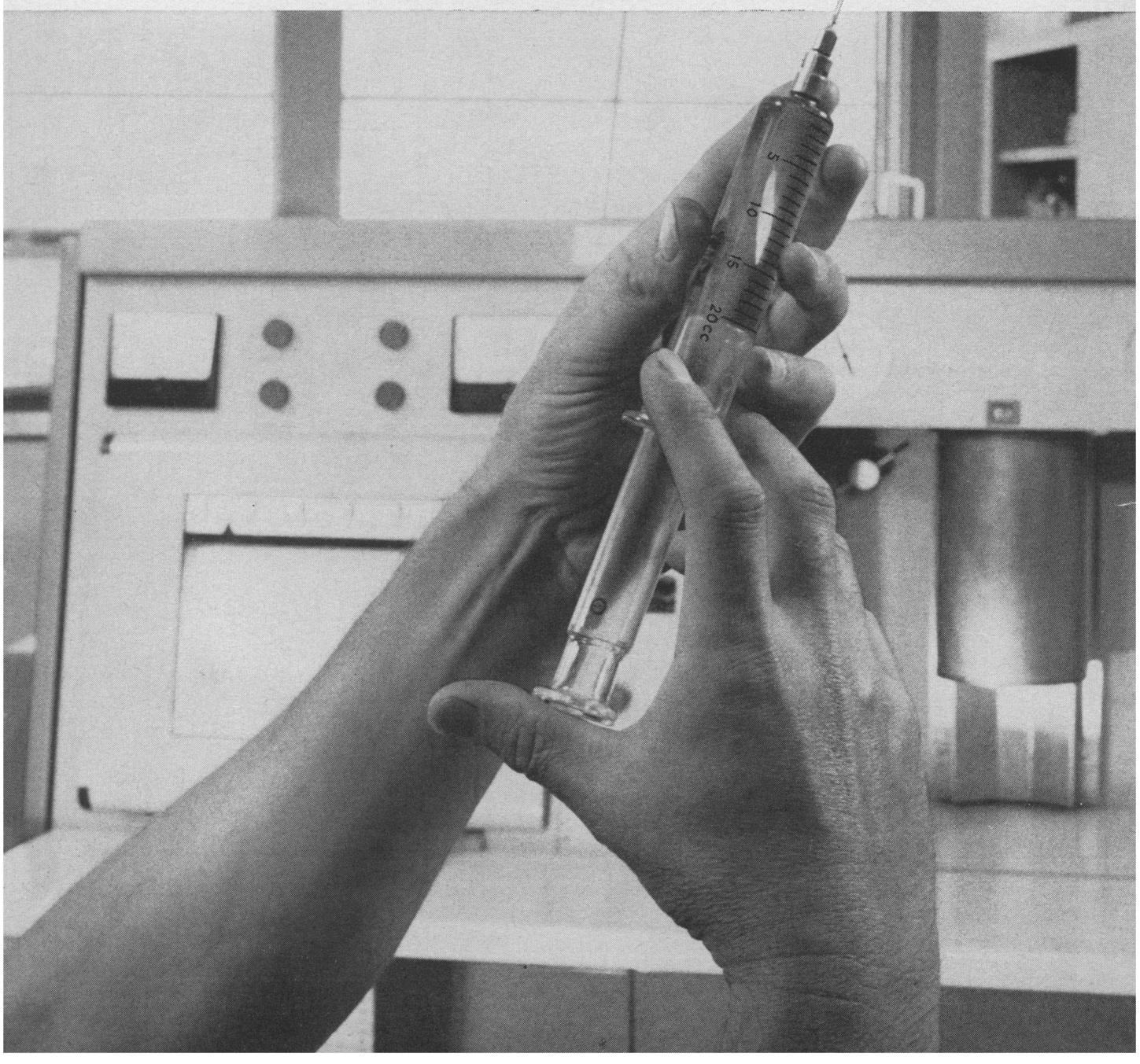

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Coleman Flame Photometer	Bulletin No.	SB-242A

COLEMAN INSTRUMENTS, INC., MAYWOOD, ILLINOIS

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Footnote to History

In his farewell address to the nation on 17 January 1961 President Eisenhower had this to say about science and technology:

"Today, the solitary inventor, tinkering in his shop, has been overshadowed by task forces of scientists in laboratories and testing fields. In the same fashion, the free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of electronic computers.

"The prospect of domination of the nation's scholars by federal employment, project allocations, and the power of money is ever present—and is gravely to be regarded.

"Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite."

A good many scientists have shared this concern about the "equal and opposite danger" and would welcome further discussion. G .B. Kistiakowsky, President Eisenhower's Special Assistant for Science and Technology, writes in this connection:

"I would like to comment briefly about President Eisenhower's reference to science and technology in his farewell address. Several questions have been directed to me about it, and since Mr. Eisenhower talked to me at some length later that week, others may be interested to know more about his views than could be developed in a short talk.

"The major point, I believe, which he wanted to convey was his conviction that the part of science which is engaged in for armaments purposes must never be allowed to dominate all of science or curtail basic research. He was concerned to see so many pages of advertisements identifying 'science' with armaments, asserting to the people that research means just bigger and better missiles, etc., while very little is said about the true nature of basic research as a cultural endeavor and a source of advancing welfare to the people. And he was particularly anxious that educational institutions, whose task he sees as the support of free intellectual inquiry and the acquisition of new scientific knowledge, should not concentrate on large-scale military research and development contracts at the expense of their true scientific endeavors.

"In line with these ideas, I believe President Eisenhower was concerned that the emphasis on military research and development in our industry, press, and even institutions of higher learning could create a combination of special interests highly undesirable in our society. His reference in the speech to the scientific-technological elite I know was meant in this context.

"It is interesting to me to realize how similar the views of Mr. Eisenhower are in these matters to those I have heard many times from scientists all over the nation, and which I share. I think, in part, this reflects the great interest in and support for science President Eisenhower demonstrated during his term of office."—G.DuS.

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a definition of "very good"... a mask for glass, switched by light... an interesting sandwich

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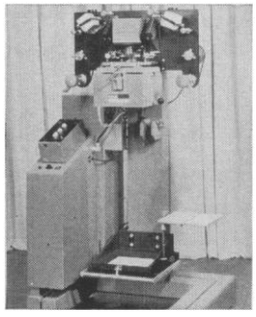

This enlarger was custom-built. The client's affairs are of such a nature that to supply him with anything short of the best-performing merchandise that money can buy could have disastrous consequences for all men of good will. The enlarger is a link in an astonishing chain on which much depends.

It is indeed a very good enlarger. We are tempted to resort to the cant of the times and call it a breakthrough in enlargers. We shall resist the temptation because we hate to lie. Nothing as climactic as a "breakthrough" has occurred in enlargers.

The reason it's a very good enlarger (the best in the world, we hope) is that some years ago it became apparent that descriptions like "very good" don't help much in dealing with such problems and that more precise-sounding terms like resolving power don't tell a full and honest story either. Progress came when we adopted the *weltanschauung* of the sound engineer, of all people!

Can you imagine the audacity of treating a photographic lens or a photographic emulsion or a combination of the two as though it were a loud-speaker or a telephone line and developing equations for its sine-wave frequency response? Yet this is what we were forced to do and it worked. The enlarger above can prove that it worked. The photographic-emulsion men and the lens men are given a common language, which they had lacked. The frequency response of a combination as in the above enlarger can be cascaded with the frequency response of other elements in the total picture-handling system, including the electronic, if any.

We have good reason to want to convince you that this nonsense is not as foolish as it sounds. We think that in the long run we shall be better off if we let you in on the principles by which we design a photographic *system* even though, under certain circumstances, we wish you would let us (George's successors) do it for you.

Education had best begin by studying a review paper, "Methods of Appraising Photographic Systems," by one of our men who has been up to his ears in this subject for a couple of decades. Get your free copy from Eastman Kodak Company, Apparatus and Optical Division, Rochester 4, N. Y. Freshman calculus and doggedness required.

An invitation to engrave

Etching is, of course, not the only way to dig into a glass surface. With sufficient patience and skill a grinding wheel yields superb results. If time flits too rapidly for that sort of monkeying around, you coat a resist over your surface, scribe through it, and let the HF go to work.

In case the pattern is intricate, or needs to be repeated, or both, you want a photosensitive resist. Then you can draw up the pattern once, nice and big and black, reduce it photographically onto a *Kodalith* material and use the resulting photograph as a mask which determines where the resist comes off and exposes the naked glass to HF.

Think a moment what you are asking of any photosensitive resist. It must be capable of being switched by a reasonable amount of light from one to the other of two conditions: a) tenacious adherence to the particular material you wish to etch and impenetrability to agents which rapidly attack that material; b) abject submission to attack by agents which do not affect the substrate, or alternatively, full permeability to appropriate etchants for the substrate.

Obviously, *we* have given this matter much more than a moment's thought. Our researches have now brought forth a photosensitive resist for glass and silicate ceramics to join our previously announced *Kodak Photo Resist* ("KPR," for copper, clear anodized aluminum, and high-copper alloys) and *Kodak Metal-Etch Resist* ("KMER," for other metals). We would be justified in trying to recover all that thinking expense by selecting a similar proprietary name to imply the discovery of a new chemical compound but have decided on a cleverer course...

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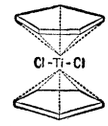
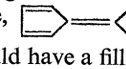
For details, write Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N. Y. If you don't want to bother stating your problem, just say "photosensitive resists."

Aromatic titanium



Our first entry in the class of compounds called ferrocene is a little item that goes by the name *Dicyclopentadienyltitanium Dichloride.* That is to say, the first member of the class obtainable as an Eastman Organic Chemical (Eastman 8057, 5 grams for $4.45). Statements must be carefully worded when mentioning a compound reputed to be a stereospecific catalyst for polyolefins. Wealth of empires hangs on such things. Nobody make a move, nobody drop or pick up a hint without first consulting his or her patent department.

Academics can afford to be carefreer. *They* can follow knowledge where e'er it leads. *They* can revel in ferrocenes and rejoice to see a broadening of the whole concept of aromaticity in organic chemistry. Benzene, naphthalene, such old-fashioned aromatic nuclei are essentially two-dimensional. Here aromaticity enters the third dimension. Whee!!!!

Considerations like zero dipole moment, non-polar nature, a single C-H absorption band, and the x-ray diffraction pattern cinched the pentagonal anti-prismatic "sandwich" structure for ferrocenes. Look at it up there. You would almost think that the science of chemistry has come to resemble the art of constructing ship models inside abandoned whiskey bottles. The image is historically false, however. Ferrocenes are the offspring of a casual liaison between two problems: preparation of organo-iron compounds and the hunt for a route to fulvalene,  .

It soon developed you could have a filling in the sandwich other than iron. Our titanium ferrocene has a bright, gleaming copper-bronze sheen to it. The original iron ferrocene is also orange-colored. Maybe the color has more to do with the bread than with the filling. Maybe we see too many images.

There is a lot of literature around on ferrocene chemistry. We ourselves put out a review article on it a couple of years ago. We had no ferrocenes to sell then, but we did have a ferrocene expert on the payroll and wanted to show him off. Request a copy from Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company). Same address to order five grams of the compound. Need a copy of "Eastman Organic Chemicals, List No. 42"?

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Letters

Interpeduncular Nucleus

Thompson [*Science* **132**, 1551 (1960)] relates damage to the interpeduncular nucleus of the rat to the loss of a visually conditioned avoidance response. Since no mention is made of the closely adjacent nucleus of the posterior accessory optic tract, it would seem necessary to confirm the absence of damage to this visual center before ascribing a role in visual responses to the interpeduncular nucleus.

DAVID BODIAN
Johns Hopkins University School of Medicine, Baltimore, Maryland

David Bodian's point, that neural structures (for example, the nucleus of the posterior accessory optic tract) other than the interpeduncular nucleus may be involved in retention of preoperatively learned visual tasks is well taken. The following data derived from two experiments [*J. Comp. Physiol. Psychol.* **53**, 488 (1960); *Exptl. Neurol.*, in press], however, strongly support my original contention [*Science* **132**, 1551 (1960)] that the interpeduncular nucleus has a significant role in visual responses: (i) the degree of retention loss is directly related to the amount of damage to the interpeduncular nucleus; (ii) lesions placed immediately lateral, superior, or posterior to the interpeduncular nucleus are without effect; (iii) lesions in the region of the posterior accessory optic tract are without effect; and (iv) damage to the habenulopeduncular tract produces a deficit similar to that found with damage to the interpeduncular nucleus.

ROBERT THOMPSON
Neuropsychiatric Institute, University of California Medical Center, Los Angeles

I would like to comment on the report of the President's Science Advisory Committee as it appeared in *Science* [**132**, 1802 (1960)]. As I read through the report, I was struck by one glaring lack: hardly anywhere, except inadequately in the section called "Background," was there any questioning of why we scientists should do research. In that section, a pat on the back is given to the idea that research, that knowledge, is good for its own sake, but the main emphasis is on the "material returns of scientific investigation," on a "recognition that the defense and advancement of freedom require excellence in science and in technology."

Now I do not want to quarrel with this division. We all recognize that not only science but all the arts—everything which lifts man above the brutes—should have the support of the government and of the people. But, once we recognize that scientific endeavor has another function, that of increasing real wealth, of eradicating poverty and misery—once we recognize this function, should we not also go about seeing to it that scientific research is so conducted that we can obtain these hoped-for results? Oh, I know that many scientists will immediately cry out, "Planned research! Conducted research!" But is not our research in this country mostly conducted, conducted for the government, for "defense," for private profit? I hear no complaints from these people about this kind of research.

What I would like to have read in that report was a summary of the areas where we could have more scientific research and of areas where we could immediately end research without loss to anyone. With no direction, talent is wasted, and the good name of science is besmirched in the public mind. For example, should so much money have been spent on a relatively minor disease, poliomyelitis? Do we really need research so that we can travel faster on this earth, or get to the moon within our lifetime? We have many problems which cannot be solved by improved weedkillers, or improved nasal sprays, or improved antibiotics. Our urban sprawls are spawning inhumanity; our resources are being squandered, our air is being polluted. Why cannot we do away with the internal-combustion engine and get some research going on something to take its place, without noise, without pollution, without a wastage of scarce resources? Racial tensions are increasing all over the world; this is assuredly a problem which scientists can tackle. All your readers can multiply instances of such problems many fold, and I am sure all the problem-areas that they cite will be relevant, and all will be amenable to scientific endeavor.

You will say that it was not the purpose of the advisory committee to talk about these things. I answer that it was precisely in their province, if they were going to ask for more federal help and money, to give some ideas as to where this money and these brains are going to be used. Once you accept the idea that scientific research has goals besides the burgeoning forth of new knowledge to set beside the knowledge that has been handed down to us from previous generations—once you accept the idea that science should act to make more men's lives better, more humane, sacrosanct, then it devolves upon you to make it clear where this research should be conducted, in what fields, to meet what needs.

If this is not done—and if the report is accepted it will not be done—then, to the layman, more scientific research

will mean more gadgets, more and better bombs, more drastic, unnecessary changes in the conduct of our life. Really now, do we honestly need communications satellites? I have talked to many nonscientists, and to them, more scientific research means deadlier wars. Right or wrong, this is a conception, and it is up to us scientists to do something about this, or else we will be damned, and, I think, rightly so.

PHILIP SIEKEVITZ
Rockefeller Institute,
New York, New York

Western Snake River Fault Zone

Malde [*Science* **130**, 272 (1959)] has described a zone of northwest-trending, high-angle faults which have displaced the western Snake River Plain downward relative to highlands on the north by at least 9000 feet; 5000 feet of the movement occurred between the early and middle Pliocene, and the balance occurred in Cenozoic time. His studies are based in part on numerous gravity measurements, and from an "analysis of a 50-milligal residual anomaly associated with the steep gravity gradient near Mountain Home, it is calculated that from 13,000 to 38,000 ft of rocks about as dense as Columbia River basalt have been dropped down against the Idaho batholith."

Kirkham [*J. Geol.* **39**, 210 (1931)], from a plane table traverse of Squaw Butte near Emmett, calculated a thickness of 17,000 feet for the Columbia River basalt exposed in the butte. He said that this thickness would not hold if faults were found. While the faults are not particularly obvious on the surface, they are easily observed from an airplane. The rocks are tilted at various angles, from 8 to 40 degrees, and form narrow north-south wedges. Horizon markers are not easily identified in the Columbia River basalt, but it is obvious from the large amount of displacement visible from the air that the actual thickness of the basalt is of the order of 3000 rather than 17,000 feet. I have studied these basalts over large areas of Oregon, Washington, and Idaho and believe that a thickness in southern Idaho of appreciably more than 4000 feet is not likely. It might be argued that Snake River basin was a downfaulted basin in which the basalts pooled and became unusually thick. However, nothing in the appearance of the basalts next to the major fault zone indicates that the basalts are ponded. It seems more likely that steep gravity gradient near Mountain Home is due to thin wedges of Columbia River basalt downdropped along the border of the plain against the Idaho batholith, leading to an error in calculated thick-

ness similar to that which caused Kirkham to miscalculate the thickness in Squaw Butte.

HAROLD T. STEARNS
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Competitive Exclusion Principle

It may seem unwarranted to extend the series of comments on the competitive exclusion principle, which has now proceeded from Hardin [*Science* **131**, 1292 (1960)] to Cole [**132**, 348 (1960)] to Savile [**132**, 1761 (1960)], with asides by Van Valen versus Cole [**132**, 1674 (1960)]. However, two points in the discussion by Savile deserve comment.

He asserts that "the absence of clearly defined associations" emphasizes the reduced importance of competition in the arctic flora. Considerable recent vegetational research, some of which I summarized in an article in *Science* [**128**, 115 (1958)], suggests that clearly defined associations may not be characteristic and that the vegetation in an area may be regarded as changing in a manner most effectively treated as a continuous variable. It is, therefore, questionable whether the absence of clearly defined associations emphasizes anything. Savile's suggestion that the flora, or better the vegetation, be described in terms of major habitats, if these are discernible independently of the vegetation itself, certainly has merit.

Secondly, Savile refers to "closely related species with identical ecological requirements." If we must beware of assuming that species have different ecological environments because they do coexist, we must also beware of speaking of two species' having identical ecological requirements. The ecological demands of well-known species are not usually known in detail, and there is always the possibility that some essential requirement of a species may escape our most careful observation or experimentation. It may be argued that the plant as it integrates the multiple and undetermined components of the environment is the most, and perhaps the only, adequate measure of its environmental requirements. In any event, the assertion of ecological identity is fraught with at least as many difficulties as the assumption of lack of identity.

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McIntosh's first point concerns the permanence of associations. With our currently ameliorating climate I feel certain that all plant associations are changing throughout temperate Canada, but that does not rob the association concept of its usefulness, if we use it with discretion. The lack of such associations in most arctic habitats, whether we use this term or indulge in circumlocution, still reflects meager biological competition—as others with arctic field experience have agreed since my note appeared.

In his final paragraph McIntosh questions my phrase "identical ecological requirements" used in connection with disease resistance. I used the words, following ecological practice, with some misgiving, realizing that a semantic wrangle might ensue. Consider the extreme case of a single plant species with two populations differing by a single gene that governs disease resistance. The parasite being part of the environment, these populations have different ecological requirements. Thus, if we insist on complete precision, no two species will ever have identical requirements, and the exclusion principle becomes completely meaningless, whereas, if we realize that usable definitions of biological phenomena must generally be flexible, the principle can be moderately useful under many, but not all, circumstances.

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Meetings

Forthcoming Events

March

1–3. Chemistry Symp., intern. (by invitation), Stanford, Calif. (B. Lamar, Stanford University News Service, Stanford, Calif.)

2–4. Optical Soc. of America, spring meeting, Pittsburgh, Pa. (Miss M. Warga, 1155 16th St., NW, Washington 6, D.C.)

2–5. National Wildlife Federation, 25th annual, Washington, D.C. (Natl. Wildlife Federation, 1412 16th St., NW, Washington 6)

5–9. Gas Turbine Conf. and Products Show, 6th annual, Washington, D.C. (Meetings Dept., American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18)

6–8. North American Wildlife and Natural Resources Conf., 26th, Washington, D.C. (C. R. Gutermuth, Wildlife Management Inst., 709 Wire Bldg., Washington 5)

7–9. American Railway Engineering Assoc., annual, Chicago, Ill. (N. D. Howard, 59 E. Van Buren St., Chicago 5)

8–10. Instrument Soc. of America Conf., 11th annual, Pittsburgh, Pa. (R. R. Webster, 900 Agnew Ave., Pittsburgh 30)

8–11. Neurosurgical Soc. of America, Boca Raton, Fla. (R. K. Thompson, 803 Cathedral St., Baltimore 1, Md.)

9–10. Magnetohydrodynamics, symp. on engineering aspects of, Philadelphia, Pa. (N. W. Mather, Project Matterhorn, P.O. Box 451, Princeton, N.J.)

12–17. American College of Allergists, annual, Dallas, Tex. (P. Gottlieb, 818 Medical Arts Bldg., Philadelphia, Pa.)

13–17. National Assoc. of Corrosion Engineers, annual, Buffalo, N.Y. (W. A. Mapler, 18263 W. McNichols Rd., Detroit 19, Mich.)

13–24. Radiological Health, course in, Cincinnati, Ohio. (Chief, Training Program, Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26)

14–16. Clinico-Pathological Significance of Renal Biopsy, Ciba Foundation symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Place, London, W.1)

14–16. Inter-Station Supersonic Track Conf., 6th symp., China Lake, Calif. (U.S. Naval Ordnance Test Station, Code 307, China Lake, Calif.)

15–17. Medical Photography and Cinematography, intern. cong., Cologne, Germany. (Deutsche Ges. für Photographie, Neumarkt 49, Cologne)

16–17. Textile Engineering Conf., American Soc. of Mechanical Engineers, Clemson, S.C. (ASME Meetings Dept., 29 W. 39 St, New York 18)

16–18. Aviation/Space Education, 5th natl. conf., Washington, D.C. (Natl. Aviation Education Council, 1025 Connecticut Ave., NW, Washington 6)

17–19. International Medical Conf., Liège, Belgium. (Medical Commission of the FIR, Castellezgasse 35, Vienna II)

19–25. American Soc. of Photogrammetry, American Cong. on Surveying and Mapping, Washington, D.C. (C. E. Palmer, ASP, 1515 Massachusetts Ave., NW, Washington 5)

20–22. American Physical Soc., Monterey, Calif. (W. A. Nierenberg, Univ. of California, Berkeley 4)

20–23. Institute of Radio Engineers, 1961 intern. convention, New York, N.Y. (E. K. Gannett, IRE, 1 E. 79 St., New York 21)

20–24. American Surgical Assoc., Boca Raton, Fla. (W. A. Altemeier, Cincinnati General Hospital, Cincinnati 29, Ohio)

20–24. National Health Council, forum and annual meeting, New York, N.Y. (NHC, 1790 Broadway, New York 19)

20–24. Western Metal Cong. and Exposition, 12th, Los Angeles, Calif. (A. R. Putnam, American Soc. for Metals, Metals Park, Ohio)

21–23. American Meteorological Soc., general meeting, Chicago, Ill. (E. P. McClain, Dept. of Meteorology, Univ. of Chicago, Chicago 37)

21–23. American Physical Soc., Division of High-Polymer Physics, 21st, Monterey, Calif. (D. W. McCall, Bell Telephone Laboratories, Murray Hill, N.J.)

21–23. American Power Conf., 23rd annual, Chicago, Ill. (W. C. Astley, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa.)

21–24. American Assoc. of Anatomists, 74th annual, Chicago, Ill. (O. P. Jones, Dept. of Anatomy, Univ. of Buffalo, Buffalo 14, N.Y.)

21–30. American Chemical Soc., 139th, St. Louis, Mo. (A. T. Winstead, ACS, 1155 16th St., NW, Washington 6)

23–25. American Orthopsychiatric Assoc., 38th annual, New York, N.Y. (M. F. Langer, AOA, 1790 Broadway, New York 19)

(See issue of 20 January for comprehensive list)