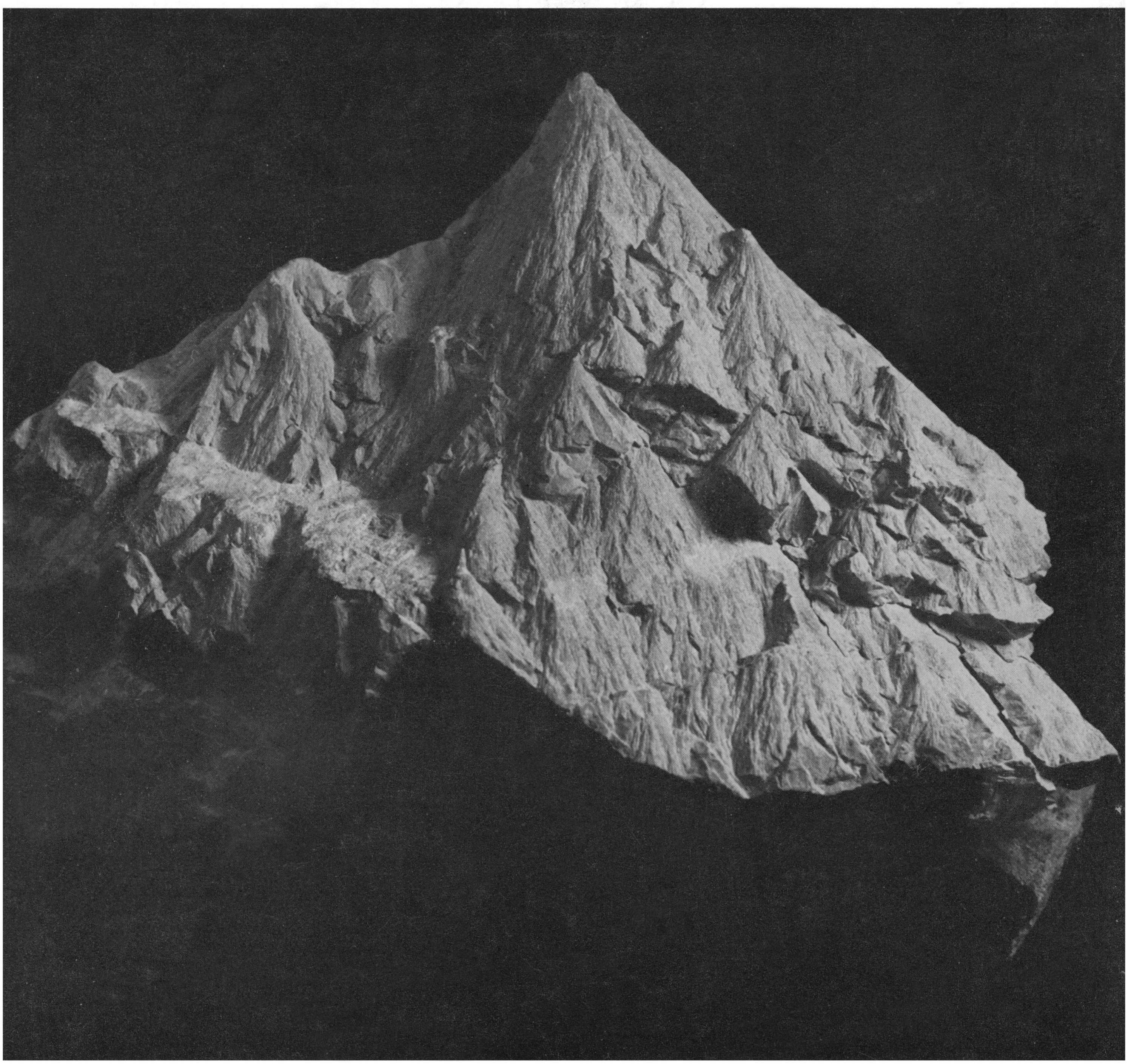
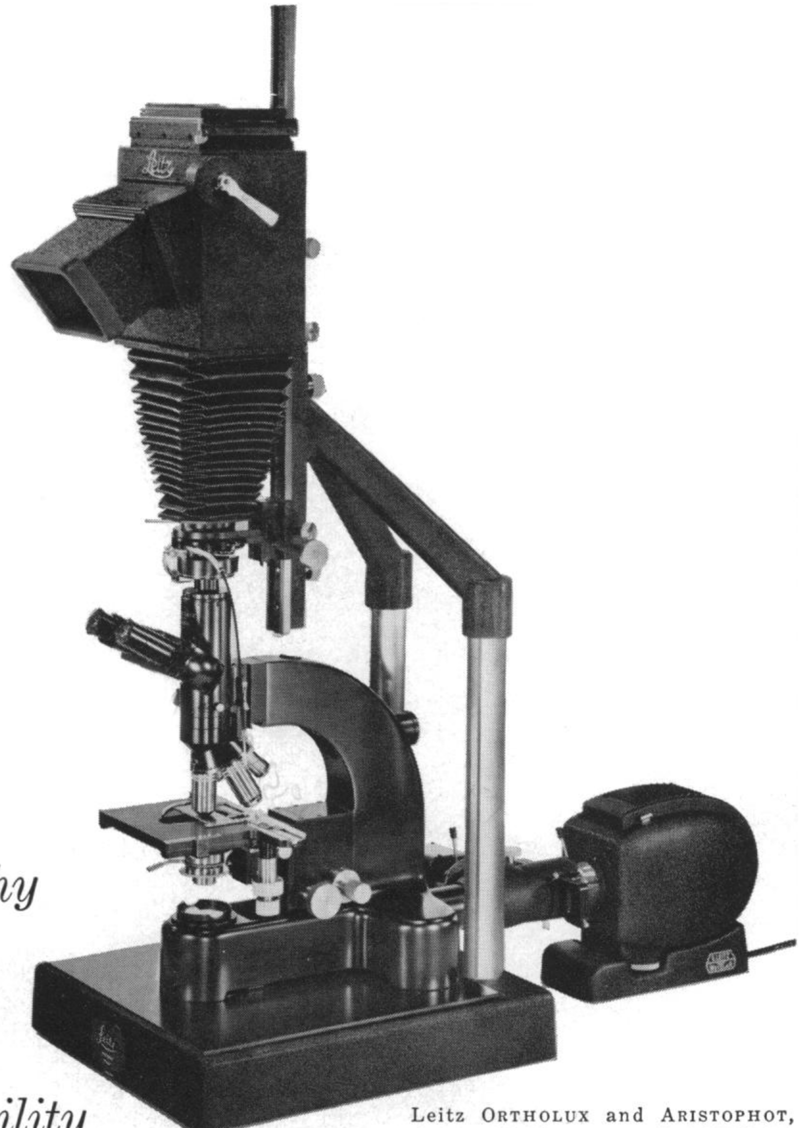
SCIENCE

17 June 1960
Vol. 131, No. 3416

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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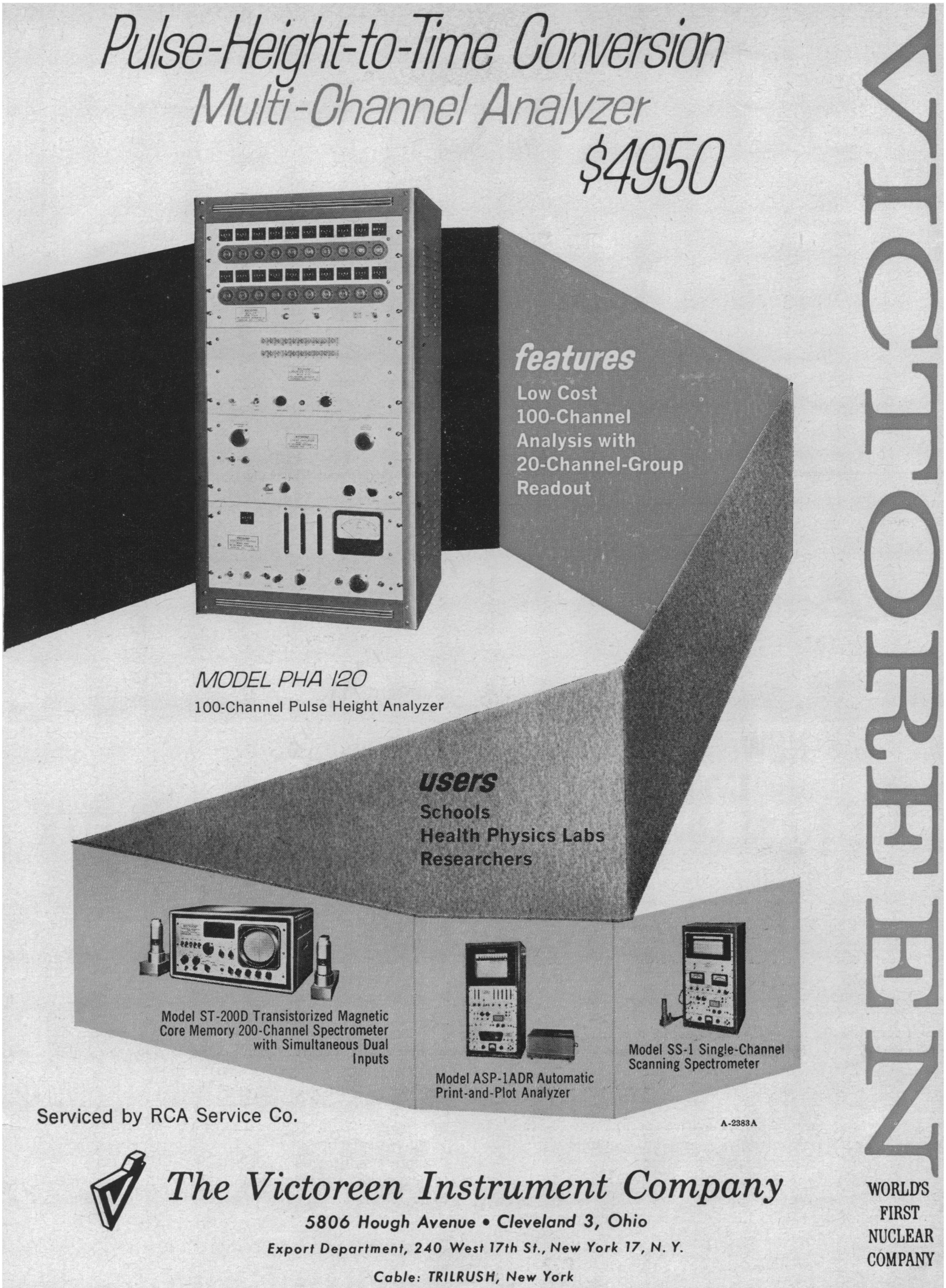

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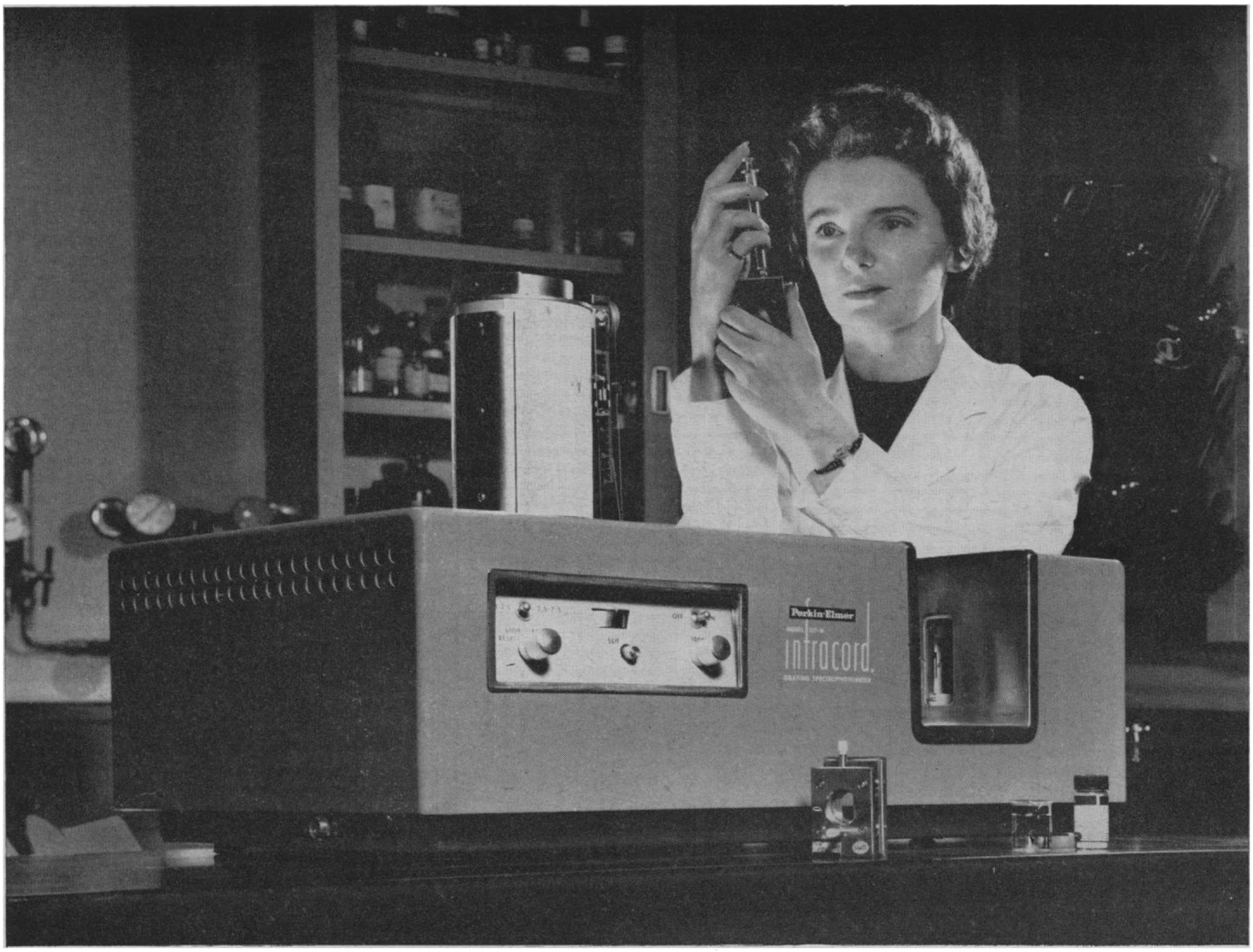

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17 June 1960, Volume 131, Number 3416

SCIENCE

Cover Shatter coned Knox dolomite from the Wells Creek Basin cryptoexplosion structure in Tennessee. The coning is believed to have resulted from an intense high-velocity shock wave from a meteorite impact (about one-half natural size). See page 1781. [C. W. Wilson, Jr., Vanderbilt University]

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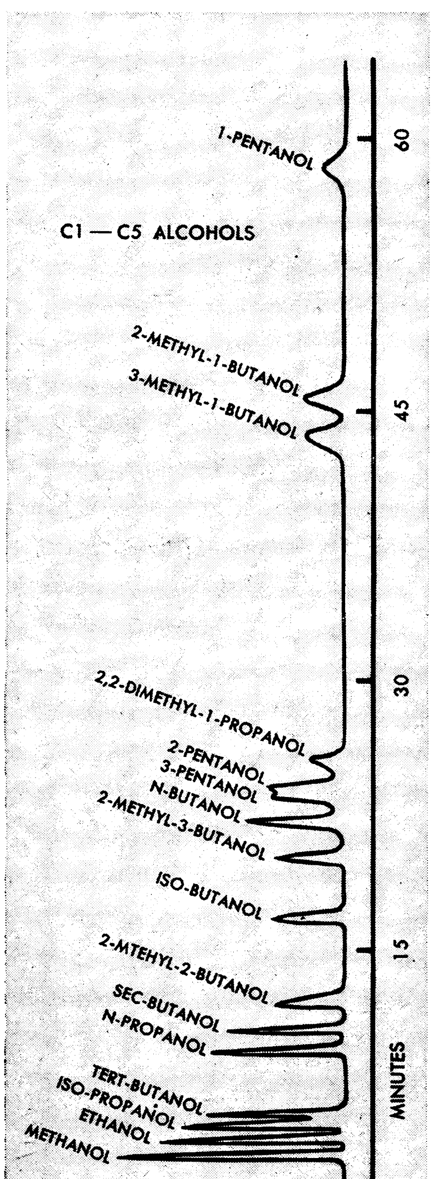

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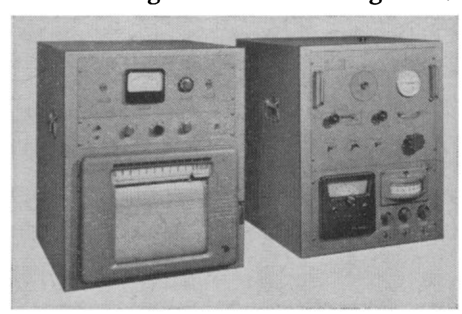

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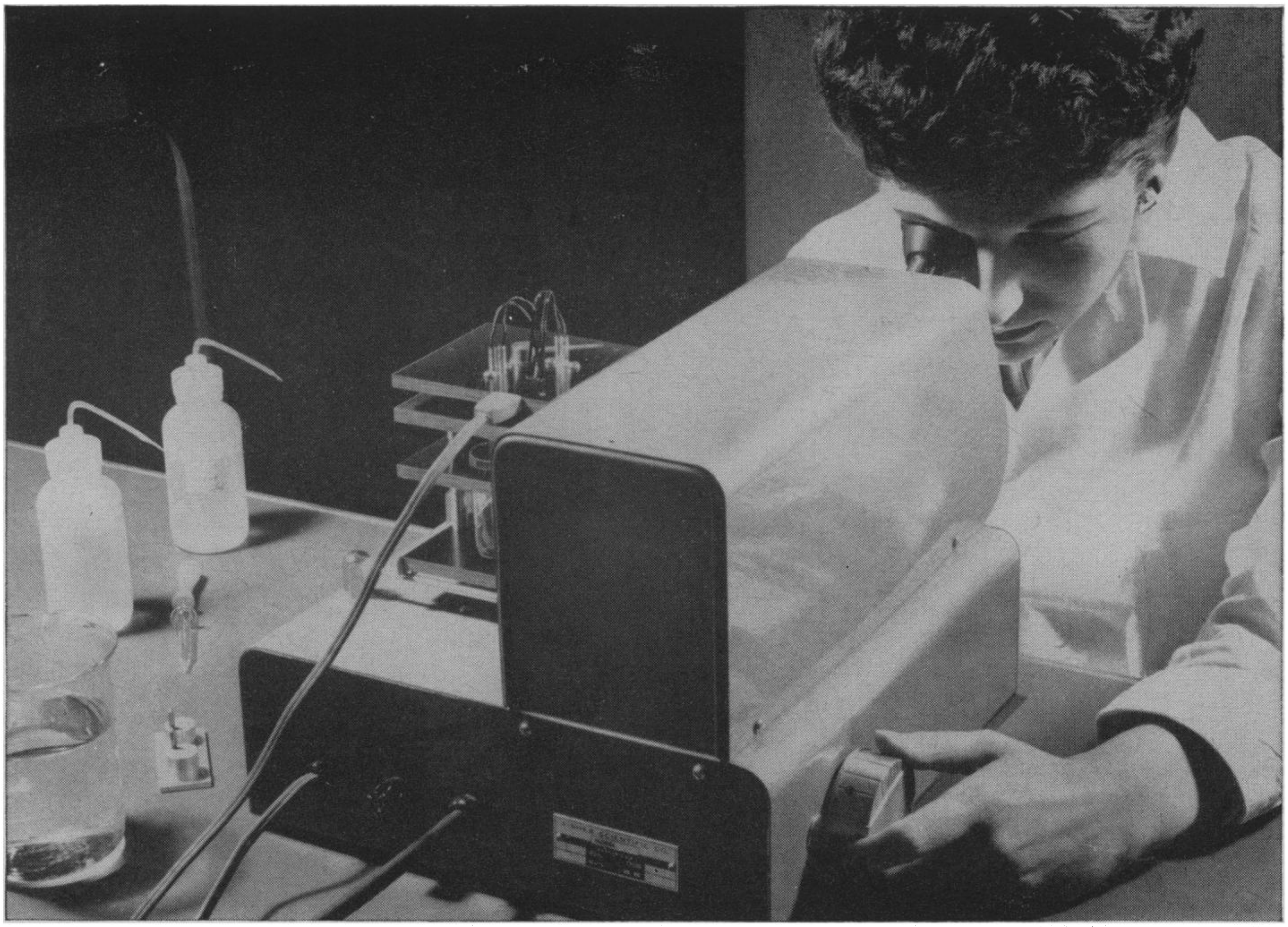

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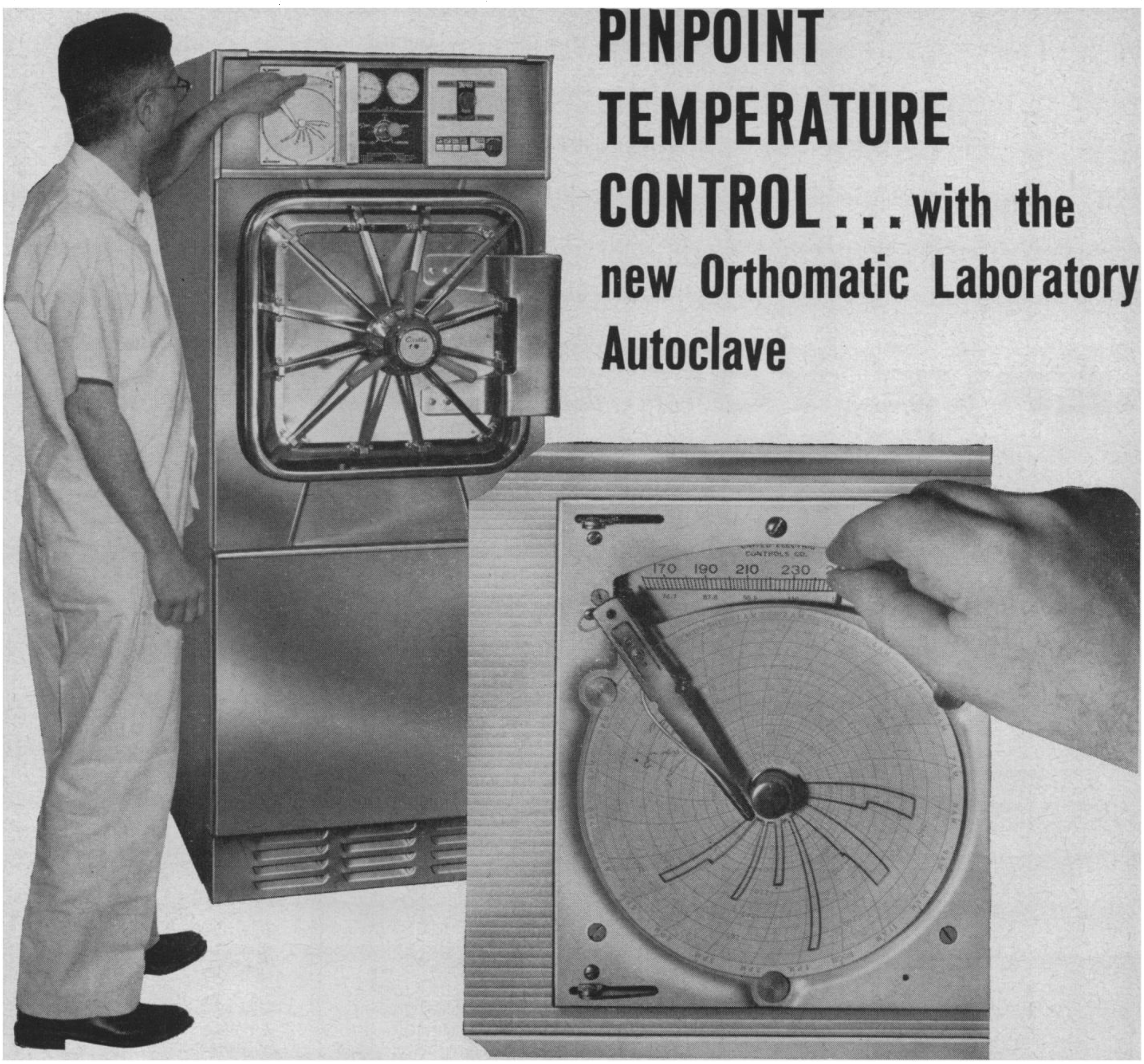

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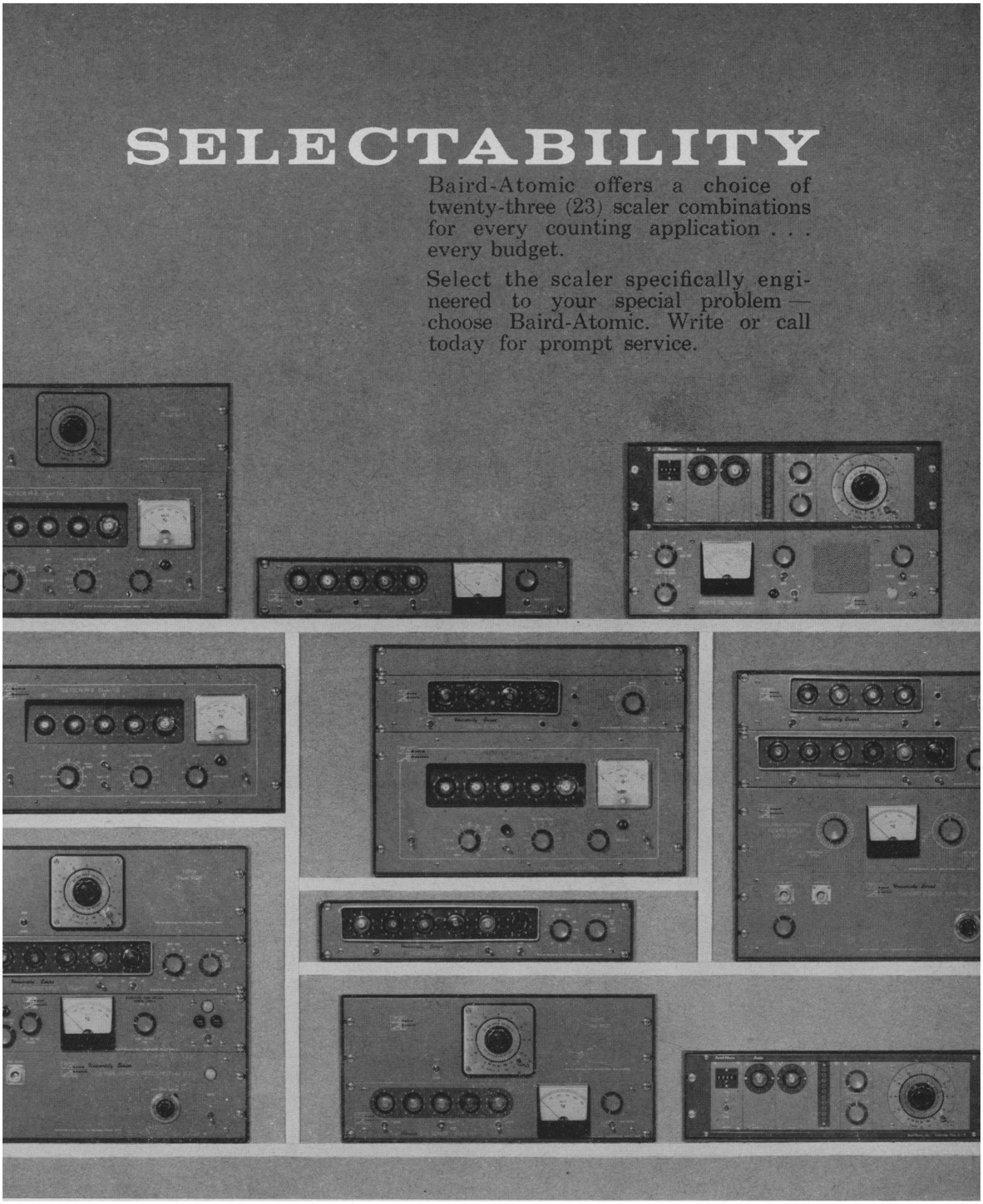
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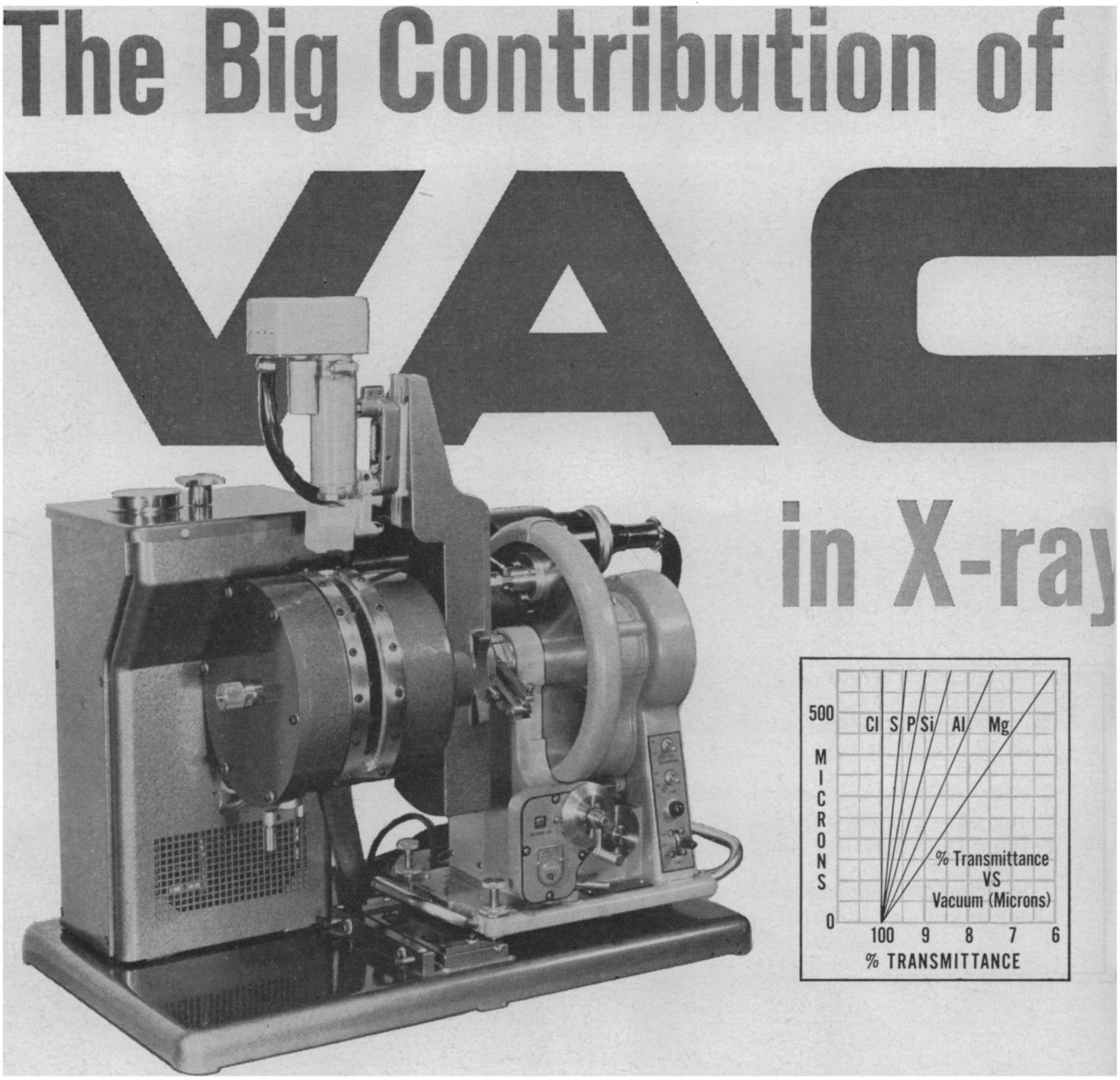

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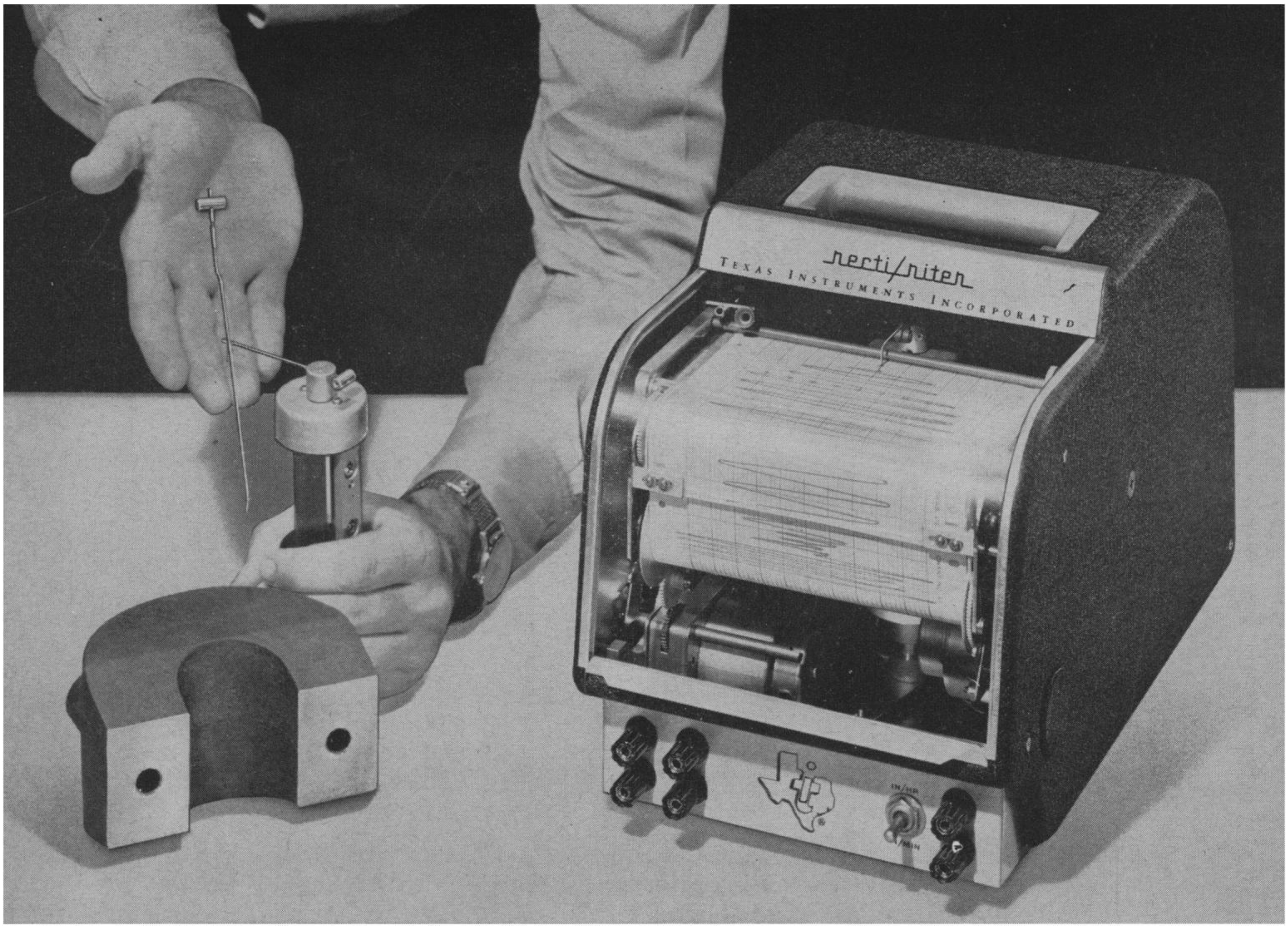

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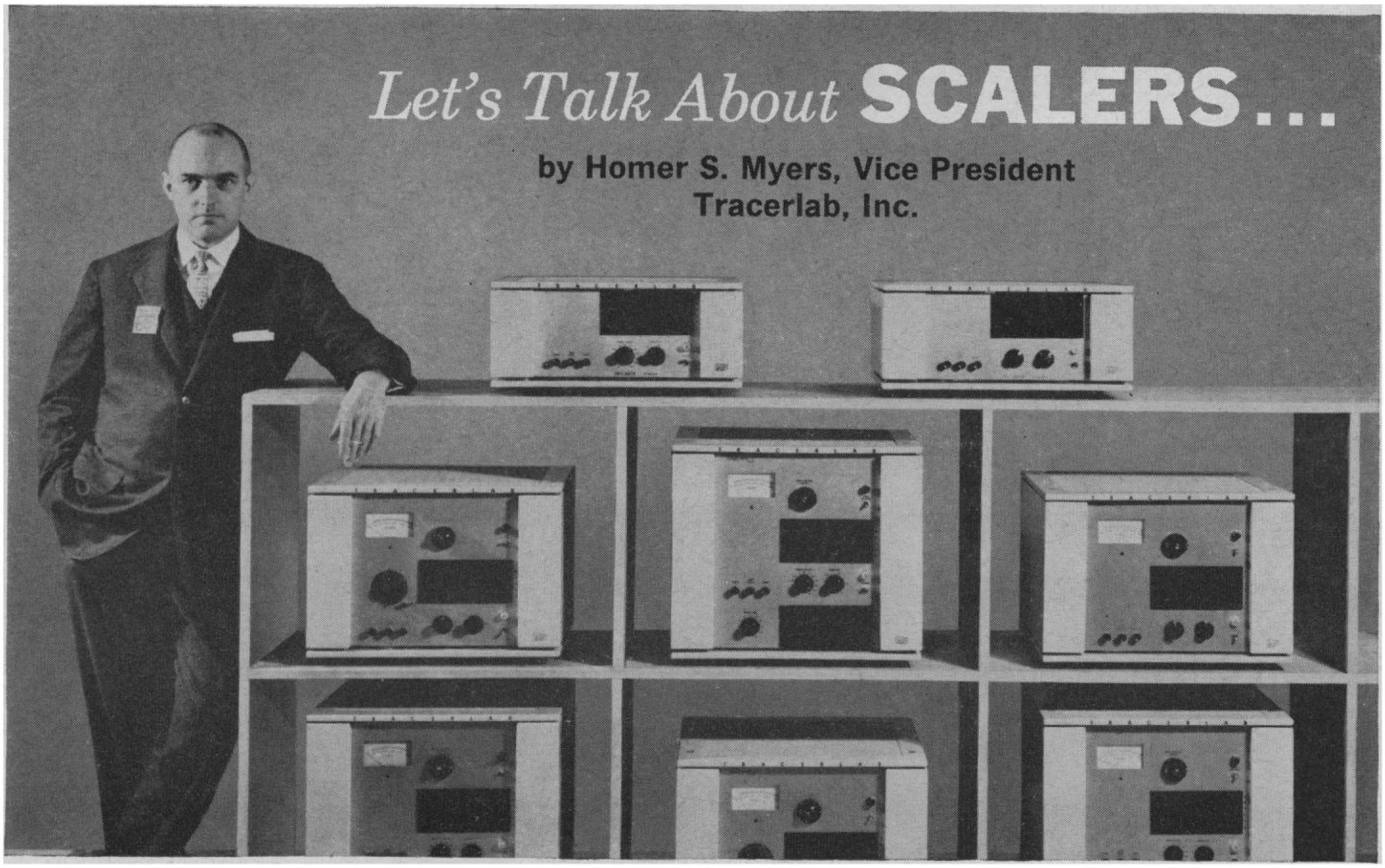
One of a series of discussions on topics of particular interest to those employing radioisotopes and tracer techniques.



Scalers have come a long way since Tracerlab designed and produced the first all-electronic automatic scaler back in 1946. Today several hundred types, made by more than 50 different companies, are available. So, if you are planning to buy a new one, this eight point check list will help you in making your decision. Consider:

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2. Availability of preset count and preset time.
3. Resolving time.
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6. Adaptability to future needs.
7. Reputation and experience of manufacturer.
8. Cost.

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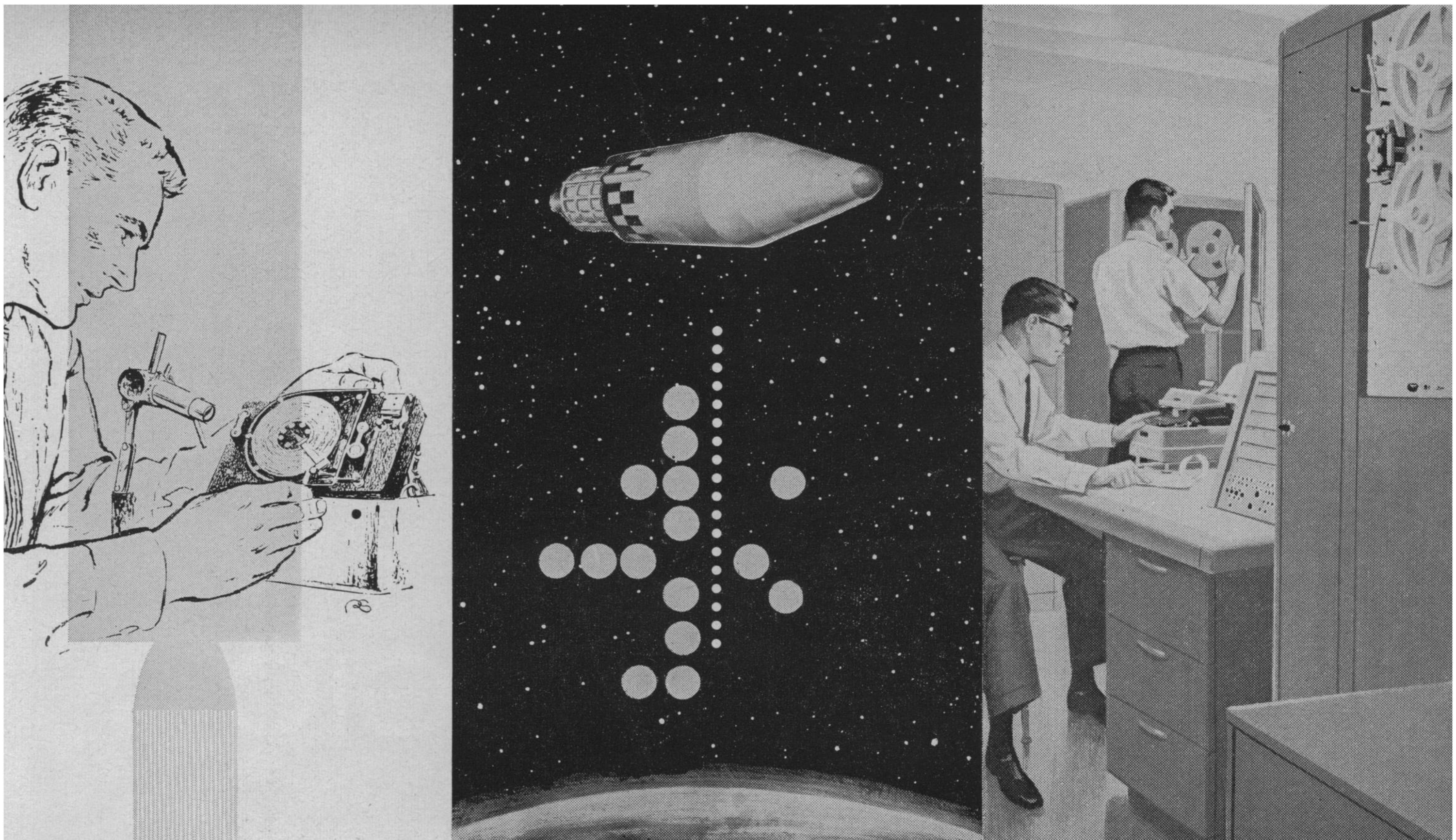

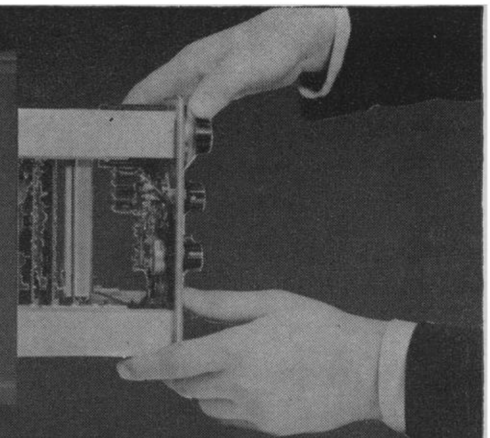

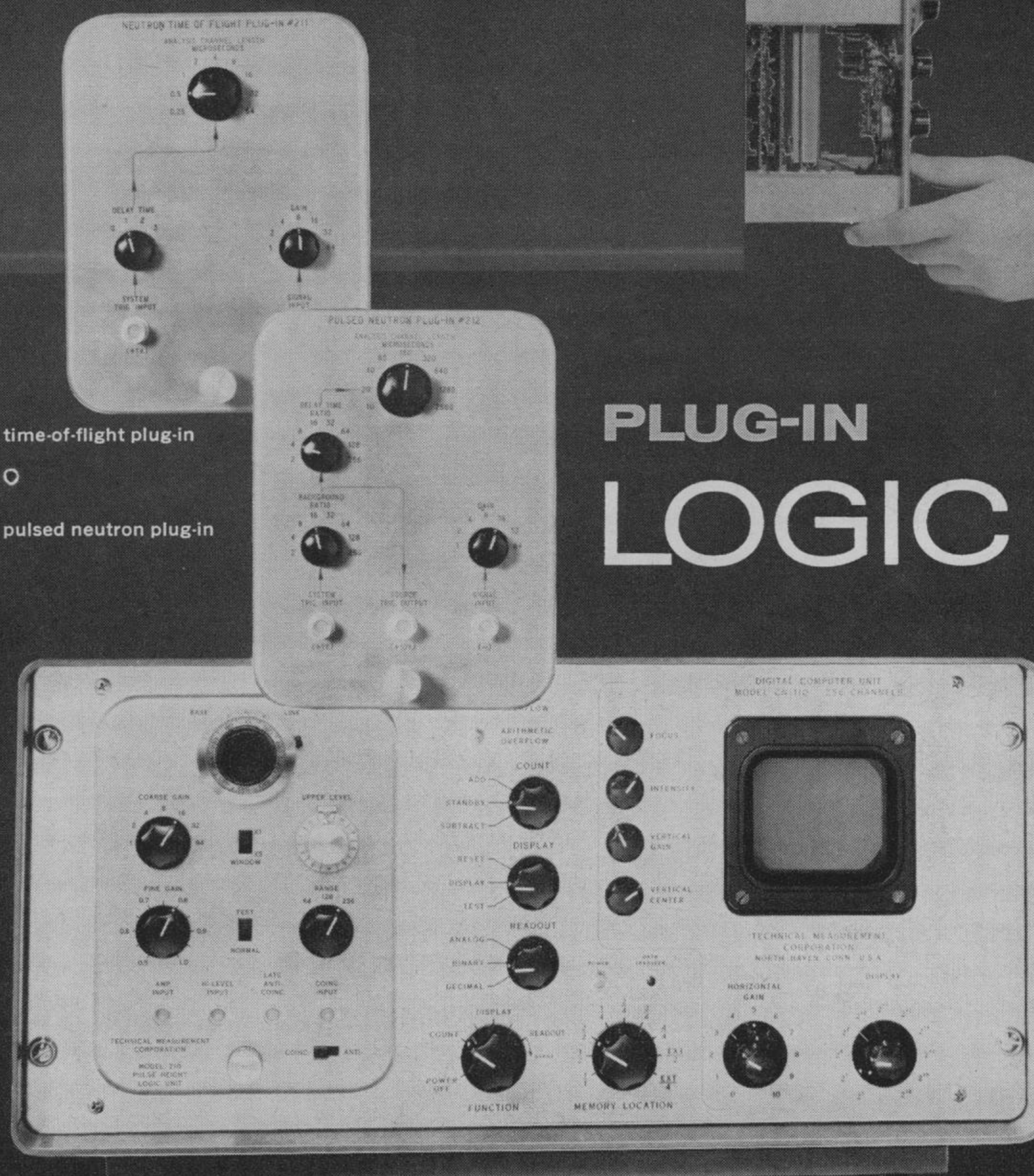

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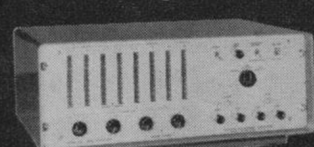

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Science Teacher Certification

State departments of education hold legal responsibility for teacher certification. In granting certificates, a state certification officer, in some instances, administers state laws and, in others, requirements set up by a state board of education or committees appointed by and advisory to the state education department. Until recently academicians have had no prominent place on these advisory committees. There is justification for the criticism that most certification requirements provide for adequate preparation in professional education but not in major specialization.

The National Council for Accreditation of Teacher Education (NCATE), affiliated with the National Commission on Accrediting, accredits teacher-education programs of colleges, requiring that the college first be accredited by the regional association, such as the North Central Association, and asks that states grant certificates to graduates of teacher-education programs of NCATE-approved colleges. Several states follow this practice but apply state standards for certificates in special areas.

As a first phase of the teacher preparation-certification study, sponsored by the National Association of State Directors of Teacher Education and Certification (NASDTEC), with the cooperation of AAAS [*Science* **130**, 1237 (1959)], four regional conferences—in Chicago, Salt Lake City, Atlanta, and New York—have been held in which preliminary recommendations of guidelines for teacher certification in science and mathematics were made. Participants included scientists, certification officers, and representatives of teachers colleges and public schools. In these conferences scientists expressed their point of view to certification officers in 47 states. The Garrett report [*Science* **131**, 1024 (8 Apr. 1960)] was highly influential in the formulation of recommendations. Certification officers demonstrated their desire to establish standards for science teacher certification much as scientists wish them to be. For example, the mathematicians recommended four courses in mathematics for the prospective elementary teacher, and certification officers supported them. It is rare, at this time, that even one course is required.

The guidelines to be prepared in the NASDTEC-AAAS study are for use by the several states in approving teacher-education programs in science and mathematics. If the study is successful, state departments of education will be advocating programs which have been developed cooperatively with scientists in the various scientific-society and curriculum projects. A college scientist may find himself to be less up to date than the certification officer in his state! At the annual meeting of NASDTEC in San Diego, 19–20 June, further consideration will be given to the regional conference recommendations. Subsequently, in the four-day San Diego conference of the National Commission on Teacher Education and Professional Standards, cosponsored by AAAS, NAS–NRC, and the American Council of Learned Societies, scientists and educators again will work together in planning improved teacher-certification programs.

Several scientific societies have studied proposals for accreditation or for recognition by them of secondary school teachers. Now some educationists are suggesting that the scientists do this. Serious study of such accreditation is called for. The NASDTEC-AAAS study recommendations will be reviewed in the 50 states in the coming year. It is essential that scientists take a very active part in these state deliberations. The leadership which scientists want from state departments of education can be obtained only if scientists are willing to give time to this important work.—JOHN R. MAYOR, *AAAS*

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Letters

Scientists and Responsibility

Science deserves the gratitude of scientific men of good will everywhere for publishing Bertrand Russell's magnificent little speech, "The social responsibilities of scientists" [**131**, 391 (1960)]. Russell's message is as old as the problem with which he deals, but never before in human history has the need for saying it been more acute. Let us hope it is heard widely, "loud and clear."

Every scientist has to make a living and, if he is to pursue a scientific career, must have the wherewithal in equipment, money, and freedom to carry out his work. Increasingly, however, he is faced with an ever-narrower orbit of choice of problems to be investigated and scope and emphasis of investigation. Rewards of wealth and position for "popular" or "approved" research in terms of policy needs of government and industry burgeon in tantalizing proportion as rewards for "unpopular" or "disapproved" or "impractical" research shrink alarmingly. The university, traditional stronghold of scientific freedom, becomes almost pervasively dependent upon the largess of government and industry for research funds already earmarked for official or business purposes.

We in the social and behavioral sciences, though not often involved directly in the mad marathon of devising an ever more horrendous armamentarium, also bear responsibility for the consequences of our works. Had we not known this before, the scathing rebukes of a C. Wright Mills should have made it apparent (though self-conscious contentiousness tends to dilute the effectiveness of his argument). Like the physical scientists we are engaged in large numbers in research on "applied" —or what some of us term "action"— problems, in which funds are supplied by government and industry or by foundations geared often to similar objectives. Many of us find satisfaction in being able to use our skills in efforts which we hope will alleviate or change some area or aspect of a painful human condition. Simultaneously we may be subject to pressures, however delicately subtle, to orient data collection and findings in the direction of enhancement of, say, the institution or organization in which the investigation occurs. Thus, strong and persistent effort is required to maintain scientific integrity and insure that *all* results will see the light of day, and not alone those which confirm existing policies.

While sporadic symposia have occurred in the past (and frequently in such groups as the Society for Applied

Anthropology), I urgently propose that each of the professional organizations and academies in the social sciences enter the subject of scientific social responsibility for rounded and open discussion in its meetings and journals.

DAVID LANDY

223 Grant Avenue,
Newton Centre, Massachusetts

Physics has not always been an important profession. What we seem to find important is some knowledge of ourselves in relation to whatever and whoever interacts with us most strongly, rather than knowledge of the simpler and more remote world which physics describes. Even the practical results of physics, while historically pertinent, have seldom been a dominant factor in men's lives. When a physicist, in the past, had to decide on a job, his decision was of concern mainly to himself. Others, including military leaders, were not too strongly affected, either practically or otherwise. They had worse worries.

This is no longer so, of course. We do not know whether a nuclear war would essentially destroy the human race, or whether it would appear to our descendants as harmless compared to what they could perpetrate. We do know that millions of men and women may suffer and die owing to the work of our hands and minds.

If nuclear armaments clearly led to nuclear war, the moral choice would lie between wholesale death and destruction, on the one hand, and whatever these items may purchase on the other. That choice seems clear: working on nuclear armaments would be immoral. We could then note that armament races, in the past, have always led to war, and thus consider the moral question of what to work on as solved.

This is not a valid conclusion, however: everything in the past has led to wars—armament races, *pax Britannica*'s and disarmament treaties alike. We have wound up fighting each other whenever some greater force has not prevented us. Now, there is no way to decide whether the fear of nuclear armaments has prevented a third world war up to now. Neither can we foretell whether the balance of terror induced by nuclear armaments will provide the pressure needed to force us into a world organization which can effectively prevent war. Since we do not know the answer to these questions, we cannot take some guess and make it serve as the basis for a moral decision. All we know is that nuclear weapons exist, and, whether the terror is balanced or not, there is certainly plenty of it to go around. What should we do then?

First, any agreement, even one which fills an obvious mutual need, can only be kept alive and in force if courage and generosity are forthcoming from some of those concerned. We can, therefore, work to the end of increasing these qualities, along with all men. We have a special incentive to do so: if world war does come, it will indeed be better for physicists if they had never been born. That will be their own opinion as well as most everyone else's! The very possibility makes us wish "not to learn war any more," in the phrase of Fox's celebrated statement to Charles II, and to turn to morally safer pursuits.

We can use our special knowledge to make the consequences of war as clear as possible. We can advise framers of agreements and makers of policy concerning the technical pitfalls that we know about, so that the agreements and policies will not fail through any ignorance or conceit of ours.

But none of this is physics. Doing these things does not answer the question, Shall we work on armaments? What jobs shall we do?

I am not sure that it is showing social responsibility for all of us to turn away, in our work, from what we have done, as being too horrible to contemplate. The real hope is that our maturity in knowing and dealing with each other can grow to match our maturity in knowing and dealing with the rest of our environment. This hope is a forlorn one if we try to force the match by burying nuclear tests, or by forgetting or even failing to explore some areas of our knowledge. We will not become more mature that way.

We have to build institutions strong enough to withstand all the pressures for war which exist now and which will become worse if we allow ourselves to forget the fireballs and what they can do. Such institutions do not come about easily. They may not come without war. They will not come at all, or, if they come, they will not last, if we simply destroy our current worst weapons and hope for the best.

Under these circumstances, in what way does it help for physicists to quit working on the physics of nuclear armaments? Surely we are not so conceited as to believe that our well-intentioned admonitions will succeed where the awesome results of our work would fail.

These are questions which I have not been able to answer and concerning which Bertrand Russell's advice would be most welcome.

MICHAEL M. MAY
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Bertrand Russell's article will be long remembered as a classic of rationalization. Russell states that scientists must concern themselves with the uses that society makes of scientific discoveries. In the case of "pure" science, that is manifestly impossible. We have been teaching scientists that it is impossible to foresee the future applications of their pure research and unwise to concern themselves with them. Now, says Russell, we should condemn Rutherford for his investigations of the structure of matter and Einstein for his equation on the relation between energy and matter because they have led to the atomic bomb. Should we not criticize Russell himself for his mathematical writings, which may have contributed something to the calculations that led to atom bombs?

Russell advises scientists to support fields of research the practical uses of which are beneficial. There are no such fields. All forms of scientific knowledge can be used for beneficial or nonbeneficial purposes according to the user's wish. Pasteur's work on fermentation might seem beneficial to some because it led to pasteurization, but to others it might seem nonbeneficial because it led to increased alcohol production and possibly to increased alcoholism.

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Evolution and Modern Man

In his article "The world into which Darwin led us" [*Science* **131**, 966 (1 Apr. 1960)] George Gaylord Simpson proposes a criterion by which we can judge the validity of a hypothesis in natural science. "Perceptions that are not materially testable," he says, "or that have been contradicted by adequate tests are not rationally valid." Among valid perceptions he includes that of the truth of evolution considered as a fact, not merely as a theory. He acknowledges that "the import of the fact of evolution depends on how far evolution extends, and here there are two crucial points: does it extend from the inorganic into the organic, and does it extend from the lower animals to man?"

At these crucial points we look for a careful application of the criterion for rational validity, and we find: (i) some experts consider the experimental production of life from the nonliving as something not only materially testable but also as "imminent"; (ii) no evolutionist has seriously questioned that man did originate by evolution, although some have maintained that special principles are required to explain human origins.

In other words, the hypothesis of evolution is materially testable, and has not been contradicted by adequate tests. No claim is made that evolution, at its crucial points, has been established by adequate tests, or that it has been unambiguously observed as an accomplished fact. Nevertheless, we are expected to perceive the truth of evolution, and the fact itself is proposed as "a matter of simple rational acceptance or superstitious rejection." It takes very sharp perception, indeed, to see all this as a matter of fact, however satisfied one may be with evolution as a theory.

Furthermore, Simpson insists that, although the world certainly has purpose, and directiveness is characteristic of vital process, still these are amply explicable by natural selection. "The hypotheses of vitalism and finalism are not necessary. Everything proceeds as if they were nonexistent." The vitalism and finalism which are here rejected are not the classical principles of Aristotle, the father of biology, or of Harvey, the founder of modern biology. Both Aristotle and Harvey thought that organs such as the heart or the eye, which are normally found in certain types of animals, are inner ends or goals of embryonic development. These great naturalists reasoned that whatever happens is either by necessity, or by chance, or for a purpose. Normal organs of vision and circulation are not strictly necessary, as we know from the fact that they are sometimes lacking, and sometimes are abnormal in structure and function. Nevertheless, they are useful instruments regularly developed in many species of animals, and so they are not by mere chance, which is haphazard. Consequently they are the ends of specialized development.

The embryo proceeds by active and orderly stages of self-development toward the perfection of the whole, and in countless cases manifestly attains it. This is the classical meaning of vitalism and finalism in regard to the individuals of concrete experience, which are the ones we know best. Any other account of these facts in teleological terms is a travesty of the classical principles of natural science. To say that everything proceeds as if these principles were nonexistent is to say what is manifestly untrue. An eye is produced by matter of a very special disposition tending actively in a definite way and in a definite environment to a definite goal. If Simpson wishes to maintain that an eye can be produced by matter which lacks an active tendency of self-development oriented toward a definite goal, he should meet the requirements of his own criterion for what is rationally valid.

WILLIAM H. KANE
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George Gaylord Simpson's "The world into which Darwin led us" has left me rather puzzled and a bit disturbed. It was difficult to determine just what Simpson's purpose was. He seemed to be reviving the 19th-century science-religion battle, which few mature believers have difficulty with today.

Simpson seemed to say that religion has no right to claim mechanistic explanation of observable phenomena. In effect, religion should stay out of the laboratory.

What Simpson seems to misunderstand is that few modern believers in his "higher superstition" will disagree with his thesis. Religion has left the 19th century, even if only a few naturalists have. The old war is over—evolution in all its scientifically valid aspects can be worked very easily into traditional Christianity.

Yet, I still am trying to understand what Simpson was suggesting. Was it that science has finally enabled us to outgrow religion? That religion is no longer needed? The fact remains, however, that any scientist with a mature concept of and belief in the supernatural—and who understands the limitations of science—knows that science can never disprove the existence of a transcendent state.

Indeed, the day science claims ultimate explanation will be the day it loses its humility, and thus its vitality.

Some day I hope to hear a naturalist recommend that our lonely and pessimistic 20th-century man come to grips with what is often called his spirit. The "Dr. Simpson naturalist school" may be stressing man's responsibility to himself, but it nevertheless appears that, even though he lives in an age of self-reliance, abundance, and various brands of "freedom," modern man has become a goalless, lonely prisoner of his technosphere.

Perhaps Simpson meant that the "higher superstition" is still too much with us and must be shorn away completely. But here he would have to assume that religion (the higher superstition) has had no positive role in the shaping of our culture. This has never been shown—and, sadly, few will admit that it deserves study. Perhaps somebody besides a theologian ought to suggest bringing man's essentially spiritual nature back into harmony with his evolving, material nature—his continually greater consciousness.

WIL LEPKOWSKI
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Kane and Lepkowski have interestingly widened the discussion by consideration of things not actually said in my article.

In that article I gave a criterion (obviously only one of several possible) for "perceptions . . . not rationally valid." That is not at all the same thing as a criterion for the correctness of a scientific conclusion, and the issue is obscured by Kane's assumption that they are the same, or that I thought they were. It has of course happened repeatedly that rational perceptions have been contradicted by subsequent scientific discovery. Two centuries ago it was rational for man's perception of himself to be based on the postulate of his special creation. Now it is known that the postulate was incorrect, and therefore its acceptance is no longer rational.

Kane further and even more significantly confuses the issue as to criteria for the truth of evolution. Evolution has in fact been established by adequate and positive tests, quite distinct from any negative criterion for validity of perception. I did not enumerate those tests because that was not my subject, because they are far too numerous and complex to summarize in an article, and because the more important of them are known or readily accessible to an educated American audience.

On the topics of vitalism and finalism Kane has changed the subject. I carefully defined those terms as they are understood by modern evolutionists in their relevance to phylogeny and evolution. Surely it is beside the point that Aristotle and Harvey, who of course knew nothing of evolution and whom I purposely did not mention, held different views. The obvious directiveness of individual ontogeny is another matter, one to which I did call attention and for which I mentioned the evolutionary explanation that makes vitalism and finalism (as I defined them) unnecessary hypotheses.

That, as Lepkowski puts it, "religion should stay out of the laboratory" is, on the other hand, a pertinent inference from what I actually said. It does not follow and was neither stated nor implied that all religion is incompatible with science or has no role in modern life. I expressly recognized the inability of science to solve the ultimate mystery. I also emphasized that quasi-religious concepts of vitalism and finalism (in the evolutionary, not Neo-Aristotelian, senses, please) cannot be scientifically disproved but are simply unnecessary and inappropriate in the laboratory.

Both Kane and Lepkowski are evasive as to the real point of such of my remarks as had any bearing on religion. That point is that opposition on solely religious grounds to well-attested scientific conclusions about the material universe is superstitious and impedes human progress. Evolutionists recognize that religion, in a suitably liberal sense, can be compatible with a rational, evolutionary concept of man. Lepkowski's suggestion that communicants of dogmatic religions now generally share that view is unfortunately not true. Even if other evidence were lacking, a look at my mail for a

week or two would disillusion him. A few sects, including the Roman Catholic, do conditionally permit the accommodation of evolutionary fact to official dogma. Even in those sects many pastors and most laymen nevertheless reject evolution on superstitious grounds, and it is well known that other sects forbid acceptance of this and some other facts established scientifically.

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Meetings

Program for Collecting Meteorites

The urgent need for a scientific program for collecting meteorites was a key topic at the 22nd meeting of the Meteoritical Society. Attended by 50 members and guests, the meeting was held at the Harvard College Observatory, Cambridge, Mass., 10 and 11 September 1959, under the auspices of the Smithsonian Institution. A symposium was conducted on the ages of meteorites and on the effects of the bombardment of meteorites by cosmic rays. During the regular sessions, participants read technical papers on the spectra of meteor trails, electron-probe microanalysis, meteorite craters, micrometeorites, cosmic dust, and tektites. Of particular importance was a conference held to discuss the critical shortage of meteoritic materials for research purposes and to outline a cooperative program to improve the situation.

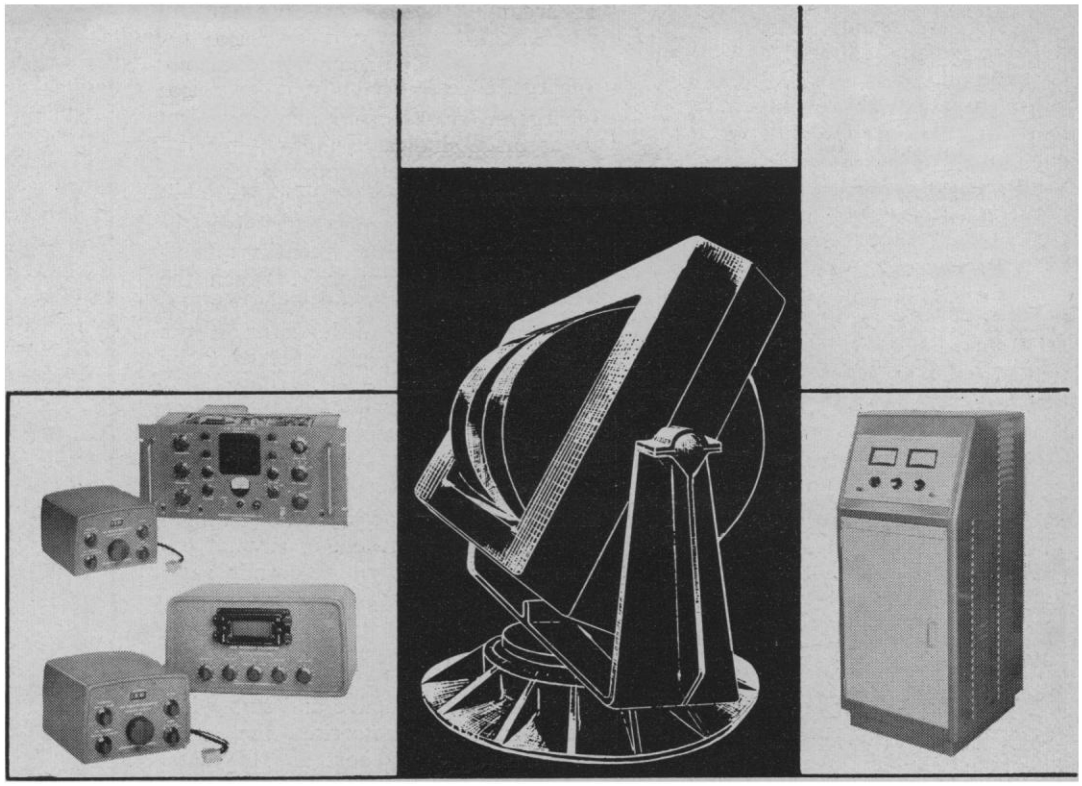
A scientist working alone can do fruitful research on meteorites if he has suitable and adequate specimens. However, the efficient collection and proper distribution of meteorite samples requires the cooperative efforts of many people.

The amount of meteoritic material available in the United States is rapidly diminishing as specimens from private and institutional collections and the meagre supply from new falls are rapidly being used up in research. Meanwhile, our need for such material is growing rapidly. At present, researchers receive samples from only about one new fall a year, an amount far less than that required for the many investigations now being carried on. As a consequence, some important research cannot be undertaken, and some investigations presently under way are starved for material.

Importance of Meteoritic Research

Results important both to astrophysics and to our national space program have been obtained from the study of the chemical, metallurgical, and mineral composition of meteorites and from measurements of the amounts of radioactive and stable isotopes produced in meteorites by cosmic rays. These results have contributed significantly to our knowledge of cosmic rays in the far regions of the solar system; the frequency of collisions among asteroids, comets, and cosmic dust; the history of the temperature and pressure to which meteorites have been subjected; the abundances of the chemical elements; the ages of meteorites; and the time lapse between the formation of the elements and the formation of the meteorites.

Measurements of the abundances of long-lived radioactive isotopes in meteorites tell us the average of the cosmic-ray intensity in the same region of space at different times; measurements of the abundances of short-lived radioactive isotopes tell us the intensity of cosmic rays in different regions of space. Recently, the amounts of tritium (half-life, 12.4 years), argon-37 (half-life, 34 days), argon-39 (half-life, 260 years), and chlorine-36 (half-life, 3.1 $\times 10^5$ years) produced in meteorites by cosmic-ray bombardment have been measured in a few samples. The ratio



of argon-39 to chlorine-36 indicates, when integrated over these long half-life times, that the intensity of cosmic rays is constant. However, the ratios of argon-37 to argon-39 and of tritium to argon-39 indicate, when integrated over these short half-life times, that the intensity is not always constant.

These measurements have given us information about the intensity of cosmic rays in the regions between the planets, just as in recent years rockets have provided us with data on the intensity in the region between the earth and the moon.

The amounts of the stable isotopes helium-3, helium-4, neon-20, neon-21, neon-22, argon-36, and argon-38 have also been measured in several specimens. The abundances of these isotopes in some meteorites can easily be explained by the action of cosmic rays; in others, they remain a mystery.

The length of time during which the meteorites were exposed to cosmic-ray bombardment can be derived from this study of the radioactive and stable isotopes. In some meteorites, the exposure time was as short as 10^7 years, while in others it was as long as 2×10^9 years. These data can best be explained by our assuming that collisions between interplanetary bodies have occurred at different times. However, a systematic investigation of this problem will require the experimental use of many more meteorite samples than are now available.

Metallurgical studies of iron meteorites, and studies of the diffusion of the noble gases in stony meteorites, have provided us with valuable information about the history of the pressure and temperature of these bodies. The metallurgical evidence indicates that the iron meteorites cooled very slowly under high pressures until they reached a temperature of approximately 300°C; they remained at this temperature for at least 50 million years and then became cold. On the other hand, the studies of the diffusion of the noble gases in stony meteorites indicate that these were colder than −150°C and under low pressures for almost all of their 4.5×10^9-year history. Further work is needed, however, to establish the validity, consistency, and significance of these observations.

The abundances of the nonvolatile elements in the universe are assumed to be the same as their abundances in chondritic meteorites. We therefore base our theories of the origin of these elements on a study of the chemical composition of chondrites. However, many of the measurements of these abundances which are still used as basic data were made decades ago; we should repeat them, using current laboratory techniques. We need also to investigate further the question of which elements have relatively the same abundances in all chondrites and which have not.

Perhaps even more important than the measurements of the time that a meteorite was exposed to cosmic rays are determinations of the time when it solidified, or its radiogenic age. This time is calculated from the relative amounts of a primordial parent isotope and of the stable daughter isotope. Stony meteorites have much higher concentrations of the isotopes useful for this measurement than do iron meteorites. Consequently, the radiogenic ages of the former have been measured by many investigators by several different methods; 4.5×10^9 years is the maximum value that has been obtained. Recently, the radiogenic age of several iron meteorites has been determined; the value was 10^{10} years, much higher than that for stony meteorites. This work should be repeated and extended.

The presence of isotope xenon-129 was very recently discovered in a meteorite, although a previous investigation had failed to reveal it in a sample of a different meteorite. The amount of this isotope indicates the time between the formation of the elements and the solidification of the meteorite; the value derived for this one sample was 3×10^8.

These and other investigations emphasize the critical need for an abundant supply of meteorite specimens for research purposes. Furthermore, a point often overlooked is the value of a "surplus" of samples. At present, we have so little meteoritic material to work with that every gram must be used only in a carefully planned way. A surplus would allow researchers a greater freedom in their experiments, a freedom which could lead to results that at present we cannot in any way foresee but that might be of great scientific importance.

Haphazard Collecting

The collecting of meteorites in the United States is very haphazard. No effort is made to obtain material from some reported falls; for other falls, collectors compete for the material. There is no cooperative plan for searching for finds. No extensive and continuing survey of the night sky is maintained to record the transits of meteors and determine the possibility of falls. While a few scientists and organizations have been fairly successful in obtaining specimens, there is no over-all program, and there is no well-established and generally accepted procedure.

When a meteorite falls, the owner of the property on which it lands becomes the legal owner of the material. However, he is often uncertain whether it actually is a meteorite, and he seldom knows its scientific and market value. He may take a sample to the curator of a museum or to a faculty member of a local college or university. On the other hand, he may display it on the mantelpiece or store it away, give it away, or throw it away.

If considerable noise was associated with the fall, or if there was some property damage, the event may make the local newspaper and even, though rarely, a metropolitan paper. Frequently, as a consequence of this publicity the owner then asks an exorbitant price for the specimen. A few collectors will investigate such stories and attempt to obtain the meteorite; the others will not.

The personality of the successful collector is also an important factor. Some collectors readily sell or donate samples to scientists and museums; others refuse to part with any.

During the past 40 years, H. H. Nininger has been the most successful and most enlightened collector in the United States and has contributed much of the material now being used in research. Nininger is planning to retire soon.

The U.S. National Museum, the American Museum of Natural History, and the Harvard Geological Museum have also donated many samples to research. However, these museums are not at present in a position to devote much time to collecting new falls; they acquire most of their specimens through bequest or purchase from the estates of private collectors.

The result of this haphazard situation is that we obtain for research only about one new fall a year, whereas we could, through a cooperative, scientific program, acquire materials from perhaps five new falls per year. Furthermore, specimens usually do not arrive at the laboratories soon enough and in good enough condition to be of maximum value to science. For example, if we are to measure the argon-37 in a sample, we must be able to work with the sample in the laboratory within a month or two of its fall; this is seldom possible under present circumstances.

The Proposed Program

The conference at the meeting suggested three methods that would result in more efficient collecting of meteorites. First, a central agency should investigate all reported falls, actively search for meteorites, quickly purchase specimens at reasonable prices, inform interested scientists of the availability of new material, distribute samples for research, and keep accurate records. A clipping service should be used to ensure that all falls reported in the newspapers are made known to the agency. And the active support of meteorite collectors should be enlisted.

Second, amateur astronomer groups, science clubs, and the general public should be alerted to the need for specimens and urged to report to the agency any bright meteors they observe. Ideally, the report should include the time of observation, the estimated magnitude of the meteor, the position at the beginning and at the end of the meteor trail relative to familiar landmarks and to background stars, and the presence or absence of any noise associated with the passage of the meteor.

Third, a network of meteor cameras should be built to photograph continuously and automatically the night sky over a large area of the United States. A realistic plan would be to have between ten and 20 wide-angle cameras stationed 100 to 200 miles apart. Periodically, the film in each camera would be processed and new film would be inserted. When the photographs show that a meteor larger than a certain size (perhaps 1 kilogram) has fallen, a search party would attempt to find the meteorite. From the photographs, the area containing the specimen would be known to within approximately 0.1 square mile.

By this means, two fields of knowledge now separated could be joined. For, associated with each collected specimen would be photographs giving its precise transit through the atmosphere, and from these data its precise orbit in space and its interactions with the atmosphere could be determined. What we thus learn from a study of the meteor trail would be correlated with what we learn from the specimen in the laboratory.

The Smithsonian Institution has agreed to serve as the central agency for this program. The Moonwatch volunteer satellite observing teams have been alerted to report falls. Any information concerning recent meteorite falls should be sent to Dr. F. L. Whipple, Director, Smithsonian Institution Astrophysical Observatory, Cambridge 38, Mass., or to Dr. E. P. Henderson, Curator of Mineralogy and Petrology, U.S. National Museum, Washington 25, D.C.

E. L. FIREMAN

Smithsonian Institution Astrophysical Observatory, Cambridge, Massachusetts

Forthcoming Events

July

11–12. Response of Materials to High Velocity Deformation conf., Estes Park, Colo. (AIME, 29 W. 39 St., New York 18)

11–15. British Dental Assoc., annual, Edinburgh, Scotland. (Secretary, British Dental Assoc., 13 Hill St., Berkeley Sq., London, W.1, England)

11–15. Royal Medico-Physiological Assoc., annual, London, England. (A. B. Monro, 11 Chandos St., Cavendish Sq., London, W.1)

11–16. Inter-American Nuclear Energy Commission, 2nd meeting, Petropolis, Rio de Janeiro, Brazil. (J. D. Perkinson, Jr., Inter-American Nuclear Energy Commission, c/o Pan American Union, Washington 6)

11–18. Earthquake Engineering, 2nd world conf., Tokyo and Kyoto, Japan. (K. Muto, Organizing Committee, 2nd World Conf. on Earthquake Engineering, Science Council of Japan, Ueno Park, Taito-ku, Tokyo)

11–22. Grassland Cong., 8th intern., Reading, Berks, England. (British Grassland Soc., Grassland Research Inst., Hurley, North Maidenhead, Berks)

15–22. Mycology, 6th Commonwealth conf., London, England. (Commonwealth Mycological Inst., Ferry Lane, Kew, Surrey, England)

18–22. International Conf. on Congenital Malformations, London, England. (S. E. Henwood, Intern. Medical Congress, Ltd., 120 Broadway, New York 5)

18–22. Peaceful Application of Nuclear Energy, 3rd Inter-American symp., Petropolis, Rio de Janeiro, Brazil. (J. D. Perkinson, Jr., Inter-American Nuclear Energy Commission, c/o Pan American Union, Washington 6)

18–23. Endocrinology, 1st intern. cong., Copenhagen, Denmark. (G. Pincus, 1st Intern. Cong. of Endocrinology, Worcester Foundation, Shrewsbury, Mass.)

18–25. French Assoc. for the Advancement of Science, 79th cong., Grenoble. (Association Française pour l'Avancement des Sciences, 28 rue Serpente, Paris 6ᵉ)

19–22. International Conf. on Scientific Problems of Crop Protection, Budapest, Hungary. (Z. Király, Research Inst. for Plant Protection, Budapest)

21–27. Medical Electronics, 3rd intern. conf., Olympia, London, England. (Secretary, Institution of Electrical Engineers, Savoy Pl., London, W.C.2)

23–28. Otolaryngology, 7th intern. cong., Paris, France. (H. Guillon, 6, avenue MacMahon, Paris, 17ᵉ)

24–19. Modern Physical Theories and Associated Mathematical Developments, Boulder, Colo. (K. O. Friedricks, New York Univ., 25 Waverly Pl., New York)

25–6. International Assoc. of Physical Oceanography, 13th general assembly, Helsinki, Finland. (B. Kullenberg, c/o Oceanografiska Institutet, P.O. Box 1038, Goteborg 4, Sweden)

26–28. Poliomyelitis, 5th intern, conf., Copenhagen, Denmark. (S. E. Henwood, International Poliomyelitis Congress, 120 Broadway, New York 5)

27–12. Mathematical Statistics and Probability, symp., Berkeley, Calif. (A. P. Burroughs, Air Force Office of Scientific Research, Research Information Office, AFOSR/USAF, Washington 25)

28–29. Computers and Data Processing, 7th annual symp., Estes Park, Colo. (W. H. Eichelberger, Denver Research Inst. Univ. of Denver, Denver 10, Colo.)

30–6. Institute on Religion in an Age of Science, 7th annual conf., Star Island, N.H. (R. Burhoe, American Acad. of Arts and Sciences, 280 Newton St., Brookline 46, Mass.)

31–5. Alcohol and Alcoholism, 26th intern. cong., Stockholm, Sweden. (A. Tongue, Bureau International contre l'Alcoolisme, Case Gare 49, Lausanne, Switzerland)

31–5. Photobiology, 3rd intern. cong., Copenhagen, Denmark. (A. Hollaender, Biology Div., Oak Ridge Natl. Laboratory, Oak Ridge, Tenn.)

31–6. Psychology, 16th intern. cong., Cologne, Germany. (Prof. Undeutsch, Psychology Inst. Universität, Cologne)

31–7. Anthropological and Ethnological Sciences, 6th intern. cong., Paris, France. (H. Vallis, Directeur, Musée de l'Homme, Palais de Chaillot, Place du Trocadéro, Paris 16ᵉ)

August

1–3. Global Communications, 4th symp., Washington, D.C. (R. L. Clark, c/o Office of Director of Defense Research and Engineering, Washington 25)

1–6. Esperanto Cong., 45 annual intern., Brussels, Belgium. (45-a Universala Kongreso de Esperanto, Brussels)

1–12. Modulation Theory and Systems, Cambridge, Mass. (E. J. Baghdady, Dept. of Electrical Engineering, Massachusetts Inst. of Technology, Cambridge)

2–5. Poultry Science Assoc., Davis, Calif. (C. B. Ryan, PSA, Dept. of Poultry Husbandry, Texas A & M College, College Station)

3–6. Gas Chromatography (Infrared Spectroscopy Inst.), Nashville, Tenn. (N. Fuson, Fisk Infrared Inst., Fisk Univ., Nashville 8)

3–6. Rarefied Gas Dynamics, 2nd intern. symp. (by invitation only), Berkeley, Calif. (Engineering and Science Extension, Univ. of California, 2451 Bancroft Way, Berkeley 4)

6–12. International Geographical Cong., 19th, Stockholm, Sweden. (IGC, Postfach, Stockholm 6)

7–10. American Soc. of Clinical Hypnosis, Miami, Fla. (S. Hershman, 6770 N. Lincoln Ave., Chicago 46, Ill.)

7–12. Gerontology, 5th intern. cong., San Francisco, Calif. (L. Kuplan, Intern. Cong. of Gerontology, P.O. Box 2103, Sacramento 10, Calif.)

7–13. Industrial Research Conf., Harriman, N.Y. (Miss M. F. Garvey, Industrial and Management Engineering Dept., Columbia Univ., New York 27)

8–11. American Astronautical Soc., Seattle, Wash. (R. M. Bridgforth, AAS, Propulsion Unit, Boeing Airplane Co., Aero-Space Div., P.O. Box 3707, Seattle 24)

8–12. American Inst. of Electrical Engineers, San Diego, Calif. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)

8–13. World Federation for Mental Health, 13th annual, Edinburgh, Scotland. (Secretariat, WFMH, 19 Manchester St., London, W.1, England)

8–20. American Soc. of Criminology, London, England. (D. E. J. MacNamara, New York Inst. of Criminology, 115–117 W. 42 St., New York 36)

9–13. Hail Storms, intern conf., Verona, Italy. (H. G. M. Ligpa, American Meteorological Soc., Stanford Research Inst., Stanford, Calif.)

11–13. Rocky Mountain Radiological

Soc., Denver, Colo. (J. H. Freed, 4200 E. Ninth Ave., Denver 20)

11–16. Canadian Teachers Federation, Winnipeg, Manitoba. (G. G. Croskery, 444 MacLaren St., Ottawa 4, Ontario)

14–19. American Pharmaceutical Assoc., Washington, D.C. (R. P. Fischelis, APA, 2215 Constitution Ave., NW, Washington 7)

14–19. International Cong. of Clinical Chemistry, Edinburgh, Scotland. (S. C. Frazer, Clinical Laboratory, Royal Infirmary, Edinburgh)

14–20. Cardiology, 6th Inter-American cong., Rio de Janeiro, Brazil. (H. Alqueres, P.O. Box 1594, Rio de Janeiro)

15–16. National Assoc. of Boards of Pharmacy, Washington, D.C. (P. H. Costello, 77 W. Washington St., Chicago, Ill.)

15–17. Heat Transfer Conf., ASME and AICE, Buffalo, N.Y. (A. B. Conlin, Jr., ASME, 29 W. 39 St., New York 18)

15–17. Organic Scintillation Detectors, intern. conf., Albuquerque, N.M. (G. H. Daub, Chemistry Dept., Univ. of New Mexico, Albuquerque)

15–18. American Veterinary Medicine Assoc., Denver, Colo. (H. E. Kingman, Jr., 600 S. Michigan Ave., Chicago 5, Ill.)

15–18. Radiation Biology, 3rd Australian conf., Sydney, Australia. (P. Ilbery, Dept. of Preventive Medicine, Univ. of Sydney, New South Wales, Australia)

15–20. International Astronautical Federation, 11th cong., Stockholm, Sweden. (Secretariat, Intern. Astronautical Federation, 12, Bessborough Gardens, London, S.W.1, England)

15–23. Soil Science, 7th intern. cong., Madison, Wis. (R. Bradfield, Dept. of Agronomy, Cornell Univ., Ithaca, N.Y.)

15–24. Crystallography, intern. cong., Cambridge, England. (W. H. Taylor, Cavendish Laboratory, Cambridge, England)

15–25. Chemistry of Natural Products, IUPAC symp., Melbourne, Canberra, and Sydney, Australia. (Convener, Symposium Organizing Committee, Box 4331, G.P.O., Melbourne)

15–25. International Geological Cong., 21st session, Copenhagen, Denmark. (IGC, Mineralogical-Geological Museum, Univ. of Copenhagen, Øster Boldgade 7, Copenhagen K)

15–25. International Paleontological Union, Copenhagen, Denmark. (J. Roger, Service d'Information Geologique, B.R.G.-G.M., 74, rue de la Federation, Paris 15e, France)

15–25. Sedimentology Cong., 6th intern., Copenhagen, Denmark. [General Secretary, IAS, c/o Institut Français du Petrole, 4, place Bir Hacheim, Rueil-Malmaison (Seine-et-Oise), France]

16–18. Biological Effects of Microwave Radiation, 4th annual conf., New York, N.Y. (M. Eisenbud, New York Univ. Post Graduate Medical School, 550 First Ave., New York 16)

16–19. Society of Automotive Engineers, San Francisco, Calif. (R. W. Crory, SAE, Meetings Operation Dept., 485 Lexington Ave., New York 17)

17–19. Hydraulics Conf., Seattle, Wash. (W. H. Wisely, American Soc. of Civil Engineers, 33 W. 39 St., New York 18)

17–19. University Nuclear Reactors,

Gatlinburg, Tenn. (University Relations Div., Oak Ridge Inst. of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.)

17–21. Ionization Phenomena in Gases, 4th intern. conf., Uppsala and Stockholm, Sweden. (A. Nilsson, Fysikum, Uppsala)

20. American Inst. of Ultrasonics in Medicine, Washington, D.C. (D. M. Stillwell, Dept. of Physical Medicine and Rehabilitation, Univ. of Colorado Medical Center, Denver 20)

21–24. Latin-American Cong. of Angiology, Rio de Janeiro, Brazil. (R. C. Mayall, Caixa Postal 1822, Rio de Janeiro)

21–24. National Council of Teachers of Mathematics, Salt Lake City, Utah. (M. H. Ahrendt, 1201 16 St., NW, Washington 6)

21–25. American Soc. of Pharmacology and Experimental Therapeutics, Seattle, Wash. (H. Hodge, Dept. of Pharmacology, Univ. of Rochester, Rochester, N.Y.)

21–26. American Cong. of Physical Medicine and Rehabilitation, Washington, D.C. (Mrs. D. C. Augustin, 30 N. Michigan Ave., Chicago 2, Ill.)

21–26. Physical Medicine, 3rd intern. conf., Washington, D.C. (W. J. Zeiter, 2020 E. 93 St., Cleveland, Ohio)

21–6. Pacific Science Cong., 10th, Honolulu, Hawaii. (Secretary-General, 10th Pacific Science Cong., Bishop Museum, Honolulu 17)

22–25. American Astronomical Soc., Mexico City, Mexico. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

22–25. American Physiological Soc., San Francisco, Calif. (R. G. Daggs, APS, 9650 Wisconsin Ave., NW, Washington 14)

22–26. Plasma Physics, symp., Gatlinburg, Tenn. (University Relations Div., Oak Ridge, Inst. of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.)

22–26. Western Resources, 2nd annual conf., Boulder, Colo. (M. E. Garnsey, Dept. of Economics, Univ. of Colorado, Boulder)

23–25. Assoc. for Computing Machinery, natl., Milwaukee, Wis. (J. Moshman, ACM, Council for Economic and Industry Research, 1200 Jefferson Davis Highway, Arlington 2, Va.)

23–25. Cryogenic Engineering Conf., Boulder, Colo. (K. D. Timmerhaus, CEC, Dept. of Chemical Engineering, Univ. of Colorado, Boulder)

23–26. American Statistical Assoc., annual, Palo Alto, Calif. (D. C. Riley, ASA, Beacon Bldg., 1757 K St., NW, Washington 6)

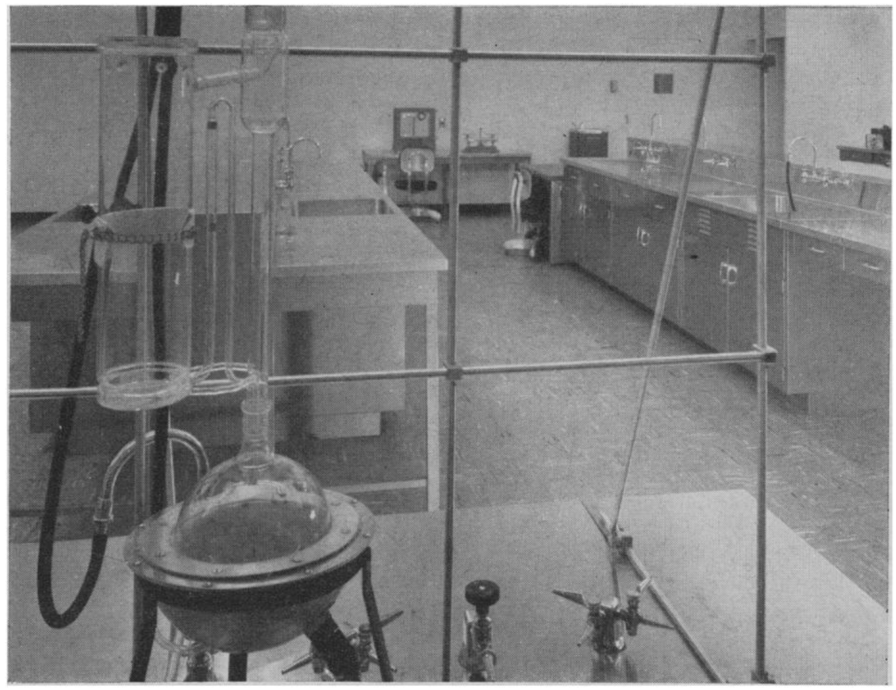
23–26. Biological Photographic Assoc., Salt Lake City, Utah. (Miss J. H. Waters, Box 1668, Grand Central Post Office, New York 17)

23–28. American Ornithologists' Union, Ann Arbor, Mich. (H. G. Diegnan, Division of Birds, U.S. National Museum, Washington 25)

24–27. Forest Biology Conf., Seattle, Wash. (Miss E. N. Wark, Technical Assoc. of the Pulp and Paper Industry, 360 Lexington Ave., New York 17)

24–27. Internal Medicine, 6th intern. cong., Basel, Switzerland. (Secretariat, 6th ICIM, 13 Steinentorstre, Basel)

24–2. International Union for the His-



tory and Philosophy of Science, Stanford, Calif. (R. Taton, 64, rue Gay-Lussac, Paris 5ᵉ, France)

25–27. Chemical Organization of Cells, 2nd conf., Madison, Wis. (J. F. A. McManus, Dept. of Pathology, Univ. of Alabama Medical Center, Birmingham)

25–3. High Energy Nuclear Physics, intern. conf., Rochester, N.Y. (W. A. Jamison, Dept. of Physics and Astronomy, Univ. of Rochester, Rochester 20)

27–30. International Union of Biological Sciences, section of embryology, Pallanza, Italy. (F. E. Lehmann, Kuhnweg 10, Berne, Switzerland)

28–31. American Phytopathological Soc., Green Lake, Wis. (W. B. Hewitt, Dept. of Plant Pathology, Univ. of California, Davis)

28–31. Potato Assoc. of America, Green Lake, Wis. (R. L. Sawyer, Long Island Vegetable Research Farm, Cornell Univ., Riverhead, N.Y.)

28–31. Soil Conservation Soc. of America, Guelph, Ontario, Canada. (H. W. Pritchard, 838 Fifth Ave., Des Moines 14, Iowa)

28–1. American Inst. of Biological Sciences, annual, Norman, Okla. (H. T. Cox, AIBS, 2000 P St., NW, Washington 6)

28–1. Association of American Geographers, East Lansing, Mich. (M. F. Burrill, Office of Geography, Dept. of Interior, Washington 25)

28–1. Diseases of the Chest, intern. cong., Vienna, Austria. (M. Kornfeld, 112 E. Chestnut St., Chicago 11, Ill.)

28–2. Combustion, 8th intern. symp., Pasadena, Calif. (Office of Industrial Associates, California Inst. of Technology, Pasadena)

28–2. International Pharmaceutical Federation, Copenhagen, Denmark. (A. W. Tønnesen, Bispebjerg Hospital, Copenhagen, N.V.)

28–2. International Soc. for the Welfare of Cripples, world cong., New York, N.Y. (D. V. Wilson, 701 First Ave., New York 17)

28–3. Electron Microscopy, European regional conf., Delft, Netherlands. (A. L. Housink, Lab. v. Microbiologie, Julianalaan 67A, Delft)

28–3. Histochemistry and Cytochemistry, 1st intern. cong., Paris, France. (R. Wegmann, Institut d'Histochimie Medicale, 45, rue des Saints-Pères, Paris 6ᵉ)

29–31. American Sociological Assoc., New York, N.Y. (D. R. Young, Russell Sage Foundation, 505 Park Ave., New York)

29–31. Clinical Chemists (Canadian and American Societies), annual, Montreal, Canada. (E. Harpur, Montreal Children's Hospital, Montreal)

29–31. Electron Microscope Soc. of America, 18th annual, Milwaukee, Wis. (W. C. Bigelow, Dept. of Chemical and Metallurgical Engineering, Univ. of Michigan, Ann Arbor)

29–31. Metallurgy of Elemental and Compound Semiconductors, Boston, Mass. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 18)

29–31. Water Quality Measurement and Instrumentation, PHS symp., Cincinnati, Ohio. (R. T. Hyde, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26)