are physicists, and the remainder are in mathematics, geology, astronomy, or geography.

Among the physicists, the largest group comes from the United Kingdom, while eight other countries (Australia, Egypt, France, India, Iran, Italy, the Netherlands, and Norway) are represented by one or more physicists. A primary interest in research rather than in lecturing is indicated for the majority of the group listed.

The Conference Board Committee suggests that many of the foreign scholars lecturing or doing research this year at American colleges and universities would welcome invitations to visit other institutions providing the expense of the travel could be covered by the institution inviting them. A number of the visiting scholars have mentioned their interest in becoming acquainted with the various kinds of institutions of higher learning in the United States, especially those which differ from their sponsoring institutions. Invitations to visit other universities and colleges, especially those in proximity to their present locations, would therefore be appreciated.

The Committee has also suggested that in view of the fact that many professional meetings occur in the winter and early spring months, invitations to any of these scholars who will be in the United States at the time of these meetings will undoubtedly be appreciated by them. It is suggested that such invitations include clear information as to the expenses entailed in attendance because of the limited dollar resources of most of the visiting scholars.

Lists of the scholars involved, together with information concerning their fields of interest, present location, and so on, can be obtained by writing to the Conference Board of Associated Research Councils, Committee on International Exchange of Persons, 2101 Constitution Avenue, Washington 25, D. C.

## Neutral Meson's Lifetime

### Established by Rochester Group

In 1949, members of the University of Rochester Cosmic Ray Group reported the first clear-cut evidence for the existence of a previously unrecorded nuclear particle, the neutral meson, in the cosmic radiation. From measurements of tracks left in photographic emulsions it was established that large numbers of neutral mesons were produced as a result of the high energy collision between a helium nucleus contained in the primary cosmic radiation and a silver nucleus in a photographic plate. Recent findings of the Rochester group were reported in a paper presented before the American Physical Society meeting in Houston, Texas, on November 30th by Morton F. Kaplon and David M. Ritson, who announced that the lifetime of the neutral meson has been established as being about $10^{-15}$ second, the briefest existence yet determined for any elementary particle.

Drs. Kaplon and Ritson obtained their results by sending an "emulsion cloud chamber", consisting of a stack of precisely-aligned electron sensitive plates separated by brass absorbers, twenty miles into the stratosphere attached to free balloons. The flight was made last spring at White Sands in New Mexico. Very energetic nuclear interactions at these altitudes produced large cosmic ray stars containing neutral mesons which decay into gamma rays, and which in turn initiate electron showers. Measurements leading to values for the energy of the particle and of the length of its track before disintegration make it possible to deduce the lifetime.

## Research at Argonne

### The Lead-Uranium "Clock"

A new procedure for analyzing lead and uranium ores which aids in the more precise determination of the age of the uranium ores has been developed in a joint research project at Argonne National Laboratory and the University of Chicago. Greatly increasing the sensitivity of the measurement of the four isotopes of lead in a given sample, the new technique has been successfully used in studying rocks containing as little as one part per million of uranium. Because it reveals more about the nature of the billion-year-old ores, the method may eventually contribute to more successful uranium exploration. The new means of analysis was developed by George Tilton and Clair Patterson, graduate students in the University of Chicago's Department of Chemistry. They worked under the guidance and with the assistance of Harrison Brown, associate professor of chemistry in the University's Institute for Nuclear Studies, Mark G. Inghram of the Institute and Argonne National Laboratory, and David C. Hess of the Laboratory's physics division.

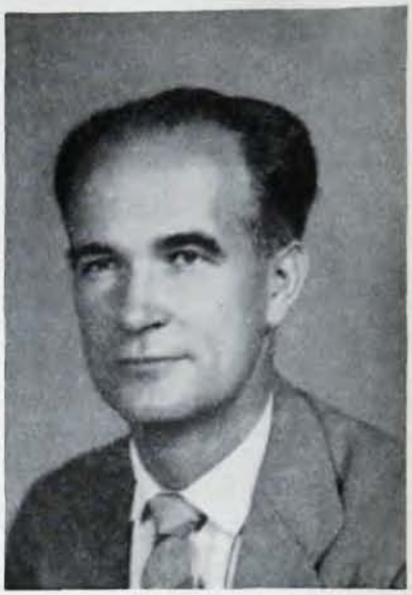
Lead occurs in nature as a mixture of four isotopes of which the atomic weights are 204, 206, 207, and 208. The isotope 206 is the end product of a series of steps in radioactive decay which starts with uranium 238, the most abundant isotope of uranium. This fact has been used for some time to estimate the age of uranium-bearing minerals by what has become known as the "lead-uranium clock" method. By measuring the amount of lead 206 formed from the decay of uranium in such minerals and the relative proportion of uranium and lead, it is possible—since the rate at which uranium turns into lead is known—to calculate the age at which the mineral was formed. The Argonne-University of Chicago researchers wished to use this method directly on igneous rocks in order to learn more about the process in which minerals are formed. This application has been impossible in the past in view of the fact that the quantities of uranium and lead occurring in rocks amount to only about three and ten parts per million respectively. The new method of isotopic analysis improves the accuracy of the measurement of lead isotopes and requires only one tenth of a millionth of an ounce of lead, whereas previous methods required at least 200 times as much.

In order to test the procedure quantitatively it has been applied to the determination of the lead and uranium contents of Essonville granite which is a part of a large continental rock called the Canadian Shield. The tests indicated that about 95% of the uranium present in the rocks is contained in minerals totalling less than half of one percent of the total mass of the rock.

## IRE Honors Shockley

### Work Leading to Transistors Cited

William Shockley, research physicist at the Bell Telephone Laboratories, will receive the 1952 Morris Liebmann Memorial Prize of the Institute of Radio Engineers "in recognition of his contributions to the creation and development of the transistor" during the IRE's national convention in New York City, March 3–6, it has been announced. The Prize carries a monetary award of varying amount, derived from the income of a $10,000 endowment fund donated to the Institute more than thirty years ago by E. J. Simon in memory of Colonel Liebmann, whose life was lost during World War I. It is given annually to a member of the IRE who, in the opinion of the Institute's board of directors and upon the recommendation of the awards committee, shall have made an important contribution to the radio art.



William Shockley, recipient of this year's IRE Morris Liebmann Prize for his work in transistor physics. A Bell Labs physicist, Shockley is the author of *Electrons and Holes in Semiconductors*, D. Van Nostrand Company, Inc., 1950.

Born in London, England, Dr. Shockley is a graduate of the California Institute of Technology and received his doctorate in physics at the Massachusetts Institute of Technology in 1936. From then until 1942 he was a member of the technical staff at Bell Labs. During World War II he directed a group at Columbia University which was concerned with antisubmarine warfare operations research, and he later served as an expert consultant to the Office of the Secretary of War. He returned to Bell Labs in 1945.

Dr. Shockley's work in the theory of solids, and particularly in the field of semiconductor physics, has played a large part in the invention and development of the transistor, a miniature amplifying device having as its essential ingredient a small amount of the element germanium. A semiconducting crystal triode, the transistor operates on very little power, is small in size, has no vacuum, glass envelope, nor heating element to cause a warm-up delay, and can be used as an amplifier or to satisfy many of the other functions usually associated with the vacuum tube. The original "point contact" transistor was created about four years ago by two other Bell Labs physicists, John Bardeen and Walter H. Brattain, under a research program initiated and directed by Dr. Shockley. Since that time, numerous refinements have been made in transistor design and a number of specialized types have been developed.

The most recent addition to the transistor family, the "junction" transistor, was announced last July by Bell Labs when it was stated that Dr. Shockley had developed an entirely new and improved transistor of a type which he had predicted theoretically two years earlier. This version, considerably smaller than the point contact type, is described as being extremely efficient and rugged. Constructed in the form of a small bead "about half the size of a pea", the junction transistor has no contact points, which in the original model corresponded to the terminals of a vacuum tube. Instead, it consists of a tiny rod-shaped piece of germanium, treated so that it embodies a thin electrically positive layer sandwiched between the two electrically negative ends. The rod is encased in a hard plastic bead about 3/16 of an inch in diameter, with wire leads connected to each of the three regions and extended outside. The entire device occupies only about 1/400 of a cubic inch, whereas even a sub-miniature vacuum tube takes up about 1/8 of a cubic inch. Perhaps even more important, the junction transistor consumes far less power than the point contact type (which itself operates on less power than an ordinary flashlight bulb) and requires only about a millionth of the power of a miniature vacuum tube.

## Standard Isotope Samples

### $P^{32}$ and $I^{131}$ Solutions Added to NBS List

Standard solutions of phosphorus-32 and iodine-131 are now included among the radioactive standards distributed or calibrated by the National Bureau of Standards for the benefit of investigators in physics, chemistry, medicine, and industry. These particular isotopes have been employed extensively for diagnosis and therapy in brain surgery, leukemia and other types of cancer, and in their early use, variations in the results obtained by different laboratories are said to have amounted to as much as 200 percent of the accepted value. The Bureau's new procedure for making the standard samples available to research workers will now permit the duplication of results at different laboratories.

The $P^{32}$ and $I^{131}$ standards consist of flame-sealed glass ampoules, each of which contains the active iso-