nucleus is comparable to its thermal energy will nuclei line up in any numbers. Because the nuclear magnetic moment is very small, the temperature must be exceedingly low to minimize the thermal motion, and the magnetic field must be very large to get the maximum orienting force. For example, the easiest nucleus to align would be the proton, and even this would require a field of thirty five thousand oersteds at a temperature of one hundredth of a degree absolute to give about ten percent alignment. A higher magnetic field, of, say, one hundred thousand oersteds would of course be more desirable for its greater orienting effect but fields of this magnitude are difficult to obtain.

Cooling the nuclear spin system of a sample of material to a temperature of about one hundredth of a degree absolute, also difficult, is partly a question of transferring heat from the nuclei to the surrounding lattice and partly that of transferring it through the lattice to the source of cold. Briefly, if the lattice has paramagnetic impurities, or is itself paramagnetic, the energy transfer from the nuclei to the lattice may be possible within a reasonable time, even at one hundredth of a degree absolute, but this has not been demonstrated experimentally. As to heat transfer through the bulk of the material, it seems that only good metallic electrical conductors like copper—but not superconductors—will have usefully large heat transfer coefficients at one hundredth of a degree absolute.

In conclusion, it seems that the alignment of nuclear spins is theoretically possible but that there are many hard technical problems to be solved before the goal can be reached. Once this goal has been attained, many new research possibilities in the low temperature and nuclear fields will be opened. For example, scattering and absorption measurements with polarized neutrons would provide information concerning spin dependence of the forces and would, in principle, determine the shape of the nuclear well for both spin orientations. M. E. R. and L. D. R.

Operations Research

A General Research Office has been established at The Johns Hopkins University, under contract with the Army, to apply techniques of scientific analysis to military problems in weapons development, strategy, tactics, and logistics. Under the General Staff supervision of Major General A. C. McAuliffe, who heads research and development for the Army, the new organization is directed by Ellis A. Johnson, physicist on leave from the Carnegie Institution of Washington. Its program specifies the broadest use yet announced of operations research, such as analysis of optimum weapons, equipment, and systems for anti-aircraft defense, studies of relative value of short range guided missiles, free rockets, and artillery, and studies of comparative over-all costs of various methods of waging ground warfare. The program includes evaluation and planning of specific weapons as well as complete weapon systems and analysis of psychological problems in personnel relations and problems involving coordination with the Navy and Air Force. The Office will be part of The Johns Hopkins University's Institute for Cooperative Research. Staff members are not under civil service but are appointed by the president of the University and can participate in other activities of the University.

NBS News

Electron microscope experiments conducted by L. L. Marton of the National Bureau of Standards have developed an electron optical analogy to the Schlieren effect for the quantitative study of electrostatic or magnetic fields. By forming a dark field image of magnetic or electric fields occurring between the electron source and a magnetic lens, a visual representation of fringe fields from the small domains of spontaneous magnetization in ferromagnetic materials is obtained. The characteristics of such field intensity patterns may then be used to compute the field distribution in the region under study. Extension of the principle provides a means of broadening present knowledge concerning space-charge fields, fields produced by contact potentials, wave guide problems, and the microstructure of metals.

Thus the new Schlieren method can be used to explore complex electric and magnetic fields of extremely small dimensions. Heretofore, field intensity at a point could be computed only in the special cases when the field was geometrically symmetrical. Using Schlieren images, the actual intensity in the neighborhood of a sample of any shape can be computed.

The technique was developed at the Bureau to measure the magnetization of wire used in sound recorders or electronic computers. But many other uses have suggested themselves. The Bureau plans a study of the behavior of fringe field patterns as a function of temperature up to the Curie point and a repetition of the measurements on a single crystal material having very large domains. There are also plans for extending the method to ferroelectric materials, to check the domain theory.

Dr. Marton addressed the French Physical Society on the new Schlieren effect when he was in Europe this summer, surveying current work in electron optics and helping to organize such research in Belgium, where he did fundamental work on the subject before 1938.

The National Bureau of Standards has developed methods for grinding and polishing thallium halide crystal prisms useful in long wavelength infrared spectrometry. Prisms of other materials, such as potassium bromide, have been available for measurements to twenty-four microns; the new thallium bromide-iodide prism allows observations up to forty microns.

AEC News

A program for the production and domestic distribution of several important chemicals tagged with radioactive elements, for research, medical, and industrial use, was announced by the United States Atomic Energy Commission. For the past two years investigators have been able to get radioisotopes from the Oak Ridge National Laboratory but they have had to synthesize or manufacture special compounds in their own laboratories.

Radioisotopes of higher activity are also available now from the Oak Ridge Laboratory, although special arrangements for their transportation must still be made.

Commercial firms will be encouraged to manufacture and distribute the tagged compounds, the announcement said. Inquiries may be addressed to Isotopes Division, Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee.

Fellowships and Awards

The Society of Rheology has completed arrangements for the establishment of an annual award in memory of the Society's founder, the late E. C. Bingham. The first presentation of the award, to a scientist living in the U. S. or Canada who has made outstanding contribution to the science of rheology, will be made on Friday, November 5, the opening day of the 1948 annual meeting.

Stanford University's Microwave Laboratory offers a number of research fellowships, assistantships, and predoctorate and postdoctorate associateships to qualified graduate students. Stipends range from nine hundred to four thousand dollars per academic year.

Airborne Instruments Laboratory, Inc., at Mineola, New York, has established two fellowships in communications and electronics. One is at Stanford University and the other at the Massachusetts Institute of Technology.

H. Wallace Baldwin

H. Wallace Baldwin, University of Chicago physicist engaged in cosmic ray research, was killed September 6 when he jumped from a burning B–29 bomber and his parachute failed to open.

Percy Hodge

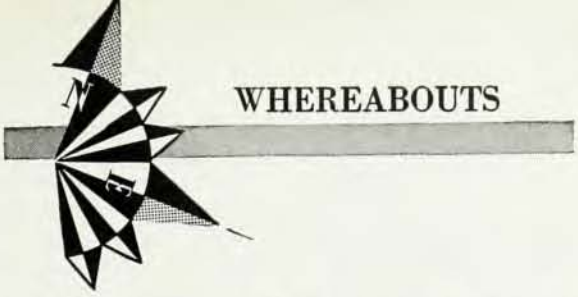
Percy Hodge, professor emeritus of physics since 1938, and head of the physics department of Stevens Institute of Technology for twenty-seven years, died on August 4 at the age of 78. He had achieved national distinction for his metallurgical research.

Lloyd W. Taylor

Lloyd W. Taylor, 55, head of the Oberlin College physics department for twenty-four years, died in a fall while climbing Mt. St. Helens, near Kelso, Washington, on August 8. He was a former president of the American Association of Physics Teachers.

Richard C. Tolman

Richard C. Tolman, professor of physical chemistry and mathematical physics at the California Institute of Technology, former vice chairman of the National Defense Research Committee, adviser to Lt. Gen. Leslie Groves and later Bernard Baruch, died September 6th in Pasadena, after suffering a stroke. He was 67.



B. Richard Ankersen has been appointed a design engineer in the physics department of Carnegie Institute of Technology.

George P. Baker has been named chairman of the Committee on Aeronautics of the Research and Development Board.

Harold A. Beatty is the new assistant director of research at the Ethyl Corporation Research Laboratories.

Ingram Bloch is now assistant professor of physics at Vanderbilt University.

J. Horace Coulliette has been appointed technical director and Irvine W. Grote administrative advisor of the Industrial Research Institute of the University of Chattanooga.

Stanley J. Czyzak, Kenneth Ferguson, Harry Hummel, and Alfred H. Weber are new staff members at Argonne National Laboratory. Francis J. Jankowski has completed his assignment there and returned to the University of Cincinnati.

Louis J. Eisele has joined the staff of Spring Hill College, Mobile, Alabama, as assistant professor of physics, and John Moore as instructor in physics.

James B. Fisk, research director of the Atomic Energy Commission, resigned to take up duties as professor of applied physics at Harvard University, a post held open for him for two years.

Richard C. Hitchcock has been appointed science lecturer for the Westinghouse Research Laboratories.

G. C. Kuczynski, of the Sylvania Electric Products' Metallurgical Research Laboratories, is lecturing on the physics of metals at the National University, Bogota, Colombia.

Jules S. Levin, John W. Weil, and William L. Whittemore have joined the staff at Brookhaven National Laboratory.

William L. Parker has been named professor of physics and head of the department at Reed College, to replace A. A. Knowlton, who will head the physics department of Bennington College this year. Kenneth E. Davis and Leo Seren have been appointed assistant professors of physics at Reed. Raymond T. Ellickson has left Reed to go to the University of Oregon, where he will be professor of physics and associate dean of the graduate school.

William J. Price has joined the staff of Battelle Institute, where he will do research in industrial physics.

Carleton Shugg has been named deputy general manager of the Atomic Energy Commission in Washington.

M. M. Slawsky recently left the Naval Ordnance Laboratory to go to the National Bureau of Standards.

A. M. Zarem has been appointed chairman of physics research and manager of the new Los Angeles Division of Stanford University's Research Institute.