body of the star, reaching several miles per second in velocity.

Even more physical are the recent investigations of cosmic radio noise, which are being undertaken with large radio receivers, some of them converted from wartime radar antennae. A review of the observational data, and the theoretical efforts to understand them, was undertaken in a special symposium by John Hagen of the Naval Research Laboratory in Washington, Ralph Williamson of the David Dunlap Observatory, and Jesse Greenstein of the California Institute of Technology. It seems that the sun is a more powerful radio transmitter than might have been expected; radiating as if it had a temperature of a million degrees Centigrade, with bursts up to a billion degrees. This can probably be explained as the result of the peculiar physical conditions in the corona for which spectroscopic measurements show a million-degree temperature.

The whole sky is being surveyed by radio telescopes tuned to high frequencies of ten to hundreds of megacycles (corresponding to radio waves from a few meters down to a few centimeters in length), and it has already been found that our galaxy—the Milky Way—is also an extraordinarily strong source of radio waves. This cannot be due to the myriads of stars broadcasting like our sun—it is over a billion times too strong. Either there are a large number of stars far more efficient than the sun, or these radio waves come from interstellar material, possibly by some process stimulated by a weak magnetic field between the stars.

There is a strong, broad source of cosmic radio noise in the direction of the center of our galaxy—which can be explained by either of these two hypotheses—and a strong localized source in another part of the sky (in the constellation Cygnus) where no stars are to be seen—which probably favors the latter alternative. In fact, Greenstein suggested that this dark radio broadcaster in Cygnus is our end-on view of a long streamer of interstellar gas, which extends along a spiral arm of our galaxy.

With all these rapid and remarkable developments in the subject, it is not surprising that astronomical textbooks are all sadly out of date. Moreover, it is no longer clear just what parts of the subject and of its new developments are required in a sound training of astronomy students. Another special symposium, led by Freeman Miller of the University of Michigan, was devoted to these problems. It was agreed by most that would-be astronomers must study a good deal of physics. One possible solution of the textbook problem is to encourage the summarizing of articles and books, each covering one broad astronomical problem completely, rather than attempt to cover the whole subject of astronomy—whatever it may include.

Or, since the boundary between physics and astronomy has become so ill defined, perhaps the physicists should extend themselves, take full advantage of the astronomer's laboratory-universe, and write a few physics texts which cover stellar energy generation along with nuclear reactions, stellar structure along with thermodynamics, and the generation of cosmic radio noise (when it is better understood) along with electrodynamics. Such, at least, is the fond hope of some astronomy teachers.

—Thornton Page

A.S.X.R.E.D.

The winter meeting of the American Society for X-ray and Electron Diffraction was held at Battelle Memorial Institute, Columbus, Ohio, December 16–18, 1948. It was attended by about 125 crystallographers and x-ray diffractionists from universities and industrial research laboratories in many sections of the country, as well as by several foreign visitors. The extraordinary strides made in this field in the quarter-century of its existence were emphasized by the presence of the guest of honor—the "father" of x-ray diffraction—M. von Laue of Germany, who received the Nobel prize in physics for his discovery in 1912.

The successful analysis of samples available only in minute quantities was described by W. H. Zachariasen of Argonne National Laboratory and the University of Chicago. Prof. Zachariasen determined the crystal structures of a large number of oxides, fluorides and other compounds of actinium, thorium, protoactinium, uranium, and the transuranic elements at a time when only microgram quantities were available and conventional complete microchemical analysis was impossible. The crystal structure analysis served to identify the compounds and establish their relationship to general crystal chemistry. Many of the compounds have never been analyzed by chemical methods. In addition to the problems introduced in working with such tiny samples, the work was further complicated by the radioactivity of some of the compounds (which raised the background on the film) and by the very short half-life of others.

D. F. Clifton and Cyril S. Smith of the University of Chicago's Institute for the Study of Metals described equipment for obtaining specimens for x-ray analysis down to one-tenth microgram by use of a sharp diamond tool. The polished metal section is viewed with a metallographic microscope and the sample chosen from the desired portion. Quartz fibres one-thousandth inch in diameter were used for mounting the samples and the powder camera was evacuated to reduce the background from air-scatter which may be relatively high, due to the long exposures required with such tiny simples.

I. Fankuchen of Polytechnic Institute of Brooklyn described several types of x-ray microcameras for back-reflection, small-angle scattering and single crystals. A microcamera has a specimen holder that allows study of the specimen under a microscope. The holder is then transferred to the camera and the collimated x-ray beam passes through only the preselected portion of the specimen. In this way the change in structure over various portions of the specimen can be studied. Prof. Fankuchen also described several ingenious devices and techniques he developed with H. Kaufman for x-ray studies at low temperatures. For the Geiger counter x-ray spectrometer, the material under investigation (which is liquid at room temperature) is sprayed onto a flat specimen surface cooled by liquid air from the rear. The randomly oriented crystallites deposited in this way gave excellent powder diffraction patterns. Several years ago, Kathleen Lonsdale of England suggested that, since little information could be obtained from liquid x-ray scattering patterns that would be useful for identification work, it might be helpful to take x-ray photographs of the frozen liquids.

James W. Edwards, Rudolph Speiser, and Herrick L. Johnston of Ohio State University's Cryogenic Laboratory, described a very high temperature x-ray camera capable of heating a specimen from room temperature to 2,500 degrees absolute. This may prove to be an important instrument, since no x-ray work has been done at these high temperatures.

The application of x-ray diffraction analysis to the detailed and exact study of alloy equilibrium diagrams and other metallurgical problems such as determination of slip plane and slip direction, stacking faults, and stress analysis was the subject of several papers. Others dealt with the problems of interpreting small angle scattering and with the properties of evaporated thin alkali halide films, and there were several papers on crystal structure analysis.

R. A. Van Nordstrand of Sinclair Refining Company has worked out the complicated phase transitions in several straight chain hydrocarbons by heating the specimens on a Geiger counter x-ray spectrometer. He is extending the study to phases developed from various solvents.

Studies of elastically bent quartz plates by B. E. Warren and J. E. White of Massachusetts Institute of Technology showed that the integrated reflection intensity was increased by a factor of two and a half for x-rays of wavelength 1.5 Angstrom and by a factor of twelve for x-rays of wavelength seven-tenths Angstrom, by bending the plates. Since the increase was the same for convex and concave bending, geometrical focusing was not an important factor.

Caroline H. MacGillavry of the University of Amsterdam, the Netherlands, spoke on the polymorphism and crystal chemistry of phosphorous pentoxide.

—William Parrish

Meetings to Be

"Acoustics and Man" is the theme of the twentieth anniversary meeting of the Acoustical Society of America which will be held May 5–7, 1949, and centered on New York City at the Hotel Statler (formerly the Pennsylvania). In an unusual move, papers are being grouped according to function rather than phenomena. The sessions are as follows: Acoustics as related to communications, acoustics as a tool in physics, acoustics in comfort and safety, and acoustics and the arts. Further information may be had from Harold Burris-Meyers, Stevens Institute of Technology, Hoboken, New Jersey.

A symposium on molecular structure and spectroscopy will be held at the Mendenhall Laboratory of Physics at the Ohio State University from June 13 through June 17, 1949. For further information, or for a copy of the program when it becomes available, write to Harald H. Nielsen, Mendenhall Laboratory of Physics, the Ohio State University, Columbus 10, Ohio.

Honors, Awards, Fellowships

George R. Harrison, dean of the School of Science of the Massachusetts Institute of Technology, was awarded the Medal for Merit in recognition of his outstanding services during the war as chief of the division of optics and chief of the division of physics of the National Defense Research Committee, and as assistant chief of field service of the Office of Scientific Research and Development.

John Stack, research scientist of the National Advisory Committee for Aeronautics, Lawrence D. Bell, president of the Bell Aircraft Corporation, and Captain Charles E. Yeager of the U. S. Air Force, as the three men most responsible for the attainment of supersonic flight, were awarded the Collier Trophy.

The Du Pont Company is awarding four postgraduate fellowships in physics for 1949–50: to California Institute of Technology, Carnegie Institute of Technology, Ohio State University, and Yale University. Each fellowship provides $1,200 for a single person or $1,800 for a married person, together with an award of $1,000 to the university. Choice of candidates and the problems on which they are to work is left to the universities. Besides the physics fellowships, Du Pont is awarding fifty-one fellowships in chemistry, fifteen in chemical engineering, five in mechanical engineering, and two in metallurgy.

Illinois Institute of Technology has announced that applications for fellowships, scholarships, and assistantships for graduate study, research, and teaching will be accepted until March 15, 1949 and should be sent to the Examiner of Credentials, Graduate School, Illinois Institute of Technology, Technology Center, Chicago 16.

James Hollie Cross

James Hollie Cross, assistant professor of physics at Texas Technological College, died on December 8, 1948.

A. Herman Pfund

A. Herman Pfund, professor emeritus of physics at Johns Hopkins University and a pioneer in the science of optics, died January 4, at the age of 69. Among his many contributions was the development of an extremely sensitive vacuum thermopile for measuring infrared rays. He won several high awards, including the Ives Medal of the Optical Society of America, which devoted its entire October 1948 Journal issue to the work of his students and colleagues, to honor his retirement. Professor Pfund was a member of the governing board of the American Institute of Physics.