News and Notes

The Atomic Energy Commission announced on 11 December that it would assume formal control of the Manhattan Engineer District soon after 1 January. Since the Commission was appointed on 28 October (See *Science* 8 November and 13 December) it has had a series of conferences with members of the War Department preparatory to taking active control of a plant valued at $1,400,000,000 with approximately 43,000 employees.

To aid the Commission President Truman appointed a nine-man General Advisory Committee specifically authorized to consult with the Commission on "scientific and technical matters relating to materials, production and research, and development" on 12 December. The new Committee is made up of James B. Conant, president of Harvard; Lee A. DuBridge, president, California Institute of Technology; Enrico Fermi, professor of physics, University of Chicago; I. I. Rabi, professor of physics, Columbia University; J. R. Oppenheimer, formerly director of the Los Alamos Laboratories of the Manhattan Project, and now professor of theoretical physics, University of California; Glenn T. Seaborg, professor of chemistry, University of California; C. S. Smith, director of the Institute of Metals, University of Chicago; Hartley Rowe, vice-president and chief engineer of The United Fruit Company; and Hood Worthington, chemical engineer, E. I. du Pont de Nemours & Co.

About People

Harlow Shapley, director of the Harvard College Observatory, left on 27 November for Mexico City, where he attended the inauguration ceremonies for President-elect Licenciado Miguel Aleman, as the President's personal guest. Dr. Shapley, who represented American science at the inauguration, will also take part at a meeting of the Latin-American Club of the Scientific Research Society of America, of which he is national president.

Staff members of the Harvard Observatory under Dr. Shapley's direction have, during the past few years, aided in the creation of the National Astrophysical Observatory in Tonanzintla, Puebla, and in the operation of the Comite Interamericano de Publicationes Cientificas, which has taken the lead in building up Mexico's scientific libraries. In addition, Dr. Shapley has also planned and conducted two scientific congresses in Mexico, one dealing with astronomy and one with physics.

While in Mexico City, Dr. Shapley also plans to discuss the possibilities with Mexican publishers of translating American scientific books into Spanish.

Previous recognition of Dr. Shapley's work in Mexico has brought him the Cross of Honor from Puebla, an honorary degree from Michoacan, membership in the Mexican National Academy of Sciences, and the Aztec Eagle.

Brig. Gen. Raymond A. Kelser, director of the Veterinary Division of the Surgeon General's Office, U. S. Army, during the war, was awarded the Gorgas Medal at the annual convention of the Association of Military Surgeons in Detroit on 9 October. The medal is awarded under the auspices of Wyeth, Inc., of Philadelphia, and is given annually by the Association for outstanding work in preventive medicine for the armed forces. Gen. Kelser's work was that of eradicating rinderpest, a cattle disease, in the Philippine Islands, making it possible for the Filipinos to develop a domestic milk supply. Dr. Kelser is now retired from active service and is dean of the College of Veterinary Medicine and professor of bacteriology at the University of Pennsylvania.

H. Jermain Creighton, Swarthmore College, received the Edward Goodrich Acheson Gold Medal and $1,000 prize at the Electrochemists' Congress held in Toronto, Canada, on 16–19 October. In his acceptance speech, Dr. Creighton revealed a number of inventions and discoveries made in electrochemistry during the war.

R. M. Strong has retired, after 28 years as professor and head of the Department of Anatomy, Loyola University School of Medicine, with the title of chairman and professor emeritus, and has been appointed research associate in anatomy at the Chicago Natural History Museum (Field Museum).

Raymond L. Taylor, formerly associate professor of biology, College of William and Mary, has been appointed resident head of biology at Sampson College, one of the recently organized Associated Colleges of Upper New York (see *Science,* 1946, **104**, 366).

Ralph A. Galbraith was appointed professor of electrical engineering and chairman of the Department, Syracuse University, on 1 September, succeeding Charles W. Henderson, who has relinquished the chairmanship because of ill health.

Nancy Graham Rogers received the first Exceptional Civil Service Award given by the Army to a woman, at Walter Reed Hospital, Washington, D. C., on 30 October. Miss Rogers received the award for her services as bacteriologist with the Division of Virus

and Rickettsial Diseases, Army Medical Center. The citation referred to her important work in developing vaccines while on a mission to Guatemala in 1943.

William K. Carpenter, Wilmington, Delaware, returned on 17 November by air from Africa, where he had been since June collecting specimens for two habitat groups in the museum of the Academy of Natural Sciences, Philadelphia. Mr. Carpenter is the son of R. R. M. Carpenter, a trustee of the Academy, who in recent years collected the specimens and installed a number of life groups in North America and African Halls. According to present plans, the recent African expedition will result in a new marsh group and a habitat group of wild dogs.

Conrad E. Ronneberg, formerly chairman of the Division of Physical Sciences, Herzl Branch, Chicago City College, is now professor and chairman, Department of Chemistry, Denison University, Granville, Ohio. He was awarded the Bronze Star Medal for his service as Commandant, Army Information and Education Staff School, European Theater of Operations, where he served as a lieutenant colonel.

William A. Lewis, Jr., research professor of electrical engineering at Illinois Institute of Technology, became dean of the Institute's Graduate School on 1 September, succeeding Linton E. Grinter, dean since 1937, who resigned to devote his time to teaching and research.

Lyman C. Duryea has been made medical director of the Research Council on Problems of Alcohol, according to Anton J. Carlson, president of the Council. Dr. Duryea was formerly medical director of the Veterans Administration in New York State. Joseph Hirsh, formerly director of Medical Administration of the Veterans Administration for hospitals and clinics in New York State, is associate director in charge of education and public relations.

A. C. Ivy, vice-president of the University of Illinois, has been awarded a special gold medal by the American Roentgen Ray Society for research achievements.

Milton O. Lee, recently released from the Army, has rejoined the staff of the Memorial Foundation for Neuro-Endocrine Research, Harvard Medical School. He will be on duty at Worcester State Hospital, Worcester, Massachusetts.

Marshall Hall, formerly of Yale University, and Howard H. Alden, University of Wyoming, have joined the staff of the Mathematics Department, The Ohio State University.

W. L. Waterhouse, reader in the Faculty of Agriculture of the University of Sydney, Australia, was appointed by the University Senate at its last meeting to be research professor in agriculture in recognition of his work in cereal pathology.

Chauncey D. Leake, vice-president of the University of Texas Medical Branch, Galveston, was the principal speaker at a meeting of the Riverside County Medical Society of Southern California in Palm Springs on 9 November. The meeting was held to commemorate the anniversary of anesthesia. Among the guests was John Parkinson, cardiologist of London.

George F. Hanson has been appointed instructor in geology at Union College, Schenectady.

Edward C. Reifenstein, Jr., formerly Harvard Medical School research fellow at the Massachusetts General Hospital, Boston, has been appointed research consultant to the Sloan-Kettering Institute for Cancer Research at the Memorial Hospital Cancer Center, New York City. He has also been named as clinical research consultant to Ayerst, McKenna & Harrison, Ltd., New York City. At Boston, Dr. Reifenstein assisted Fuller Albright in investigations on endocrine and metabolic disorders; at the Sloan-Kettering Institute, he will carry on clinical research on the relation of glandular disturbances to cancer. He will continue as secretary and editor of the *Transactions* of the Conferences on the Metabolic Aspects of Convalescence, which are being held two or three times a year under the auspices of the Josiah Macy, Jr. Foundation.

Arthur Lejwa was recently appointed scientific director of the Robert Gould Research Foundation and its Institute for Nutritional Research, Erlanger, Kentucky.

Raymond J. Seeger, secretary of Section L of the AAAS, received the distinguished service award, highest Navy award for civilians, on 22 November at special ceremonies. Dr. Seeger was cited for outstanding work as physicist in the Research and Development Division of the Bureau of Ordnance during the war. His signal achievement was described as "comprehensive investigation on the reflection of shock waves in air and in rigid surfaces. The result of an extensive exploratory program initiated by Dr. Seeger on the basis of this investigation corroborated its major discoveries, culminating in the so-called 'Mach' effect. The basis of the air-burst principle found its ultimate use in the bomb explosion over Japan." Dr. Seeger was research consultant in theoretical physics at the Bureau of Ordnance from September 1942 to November 1946. Last month he was named chief physicist in charge of the Mechanics Division, Research Department, Naval Ordnance Laboratory, White Oaks, Maryland.

Thomas H. King and *Richard H. Bohning* have been appointed assistant professor and extension plant pathologist, and assistant instructor in botany, respectively, at The Ohio State University.

Babette I. Brown, formerly at Cornell University, has been made instructor in botany at the University of Rochester, New York.

Robert D. Potter, for the last six years Science Editor of the *American Weekly,* announces that he is resigning from that publication 1 January to found a private organization to be known as The Wordshop, Scarborough, New York. The purpose of the new organization is to report and interpret science and technology to the lay public through mass media, including the radio. Mr. Potter was formerly staff physics writer for Science Service, and was at one time Science Editor of the *New York Herald Tribune.* He is one of the founders of the National Association of Science Writers and has twice served as its president.

Stephen S. Kane has been appointed assistant professor of chemistry at the New Jersey City Junior College, Jersey City. Prior to his war service in the Navy, he was chemist for the Apex Smelting Company, Chicago.

Lt. Col. Frank L. Hawkins, Chemical Warfare Service, has recently returned from a military government assignment in connection with the German chemical industry and has been released by the Army. He has returned to his civilian duties at Edgewood Arsenal, Maryland, and has been appointed assistant chief, Design Branch, Plants Division, CWS Technical Command.

W. E. Clapper, assistant professor of bacteriology, University of Utah School of Medicine, has resigned to accept a similar position at the University of Colorado School of Medicine.

Edward L. Ullman, formerly director, Joint Intelligence Study Publishing Board, The Joint Chiefs of Staff, has jointed the staffs of geography and regional planning at Harvard University as assistant professor.

Donald C. Gregg, Amherst College, has been made assistant professor of chemistry at the University of Vermont. During the past summer he was visiting lecturer in chemistry at Harvard University.

Robert L. Pendleton, of the Office of Foreign Agricultural Relations, U. S. Department of Agriculture, has been appointed professor of tropical agriculture and soils, Department of Geography, The Johns Hopkins University. He will spend the fall semester in this post and the rest of the time with OFAR.

George E. Mueller has been appointed assistant professor of electrical engineering at The Ohio State University.

Thorold Vogt, of Trondheim University, Norway, has written to Charles H. Behre, Jr., of Columbia University, that he was one of three in a group of 20 that did not suffer seriously at the hands of the enemy during the occupation of his country. He also wrote that "Carl Bugge, director of the Geological Survey of Norway in Oslo, got safely through the war. Important maps and papers belonging to the Survey which it was not desirable that the Germans should get hold of and which it was important to preserve he succeeded in placing in a mine at Kongsberg Solvverk. The offices of the Geological Survey at Oslo were badly damaged during the bombing on 25 September 1942, but all collections, archives, and the library were saved."

Visitors From Abroad

C. B. Fawcett, University College, London, and Mrs. Fawcett left Southampton aboard the *Washington* on 12 December to attend the AAAS Boston meeting, at which Prof. Fawcett will represent the British Association for the Advancement of Science. Prof. Fawcett will deliver an address on 30 December on "The Numbers and Distribution of Mankind." As previously reported in *Science,* Prof. Fawcett will be available for engagements from 1 January until he assumes his duties as visiting professor at Clark University Graduate School of Geography on 1 February.

Paul Larsen, plant physiologist from the University of Copenhagen, has arrived here on a Danish-American Society fellowship to do research in plant hormones in the Mathies Botanical Laboratory at Connecticut College.

Meetings

The Optical Society of America will hold its winter meeting at the Hotel Pennsylvania in New York City on 20–22 February 1947. Despite numerous invitations from other parts of the country, the Board of Directors again selected New York in conformity with the traditional peace-time schedule of a winter meeting in that city and an October meeting elsewhere. The Program Committee is arranging a number of special features that will be listed in the final announcement, to be made later this month. Those who intend to contribute papers are urged to submit their abstracts as promptly as possible in order that the Program Committee may be able to gauge the interests of the members and to organize sessions on special topics. In case a member hopes to present a paper for the winter meeting but is unable to submit an abstract as this time, a letter indicating the probable title will be of assistance.

Announcements

More than 2,000,000 students, a 50 per cent increase over the previous peak enrollment, are now attending the 1,749 colleges and universities of the United States, it was reported on 19 November by Francis G. Cornell, chief of the Research and Statistical Service of the U. S. Office of Education, Federal Security Agency.

The total of 2,062,000, based on a 15 October survey by the Office of Education, was compared with the previous October peak enrollment of 1,360,000 reported in the prewar year 1939–40. The 1946 Office of Education survey covered those students attending classes or lectures conducted by the regular colleges and schools but did not include students enrolled in extension or correspondence courses.

John Dale Russell, director of the Higher Education Division of the Office of Education, in commenting on the record enrollment, stated: "The present student load, which is more than double the 950,000 total of last year, has heavily taxed the resources of almost all higher educational institutions in providing adequate staff, housing, and classroom facilities. Every effort has been turned to supplying the demand for admission to college, particularly on behalf of veterans entitled to educational benefits under Public Laws 346 and 16."

In 1945 there were fewer than 50,000 veterans enrolled in higher educational institutions. This year there are 1,073,000 veterans enrolled, or approximately one-half of the present total number of students. Almost half of all students and more than half of the veterans are enrolled in the 131 larger institutions.

According to the survey, more women (667,000) are attending college this year than ever before, even though the percentage of the total has dropped markedly, due largely to the phenomenal increase of men veterans. This year, men students constitute 32 per cent of the total, as contrasted with 61 per cent in 1945, 63 per cent in 1943, and 39 per cent in 1941.

The Office of Education information was based upon a preliminary report of a sample survey of higher educational institutions made as of 15 October.

The Office of Education is now communicating with selected educational officials throughout the country to determine the extent to which the expansion of college facilities has been sufficient to accommodate all qualified persons, veterans and nonveterans, seeking admission to college this year.

Important advances in knowledge of nutrition and its relation to life and health have been made through scientific research supported by grants of the Nutrition Foundation, George A. Sloan, president of the Foundation, stated at a luncheon meeting following the fifth annual meeting of the Board of Trustees in New York on 14 November. "This Foundation," Mr. Sloan said, "has had a part in alleviating suffering caused by diabetes, anemia, and tooth decay. The work it has supported has brought advances in knowledge of the relation of nutrition to maternal and infant health, bone healing, and liver injuries. It has helped to increase the useful life span." The Nutrition Foundation, Mr. Sloan reported, has made a total of 133 grants, aggregating $1,267,305 to 53 universities and medical centers in the United States and Canada. The work of the Foundation has been supported by contributions, totaling $2,318,000, made by food and related manufacturers.

The Board of Trustees has approved renewals of grants amounting to $29,050 and new grants totaling $28,800. The latter were made to: Olaf Bergeim, University of Illinois, to study 10 or more individual amino acids in human and animal blood, tissues, sweat, and spinal fluid, in health and disease ($3,000); Paul D. Boyer, University of Minnesota, to study the mechanism of the action of vitamin E and especially the relationship between deficiencies and impaired functions of the muscles ($2,600); Ralph I. Dorfman and J. T. Wearn, Western Reserve University, to study the nature of relationships between vitamins and hormones ($3,400 each); Carl M. Lyman, A. and M. College of Texas, to study the steps by which amino acids are synthesized by living organisms ($2,000 annually for two years); Joseph H. Roe, George Washington University, to study methods for making an analytical distinction between two or possibly more of the oxidation products of vitamin C ($3,600); E. L. Tatum, Yale University, to study new techniques of inducing new strains of bacteria, molds, etc., by means of chemical irritants ($2,500 annually for two years); W. W. Westerfeld, Syracuse University, to study the changes undergone by sugars in the animal body and the relation of such changes to the functional role of certain vitamins in the B-complex ($3,000 annually for two years); and James G. Wilson, University of Rochester, to study and analyze the malformations produced in fetal and newborn rats by maintaining the mothers on a diet deficient in vitamin A ($1,200).

The first Mary Soper Pope Medal of the Cranbrook Institute of Science, Michigan, has been awarded to Frans Verdoorn, editor of *Chronica Botanica*, in recognition of his editorial work in biology as well as for his researches in cryptogamic botany and the history of the plant sciences.

A consulting and analytical laboratory has been opened by Solomon Shankman in Los Angeles. Special emphasis is to be placed on amino acid and protein analysis. Dr. Shankman was formerly a research

associate in the Department of Chemistry, University of California, Los Angeles.

The Department of Botany, University of Nebraska, has announced several changes in its staff. On the city campus, Elda R. Walker, and Leva B. Walker, associate professors, have retired; John P. Decker, formerly of the U. S. Army, and Raymond W. Darland, recently in the Navy, have been made assistant professors; and Harry L. Weaver has been appointed as instructor. Changes in the plant pathology section on the agricultural college campus are as follows: M. W. Felton, assistant professor, has resigned to carry on commercial work; Ian W. Tervet has been appointed associate professor and associate pathologist; A. F. Sherf, assistant in pathology and assistant extension pathologist; and M. L. Schuster, instructor and assistant pathologist. R. J. pool is chairman of the Department, while R. W. Goss is chairman of Plant Pathology in the Experiment Station.

The Graduate School, University of Illinois, has established four research fellowships to be awarded for one year in the fields of medicine, dentistry, and pharmacy in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Fellows are eligible for reappointment in competition with the new applicants. Candidates must have completed a training of not less than eight years beyond high school graduation. They should indicate the field of research in which they are interested and submit complete transcripts of their scholastic credits, together with the names of three former science teachers as references. Appointments will be announced on 1 January or soon thereafter each year. The fellowship year begins on 1 September or 1 July. Formal application blanks may be secured from: Secretary, Committeee on Graduate Work in Medicine, Dentistry, and Pharmacy, 1853 West Polk Street, Chicago 12, Illinois.

The National Malaria Society held its 29th annual meeting in Miami, Florida, on 4–7 November conjointly with the meeting of the Southern Medical Association. The program consisted of 27 papers on the parasitology, treatment, and control of malaria. Of particular interest were the reports on the new anti-malaria drugs. A special feature was the presentation of a gift from the Society to Mark F. Boyd, retiring president, for his contributions to the knowledge of malaria and its control.

A grant of $27,750 has been made to the University of Utah School of Medicine for further support of a study of muscular dystropy and other hereditary and degenerative disorders. This supplements the grant of $92,000 made last year by the U. S. Public Health Service, Research Grants Division, for the same purpose. With the aid of these funds a Laboratory for the Study of Hereditary and Metabolic Disorders has been established under the directorship of M. M. Wintrobe, professor and head of the Department of Medicine. The activities of this laboratory will be divided between three divisions: The Division of Biochemistry and Physiology, of which Francis Binkley and Emil L. Smith are in charge; the Division of Genetics, with Fayette B. Stephens in charge; and the Clinical Division. The chief of the latter division, who will also act as assistant director of the study, has not yet been selected. A metabolic ward at the Salt Lake General Hospital forms part of the clinical Division. The staff of the metabolic ward includes Virginia Davenport, formerly of the Peter Bent Brigham Hospital, Boston.

The Marine Biological Laboratory, Woods Hole, Massachusetts, is able to offer a limited number of postdoctoral fellowships in the fields of biochemistry, biophysics, and physiological chemistry, through a grant received from the Lalor Foundation. The fellowships are designed primarily for young investigators to work during the summer, making use of the facilities of the Laboratory. The stipend is intended to cover laboratory fees, travel, and living expenses at Woods Hole. Applications should be received on or before 31 January. Blanks and further information may be secured from the Marine Biological Laboratory or from the chairman of the Fellowship Committee, C. W. Metz, Department of Zoology, University of Pennsylvania, Philadelphia 4, Pennsylvania.

The Wellesley College Botany Greenhouses have recently been named in honor of Prof. Margaret C. Ferguson, head of the Botany Department from 1905 to 1930 and president of the Botanical Society of America in 1929–30, the only woman to have been so honored. The greenhouses, containing a plant collection from all parts of the world, also have space allotted for undergraduate student experimentation and for graduate and faculty research. Prof. Ferguson was retired from Wellesley in 1932 as a research professor and is now living at 1519 Allston Way, Berkeley 3, California.

The Albert Commons collection of fungi, presented to the Academy of Natural Sciences in Philadelphia following Commons' death in 1919, has now been labeled and arranged alphabetically in families, genera, and species according to the Engler and Prantl classification by David R. Sumstine, associate in botany, Carnegie Museum, Pittsburgh. The Academy is preparing proper space and purchasing boxes for

the collection of over 4,000 specimens of fungi, which mycologists will have access to in the near future. All inquiries about the use of these specimens should be addressed to: Dr. Francis W. Pennell, Curator of Plants, Academy of Natural Sciences, Philadelphia, Pennsylvania.

Union College has received a gift of $50,000 to build what is expected to become one of the Nation's most up-to-date and complete mental testing laboratories as headquarters for the Union College Character Research Project. The $50,000 grant, given anonymously by a college trustee, will provide for the physical remodeling of the interior of the North College Colonnade, built in 1814. The Character Research Project, directed by Ernest M. Ligon, has received an additional $75,000 during the past year for expansion of staff and equipment. During the past 12 years tests of character growth in hundreds of children and youths have resulted in a partial laboratory analysis of the psychological attitudes which make up wholesome and healthy human personality. During the past year activity in the project has been directed toward developing curricular materials to constitute an educational basis for the formation of those already in children through cooperation of parents, church, and public schools.

The Department of Pharmacology, School of Medicine, University of Maryland, has been awarded a $5,000 fellowship by the Emerson Drug Company, Baltimore, for the purpose of studying the mechanism of action of drugs in hypertension. Elaine Gaby is working on the problem under the direction of John C. Krantz, Jr., professor of pharmacology. The Department is also the recipient of a $5,000 fellowship from the Ohio Chemical and Manufacturing Company, Cleveland, for the purpose of studying anesthetic agents. Dorothy V. Kibler is working on this problem, also under the direction of Dr. Krantz.

Harvard University will cease to graduate Bachelors of Science from 1950 on, according to Richard M. Gummere, chairman of the Committee on Admission. The University will award only Bachelor of Arts degrees, which it has conferred since 1642, upon discontinuance of the science degree, first awarded in 1907. Dr. Gummere stated that even undergraduates majoring in scientific fields "prefer to receive the arts degree."

A gift of $25,000, to be used for the support of fundamental research, has been allocated to The Ohio State University by its Research Foundation. This supplements a grant of $100,000 made for this same purpose last year. These funds, which represent some return to the University for the use of its facilities in governmental and industrial research, will be used principally for fellowships and the purchase of specialized research equipment. The allocation of these funds to research projects will be made by the president of the University upon the recommendation of a University-wide committee, of which the dean of the Graduate School is chairman.

NRC News

The Division of Physical Sciences has reported the formation of a new Committee on High-Speed Calculating Machines, under the chairmanship of John von Neumann, of the Institute for Advanced Study, Princeton, and with the following as members: Howard H. Aiken, Walter Bartky, Samuel H. Caldwell, George R. Stibitz, and Warren Weaver. The Committee will study the principles and possibilities of high-speed automatic machines, with a view to finding ways and means for greatly increasing the speed of computations. It is contemplated that pertinent information relative to computation and current research in such machines will be distributed to interested parties.

The Division's former Committee on Standards of Radioactivity has been reconstituted as a Committee on Radioactivity. Its responsibilites have been enlarged to include work on units, standards, and measuring instruments in this field. The membership of the new Committee includes: L. F. Curtiss, National Bureau of Standards, as chairman; R. D. Evans, Massachusetts Institute of Technology, vice-chairman; Irving Feister, National Bureau of Standards, secretary; and H. L. Anderson, A. M. Brues, Martin Deutsch, A. Ghiosso, H. H. Goldsmith, P. M. Hurley, J. E. Rose, Nathan Sugarman, and W. H. Sullivan. P. C. Aebersold and T. J. Killian are liaison members for the Manhattan District and the Office of Naval Research, respectively. Work of the Committee has been distributed under several subcommittees, of which the various Committee members are serving as chairmen. One of these is to serve as a clearinghouse for collecting and distributing information and data for use of workers in the field.

Plans are maturing for the appointment of additional committees to cover other important aspects of nuclear science.

For the year 1946–47 the Division is under the chairmanship of R. Clifton Gibbs, emeritus professor of physics, Cornell University. The membership includes representatives of the American Astronomical Society (2), the American Physical Society (4), the American Mathematical Society (5), the Mathematical Association of America (1), the Optical Society of America (2), the Acoustical Society of America (2), the Institute of Mathematical Statistics (1), the American Institute of Physics (1), the Government (1), and 6 members at large.

Recent Deaths

Benjamin S. Paschall, 67, formerly professor of chemistry at Washington State University and for the past seven years president and head chemist of the Paschall Laboratories, Seattle, died on 22 November.

Frederick B. Mumford, 78, dean emeritus of the College of Agriculture, University of Missouri, died on 12 November, as the result of an automobile accident in which Mrs. Mumford also lost her life. He had been dean of the College of Agriculture from 1909 to 1938 and dean emeritus since the latter date.

Charles Needham Forrest, 70, retired chemical engineer formerly with the Barber Asphalt Corporation of Perth Amboy, New Jersey, died in Fort Myers, Florida, on 2 December.

James Henry Leuba, 78, professor emeritus of psychology at Bryn Mawr, died at Winter Park, Florida, on 8 December. Among Dr. Leuba's books are: *The psychological origin and the nature of religion, A psychological study of religion, The belief in God and immortality,* and *The psychology of religious mysticism.*

Henry A. Trautman, 54, head of the Trautman Chemical Engineering Company, Cleveland, died on 3 December.

In the Laboratory

Photographic Measurement of Radiation Quality and Quantity

JEAN KIEFFER

Uncas-on-Thames Sanatorium, Connecticut State Tuberculosis Commission

and

ROY M. SEIDEMAN[1]

Bureau of Industrial Hygiene, Connecticut State Department of Health

It is recognized authoritatively that the degree of ionization produced by X-rays is a relative measurement of quantum energy, the intensity of which is expressed as the number of roentgens per unit time (*6*). For a beam of radiation having a given intensity, a quality index of the degree of ionization produced, or the amount of energy absorbed, in a unit mass is expressed as the relative absorption in various thicknesses of a material (usually full absorption curves in Cu or Al), a simplified value of which is the HVL (thickness of material that reduces the ionization to one half). The biologic effect is thus expressed as the exposure in roentgens (intensity × time) to radiation of a given tissue absorbability.

To date, the standard free-air ionization chamber has been accepted as the most accurate instrument for measurement of radiation quality and intensity. According to the definition of the roentgen, the only requirement of an X-ray measuring instrument is that it indicate the same number of r's per unit time as the standard air chamber when placed at the same point in a suitably defined beam (*11*). The principles of the free-air chamber have been recently extended to the development of the thimble-type chamber, the wall of which is of a material approximating human tissue in density and X-ray absorption. Its accuracy is dependent on calibration with the free-air chamber and the conditions under which it is used. Because extensive laboratory equipment is not required, this instrument is readily employed for the measurement of small doses of scattered and direct radiation in field studies.

The photographic effects of X-rays have been studied extensively as a basic science since their discovery in 1895. Most of these studies were based on the Bunsen and Roscoe reciprocity law, $E = It$ (*5*), and the Hurter and Driffield characteristic curve relating density and the logarithm of exposure (*10*), which had been reported previously for visible light. Barkla and Martyn (*1*) in 1913 concluded that the photographic effect produced by X-ray beams of a given intensity varied with the wave length—the more penetrating the radiation, the smaller the photographic effect. This was confirmed by Berthold and Glocker, Bouvers, and Bell (*2–4*). Bell also showed that, if development variables are eliminated and intensifying screens are not used, the shape of the H & D curve is independent of quality; under these conditions the failure of the reciprocity law was found to be negligible (10 per cent or less for an intensity range of 1–10,000). Bell and Henny (*2, 8*) found that, unless intensifying

[1] The authors express their gratitude to A. S. Gray and W. H. Weidman for making this paper possible; acknowledgment with thanks is made to the Machlett Laboratories, Springdale; United Aircraft Corporation, East Hartford; and the Hartford and St. Francis Hospitals, Hartford, for the use of radiation equipment during the course of this study.