joined the Loyalists, for whom he operated an anti-aircraft gun.

While passing through Chicago on his way back to his home at Winnipeg in 1937, a chance conversation led Slotin to accept a job to help construct the new cyclotron at the University of Chicago. This served as his introduction to nuclear physics. He contributed to a number of papers in radiobiology before beginning to work in the Metallurgical Laboratory of the Manhattan District Project when it was centralized in Chicago in 1942. Always following the center of activity, Slotin went to Oak Ridge to help with the Clinton pile development there. There he worked to start the first power-producing pile. When the problems of plutonium production were solved, Slotin moved to Los Alamos to assist in the critical problem of fabricating a bomb.

It was Slotin who was responsible for assembly and delivery of the first atomic bomb to the Army for the "Trinity" test in the desert. The receipt which he received when he turned this, the first atomic bomb, over to the Army was one of his most prized possessions, since it represented the culmination of the whole $2,000,000,000 effort of the Manhattan District. Slotin had wanted very much to go to Tinian, the launching point of the Hiroshima and the Nagasaki bombs, in the summer of 1945. He was still a Canadian citizen, several weeks short of his final American papers, and the legal delay which resulted kept him at Los Alamos until the end of the war. He had been scheduled to go to Tinian for the third bomb.

Slotin was well aware of the danger of his work at Los Alamos. One of his co-workers, Harry Daghlian, died last September from exposure in a similar accident, and Slotin had stayed at his side during the weeks until Daghlian's death. He felt obliged, however, to continue the work until another physicist could be trained to take the responsibility. The accident of 21 May occurred while he was instructing his replacement in the touchy techniques of critical assembly, no less needed in peace than in war.

Physics, and especially the difficult and specialized field of nuclear physics in its application to biology, will suffer from Slotin's loss. He had an intimate and a rich experience with the techniques of both chemistry and nuclear physics few others enjoyed and preferred often to help others rather than to work on his own ideas. He was undeterred by big undertakings and great responsibility. He was the man in the laboratory who was always willing to take the time and lend his skill to make real any promising idea that came up. Those of us who worked with Slotin loved him for his selflessness, his modesty, and his sure and quiet competence.

Nine days after the exposure Slotin died. His death, like his life, was quiet, brave, and clear.

H. L. ANDERSON and A. NOVICK
University of Chicago

P. MORRISON
Los Alamos Laboratory

News and Notes

About People

Alexander Craig Aitken, a native of Dunedin, New Zealand, has been appointed to the chair of mathematics, University of Edinburgh.

Anton J. Carlson was nominated at the San Francisco session of the American Medical Association to receive the citation and Distinguished Service Medal of the Association. Dr. Carlson received the B.S. and A.M. degrees from Augustana College and the Ph.D. from Stanford University. After serving as research assistant in physiology at Stanford, he became associated with the Carnegie Institution and from 1905 to 1907 worked as an instructor in the Woods Hole laboratories. He was appointed assistant professor and then professor of physiology at the University of Chicago, and in 1929 became Frank P. Hixon distinguished service professor. He retired in 1940 with the title emeritus.

William H. Feldman, the Mayo Foundation for Medical Education and Research, was awarded the Alvarenga Prize for this year on 14 July by the College of Physicians (Philadelphia), in recognition of his studies upon chemotherapy in tuberculosis. The prize was established by the will of Pedro Francisco daCosta Alvarenga, of Lisbon, Portugal, an associate fellow of the College, to be awarded annually on the anniversary of his death, 14 July 1883. The recipient is invited to deliver an Alvarenga Lecture before the College.

Clifford Frondel has been appointed associate professor of mineralogy and curator of the Mineralogical Museum, Harvard University, succeeding the late Harry Berman.

Eugene C. Crittenden received the Doctor of Science degree on 16 June from the Case School of Applied Science. Dr. Crittenden is an associate director of the National Bureau of Standards and for 25 years was the chief of the electrical division of the Bureau. He has served as president of the Illuminating Engineering Society, of the Optical Society of America, and of the Washington Academy of Sciences. He is president of the U. S. National Committee of the International Electrotechnical Commission, and served in a similar post for the International Commission on Illumination.

John F. Suttle and *Warren S. MacGregor* will join the staff of the Department of Chemistry, University of Portland, on 1 September. Dr. Suttle was formerly of Indiana University, and Dr. MacGregor, with the Atlas Powder Company.

Willis T. Tressler has resigned from the Department of Zoology, University of Maryland, to accept a position with the War Department as of 1 September.

Bruno Jirgensons, chemist and until 1944 at the Latvian University in Riga, was evacuated to Germany by the German military forces, according to word recently received. He is at present in the Latvian Displaced Persons Camp at Lauingen, Bavaria, Germany, U. S. Zone, where he is working on *Lehrbuch der Kolloidchemie* under the general editorship of J. Springer, of Berlin. Both Bruno Jirgensons and his brother, A. Jirgensons, an engineer specializing in lanital, galalith, and nylon, are anxious to come to the United States.

Charles E. Olmsted, University of Chicago, has been appointed editor of *The Botanical Gazette* to succeed E. J. Kraus, effective with the September issue. At that time the journal, published quarterly by the University of Chicago Press, begins its 108th volume.

P. Swings has declined an appointment as professor of astronomy at the Berkeley Astronomical Department, University of California, and plans to return to his native Belgium.

R. I. Throckmorton, for 21 years head of the Department of Agronomy, was appointed dean of the School of Agriculture and director of the Agricultural Experiment Station, Kansas State College, effective 1 July. He succeeded L. E. Call, who has become dean and director emeritus. H. E. Myers has been appointed head of the Department of Agronomy.

George D. Louderback and *Wendell M. Stanley* received the degree of Doctor of Laws at the University of California's 83rd commencement exercises, held on 22 June at Berkeley. Dr. Louderback is professor emeritus of geology, University of California, and Dr. Stanley, a member of the Rockefeller Institute for Medical Research, Princeton, New Jersey.

Richard M. Foose, senior geologist of the Pennsylvania Geological Survey, Harrisburg, will resign from his position on 1 September to become professor of geology and head of the Department of Geology, Franklin and Marshall College, Lancaster, Pennsylvania. He will continue to serve as a consulting geologist.

A. C. Ivy, Nathan Smith Davis professor of physiology, Northwestern University Medical School, has been appointed distinguished professor of physiology in the Graduate School and vice-president, University of Illinois, in charge of the Chicago Professional Colleges, effective 1 September. Dr. Ivy will teach "Interpretation of Symptoms" in the senior year of the Medical College and continue physiological and clinical investigation, for which facilities have been provided.

Alice M. Boring, who has been a visiting professor of zoology at Mount Holyoke College for the past academic year, sailed from Galveston, Texas, on 12 July to return to Yenching University, China, where she was professor of biology from 1923 until the University was closed by the Japanese on 8 December 1941. Yenching opened freshman classes on 10 October 1945 (Chinese Independence Day), and hopes to carry on a full schedule of normal work this coming fall for the academic year of 1946–47.

Ralph Alanson Sawyer, technical director of the atom bomb tests at Bikini Atoll, has been appointed dean of the Horace H. Rackham School of Graduate Studies, University of Michigan, effective in September, to succeed the late Clarence S. Yoakum.

Announcements

A report of the Action Committee on Surplus Property was made during July to 21 national educational organizations. The report pointed out that almost two years had elapsed since Congress passed the Surplus Property Act of 1944, providing benefits

to education in the disposal of surplus government property. During this time various regulations issued by the War Assets Administration under the authority of this act have failed to carry out its intent, so that today the "problem of issuing educational institutions fair and equitable access to surplus property remains unsolved." According to the report, every effort of the Committee to secure fair and reasonable interpretations of the regulations has met with delay and frustration. Efforts of the Committee to deal directly with the War Assets Administration "while met courteously have not been productive of any results whatsoever." On 2 July representatives of the Office of Scientific Personnel, Association of American Colleges, National Educational Association, Association of School Business Officials, American Vocational Association, American Council on Education, and others met with President Truman to discuss the problem. The President indicated that he would instruct the appropriate government officers to do whatever they could to expedite the distribution of surplus property to colleges. In his report for the month of June, M. H. Trytten, director of the Office of Scientific Personnel, says: "There is better reason to hope for a changed Administration attitude in this matter than at any time in the past."

Some 140 delegates from various academies of science met in Burlington House, 15 July, for the Royal Society's Newton tercentenary celebration, which should have taken place in 1942 but was postponed to this time. *Nature* of 19 December 1942, however, contained articles by Prof. E. N. da C. Andrade, Lord Rayleigh, and Sir James Jeans in celebration of Newton's birth, which occurred 24 December 1642. The U. S. delegation was composed of: Walter Adams, Marston Bogert, Frederick E. Brasch, Leonard Carmichael, Leslie Dunn, Jerome Hunsaker, Herbert Ives, Walter R. Miles, Peyton Rous, and Theodor von Kármán.

Sir Robert Robinson announced that it was proposed to establish an Isaac Newton Observatory in England and that the Chancellor of the Exchequer had agreed to ask Parliament for a sum of money for the project. The details are not yet settled, but the proposal involves the construction of a 100-inch reflector and accessories, which should be the property of the government.

Prof. Max Planck was present in spite of his 88 years.

In the afternoon E. N. da C. Andrade lectured on the life of Newton, who took an active part in parliamentary affairs. In addition to his active scientific life, he was member of Parliament for Cambridge in 1688 and was appointed Master of the Mint in 1699. In 1703 he was made president of the Royal Society, which office he held until his death in 1727. He was knighted in 1705, an honor which, according to Prof. Andrade, was "never before conferred for services to science."

Other items on the program for the remainder of the week were lectures by the late Lord Keynes (read by Mr. Geoffrey Keynes) on "Newton, the Man"; by Prof. J. Hadamard on "Newton and the Infinitesimal Calculus"; by Academician S. Vavilov (read on his behalf) on "Newton's Atomism"; by Prof. Niels Bohr on "Newton's Principles and Modern Atomic Mechanics"; by Prof. H. W. Turnbull on "Newton: The Algebraist and Geometer"; by Dr. Walter Adams on "Newton's Contributions to Observational Astronomy"; and by Dr. Jerome C. Hunsaker on "Newton and Fluid Mechanics."

The Mount Desert Island Biological Laboratory, Salsbury Cove, Maine, is in operation again after being closed during the war. Twenty-two biologists are in the colony, representing 12 institutions.

The Naturalists' Directory, containing names, addresses, and special subjects of study of professional and amateur naturalists throughout the world, will again be issued in September. Naturalists may send information about themselves to be inserted in the new Directory without charge. Directories may be obtained by sending $3.00 to: The Naturalists' Directory, Salem, Massachusetts.

The McLennan Laboratory, Department of Physics, University of Toronto, through its director, E. F. Burton, announces that a graduate course will be given next year for the purpose of training graduate students in all phases of electron microscopy theory and practice. The course, which will be limited to six students with advanced training in mathematics and physics, will be accepted as work toward the M.A. degree. Candidates must be acceptable to the School of Graduate Studies, University of Toronto.

The Brooklyn Botanic Garden announces a fellowship, available immediately, for research on plant growth. The stipend depends somewhat upon the qualifications of the candidate but is limited to not more than $3,000 per annum. Applicants need not possess a Ph.D. degree but should have training and/or experience which will qualify them for either independent or cooperative work. Letters of application should state age, training, and experience and be addressed to George S. Avery, Jr., Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn 25, New York.

An inorganic solids research project has been established at Northwestern University, according to Robert K. Summerbell, chairman of the Department of Chemistry. The work, which will be directed by P. W. Selwood, will be a fundamental study of inorganic solids such as manganese dioxide and related compounds. Particular attention will be paid to oxides of the transition group elements. The project will concern itself with the preparation of pure inorganic solids, the accurate characterization of these substances as to physical and chemical properties, and the behavior of such substances in catalytic and electrochemical changes. It is anticipated that substantial additions will be made to the already well-equipped X-ray and magnetochemical divisions of Northwestern University. Heavy reliance is expected to be placed on the method of susceptibility isotherms recently discovered by Dr. Selwood as one of the most powerful tools at the disposal of the chemist interested in the structure of catalytically active solids.

This project, which is made possible by an agreement with the Squier Signal Laboratory, Army Service Forces, will be of interest to the Signal Corps Engineering Laboratory in connection with the manufacture and properties of dry cells and other types of batteries. The contract is for a two-year period and will involve the sum of $36,200 for personnel, equipment, and supplies.

The Annales d'Astrophysique is being reorganized as an international medium for the publication of articles on astrophysics, according to an announcement by the French National Center of Scientific Research (CNRS).

F. Joliot-Curie, director of the CNRS, has nominated the following committee to organize the French Service d'Astrophysique: Mr. Danjon, Paris Observatory, chairman; Mr. Chalonge, Paris Observatory and Institute of Astrophysics, vice-chairman; Mr. Mineur, Paris Observatory and Institute of Astrophysics, secretary; and Messrs. Coulomb, Dufay, Fehrenbach, Lyot, Couder, Lallemand, and Barbier, members.

An international board of foreign correspondents has also been formed, including Messrs. Abetti, Beals, Gaviola, Lindblad, Mayall, Menzel, Merrill, Oort, Plaskett, Redman, Russell, B. Strömgren, Struve, and Swings. Under the new plan the *Annales* will accept articles from all countries and will be prepared to print them in one of three languages: French, English, or German.

During the war the *Annales* published two issues per year. Those for 1945 were expected to appear in the early part of 1946. The first issue of 1946, which started the international series, was expected to appear in the middle of the year. The editor-in-chief, Dr. Barbier, hopes to increase the number of issues to three per year, and if circumstances should warrant, there may be as many as six or eight issues per year. The address of the editor is: Institut d'Astrophysique, 98 bis, Boul. Arago, Paris (14ème), France.

The National Registry of Rare Chemicals, Armour Research Foundation, 35 West 33rd Street, Chicago 16, Illinois, has submitted their new needs in the following list of chemicals: cholesteryl oleate; tetrahydro-β-naphthol (ac); 2-phenyl cyclohexanol; 1,d,- or dl-pseudoephedrine or salts; 1,d,- or dl-norephedrine or salts; stachyose; lactosine; silicon trichloride; methyl nitrate; propyl nitrate; propyl nitrite; saccharic acid; carnaubyl alcohol; ceryl alcohol; myricyl alcohol; 2,4-dichlorobenzoyl K acid; phenoxazine; isodigitoxigenin; scillaren A; uzarin; iron pheophytin; and rosamine. Please communicate regarding these directly with the Registry at the address given above.

An Antibiotic Study Section has been formed under the direction of the National Institute of Health, U. S. Public Health Service, according to R. E. Dyer, director of the Institute. The chairman of the new Section is Hans T. Clarke, College of Physicians and Surgeons, New York, and the secretary, C. J. Van Slyke, National Institute of Health. The other members of the Section are: David P. Barr and Vincent du Vigneaud, Cornell University; R. D. Coghill, Abbott Laboratories; Harry Eagle, E. K. Marshall, Jr., and J. E. Moore, The Johns Hopkins University; R. P. Herwick and Henry Welch, Food and Drug Administration; Colin MacLeod, New York University; Oskar Wintersteiner, E. R. Squibb and Sons; W. Barry Wood, Jr., Washington University; Milton V. Veldee, National Institute of Health; Arthur M. Walker, Veterans Administration; Capt. George B. Dowling, U. S. Navy; and William Leifer, U. S. Army.

The primary interest of this Section at the moment is in fostering fundamental chemical and biologic studies of antibiotics with particular immediate reference to commercial penicillin; its known species, G, X, F, and K; new and modified penicillins; and impurities contained in penicillin.

The National Institute of Health is prepared to consider applications for grants-in-aid from investigators interested in these fields. Applications should be made to Dr. Van Slyke, Secretary, Antibiotics Study Section, Research Grants Office, National Institute of Health.

The All-Union Committee on Standards of the USSR has applied for membership in the United Nations Standards Coordinating Committee and has been welcomed by Executive Committee Chairman James G. Morrow, of Canada, according to an announcement made recently by H. J. Woilner, secre-

tary-in-charge of the New York office of UNSCC. With the inclusion of the Soviet national standards body, the membership of the UNSCC now includes 18 countries. The Committee, which grew out of conferences held between the national standards bodies of Canada, the United States, and Great Britain in the later stages of World War II and which has expanded to include the national standards bodies of the other United Nations as they applied for membership, is active in coordinating national industrial standards and in planning a broad permanent peacetime program of collaboration between nations.

The UNSCC held a conference in New York last October at which discussion was largely devoted to the drafting of a constitution for a new permanent international standards organization. The draft constitution is now being examined by the national member bodies who will discuss it further at a conference to be held in London this October.

The American representative on the UNSCC is the American Standards Association, of which Henry B. Bryans, of the Philadelphia Electric Company, is president. Howard Coonley, formerly chairman of the Board of the Walworth Company, is chairman of the ASA Executive Committee, and P. G. Agnew is vice-president and secretary.

Outstanding aspects of European developments in artificial limbs and surgical techniques for amputation cases have been reported in person to Secretary of War Robert P. Patterson and Maj. Gen. Norman T. Kirk, Surgeon General of the Army, by the group of scientists recently sent to England, France, and Germany for this purpose.

This mission was headed by Paul E. Klopsteg, chairman of a committee appointed by the National Research Council last year to engage in a broad program of research in this field. This research was started at the Surgeon General's request and is now under the joint sponsorship of the Army and the Veterans Administration. The group making the European study was made up jointly of members of the Committee and of the Surgeon General's staff, and included surgeons specializing in amputation cases and research engineers.

Dr. Klopsteg said that no other country is conducting a program of research in this field in any way comparable to the great effort here, for which the Army has already provided $1,000,000. While it was found that the work in this country on most aspects of the problem is far advanced when compared with that in Europe and that the materials for and construction of artificial limbs are superior here, information of significant value was obtained from the European studies.

Dr. Klopsteg reported to the Secretary and to the Surgeon General that he was confident that artificial legs incorporating the European improvements could successfully be developed by American scientists and qualified contractors. He also expressed confidence that the new development in cineplastic surgery, when used in conjunction with improved types of artificial arms, now in process of development or which can be evolved from the present research program, would enhance the prospect for many arm amputees.

Secretary Patterson directed that the War Department continue to give every possible support, financial and otherwise, to the Committee's research program, and stated that he proposed to ask the direct aid of certain other large corporations with great research divisions to speed up the work still further. Several companies are already so engaged under contracts with the Committee.

The Instituto de Estudos Brasileiros has suspended its meetings and the publication of its journal, *Estudos Brasileiros,* by a decision of its governing board, according to a recent announcement.

The Summit Corporation, Scranton, Pennsylvania, was recently organized to carry on fundamental research in the fields of electronic physics, and electrical, mechanical, and chemical engineering. Otto J. M. Smith is the chief electrical engineer of the new Corporation. Dr. Smith has been an instructor at Tufts College, assistant professor at Denver University, research engineer at the Westinghouse Electric Corporation, and chief electrical engineer at the Scranton Record Company.

A growing trend on the part of academic and industrial scientists to work together more closely in the furtherance of research was underscored in a ceremony at Corning, New York, in May, when the Research Club of Corning Glass Works was installed as a member club of the Society of the Sigma Xi, national scientific honor society. This marked the fourth time that an industrial science group has been admitted to membership in Sigma Xi.

In the absence of Harlow Shapley, Harvard University, president of the Society, J. G. Baker, of the Harvard Observatory, delivered the charge to the new affiliates. Carleton C. Murdock, representing the Executive Committee of Sigma Xi, presented the charter of membership to Gail Smith, Research Club president. Principal speaker of the evening was E. C. Pollard, physicist, Yale University, whose subject dealt with "The Elementary Particles of Nature."

Ernst Gäumann, mycologist, Eidg. Technische Hochschule, Institute für Spezielle Botanik, Zurich, Switzerland, has written that Dr. Petrak is alive in Vienna

and working at the Natural History Museum. Dr. Gäumann also writes that letters can be sent to Germany only by giving them to American or English soldiers who spend their holidays in Switzerland.—*B. B. Mundkur* (Imperial Agricultural Research Institute, New Delhi).

The Physics Department at the University of Southern California has added the following men to its staff during the past year: C. M. Van Atta, professor; John Backus, associate professor; Edward Gerjuoy, Willard Geer, John R. Holmes, William Parkins, and G. L. Weissler, assistant professors. Profs. Backus, Holmes, Parkins, and Van Atta were formerly connected with the Manhattan Project at Berkeley, California; Prof. Gerjuoy was the assistant director of the Sonar Analysis Group at Washington, D. C.; and Prof. Weissler was on the faculty of the University of California Medical School.

The Lamme medal for engineering achievement from Ohio State University was awarded to Rear Adm. Charles A. Park at the University's commencement exercises on 7 June. The medal, which is a gift of the late Benjamin G. Lamme, long-time chief engineer of the Westinghouse Electric and Manufacturing Company, goes each year to an Ohio State alumnus who has won distinction in engineering.

The Biological Abstracts Report for 1945 summarizes the 20-year history of the publication. Nineteen volumes have appeared covering 425,000 research papers. The last volume alone contained 23,446. The editor-in-chief, John E. Flynn, pays tribute to the "generous and unselfish cooperation of 3,000 abstracters and 157 section editors whose work is done without financial reward." After a period of some uncertainty following the loss of a subvention in 1935, the publication appears to be in a strong financial position.

Upon recommendation of the Library of Congress, the NDRC Office of Scientific Research and Development has selected some 20 public and university libraries throughout the country to be repositories for technical reports issued by the Radiation Laboratory. The reports cover all phases of microwave radar developments, fundamental research in electronics, development, design, and engineering of circuit elements, components, systems, and auxiliary equipment. Only a limited number of these technical reports are available.

The Farlow Herbarium of Harvard University has received word that a valuable collection of over 3,000 specimens of Malaysian Hepaticae, chiefly epiphytic Lejeuneaceae gathered by Frans Verdoorn, as well as some other collections assembled by him between 1925 and 1926 which were on loan at the outbreak of the war to the Botanical Institute of the University of Jena, is safe. Th. Herzog, one of those working on this collection, placed most of it during the early war years in a country home near Jena. Although this house was almost entirely destroyed by a bomb, the specimens were found in undamaged condition in the wreckage of the basement and were removed subsequently to a part of the basement at the Botanical Institute. At a later date this building was also destroyed, nine students being killed and the director, Prof. Renner, seriously wounded. The bryological collections were fortunately in a wing where the basement withstood the bombing. Work on them is now being continued by Prof. Herzog and his assistants, Drs. Benedict and Schuchardt.

Wesleyan University announces the retention of R. G. Clarke as director, W. C. Nelson as assistant director; C. B. Ford and W. P. Senett as group leaders, and R. W. Fabian as chemist of the ORDWES project located on its campus. G. Albert Hill is serving as chairman of the ORDWES Consultative Board, and W. G. Cady and B. H. Camp, as members of the Board.

The Program and Research Laboratories of the Illinois State Geological Survey

The Illinois State Geological Survey, located at Urbana-Champaign, on the campus of the University of Illinois, has for many years been engaged in a program of fundamental and applied research on the geology and mineral resources of Illinois.

The scope of the Survey's program begins with basic research in stratigraphy and structure of the rock formations and extends through studies of the natural occurrence and composition of mineral deposits, their physical and chemical properties, and possibilities of improved and new utilization, to an analysis of the mineral economics of the natural market area. Attention is also given to educational extension among high schools, technical societies, and the body politic. Over a period of 14 years this sort of broad program has been carried out and its value fully demonstrated in the case of a state of large population, extensive natural resources, and high industrialization.

For the current year the specific program may be briefed as follows:

Stratigraphy and paleontology: Ordovician, Silurian, Mississippian, Pennsylvanian, and Pleistocene stratigraphic and structural studies; conodonts of the black shales of Devonian-Mississippian age involving a consideration of the intersystem boundary; and spores of the coal beds of the Pennsylvanian.

Areal geology: completion of reports on the geology and mineral resources of several quadrangles; engraving and publication of a revised geologic map of the state.

Paleophysiography: studies of buried valley systems beneath the Pleistocene deposits.

Coal studies: detailed mapping and study of important coal beds to provide essential information for further exploration for coal and to aid in the study of oil and gas structures; petrographic analysis of the banded ingredients of coal to assist in a better understanding of its properties; proximate and ultimate analyses and determination of heat values; preparation and combustion studies designed to improve coal preparation for better stoker coals; pilot-plant coking tests of coals for metallurgical coke in cooperation with the steel industry; briquetting of coal fines (waste) without binder to produce "smokeless" briquettes; and beneficiation of coal sludge by oil flotation.

Oil and gas studies: geology and oil possibilities along the eastern rim of the deeper part of the Illinois basin; subsurface structure map of the base of the "Barrow limestone" in the Golconda formation of central and southern Illinois; geological and engineering studies to appraise the application of secondary recovery methods in certain areas; reservoir conditions of certain pools; publication of revised Oil and Gas Map showing pools and pipe lines.

Zinc and lead resource studies: geological and geophysical studies of the zinc and lead mineralized belt in northwest Illinois and of the genesis of the ore.

Fluor spar studies: geology of the fluor spar districts of southern Illinois; study of the synthesis and properties of aromatic fluorine compounds and their possible industrial applications.

Silica and tripoli: fundamental physical properties of Ottawa silica and southern Illinois tripoli; viscosity of four-component silicate melts in certain composition ranges of the system lime-magnesia-alumina-silica to extend the information available in the field of rock wool, glass, and other products resulting from a similar technology.

Limestone and dolomite studies: distribution and occurrence of limestone suitable for the production of agricultural limestone; preparation of report on the soundness and weather resistance of the limestones and dolomites in the greater Chicago area.

Clays and shales: clay mineralogy of Illinois clays and shales; relation of the molecular structure of the various clay minerals to their base exchange characteristics and ceramic and other properties; studies in differential thermal analysis of clays; studies of the extractability of alumina, potash, and by-products from Illinois shales; clay mineral characteristics of soil-foundation materials in relation to their soil mechanics properties.

Ground-water geology: ground-water geology of industrialized and urban areas; geophysical studies of important water wells requiring rehabilitation; earth-resistivity surveys to aid in locating water-bearing gravels in glacial deposits for municipalities and industries.

Engineering geology: study of geological problems of highway construction and maintenance, dam and reservoir sites, heavy building construction, etc.

Topographic mapping: enlarged program of topographic mapping in cooperation with the U. S. Geological Survey, with a view to completing the mapping of the state in eight years.

During the war the Survey emphasized primarily those research projects of special importance to the war effort, including three important laboratory research contracts for federal war agencies and certain projects in cooperation with the U. S. Geological Survey and the U. S. Bureau of Mines. The new laboratories of the State Geological Survey had been completed only 10 months prior to the attack on Pearl Harbor, and the value of the results fully demonstrated the wisdom of possessing adequate facilities and research staff qualified in various fields.

Its scientific and technical staff comprises 32 geologists, 15 chemists and chemical engineers, 2 physicists, 1 petroleum engineer, 1 mining engineer, 1 mechanical engineer, 1 mineral economist, and 18 research and technical assistants. Of those above the grade of research assistant 41 per cent have Ph.D. degrees, 38 per cent have M.A. degrees, and the remainder have B.A. degrees with advanced training and experience. The research assistants have B.A. degrees. This group is supported by a full-time librarian, an editorial staff of 5 people including draftsmen, a photographer, an instrument designer, a garage superintendent and assistant, and a secretarial and clerical force of 18 persons. Some college professors participate in research as their time permits, and a considerable number of college students assist during the academic year on a part-time basis and during the summer on full time.

The Survey's quarters are in the new Natural Resources Building, constructed in 1939–40 at a cost of approximately $750,000, including cost of equipment, to house the Geological Survey and the Natural History Survey. The portion occupied by the Geological Survey contains 28 offices and 24 laboratories, a library, technical files, drafting rooms, grinding rooms, mailing room, and storage rooms for systematic filing. An applied research laboratory, built in 1940 near the University's new power plant at a cost of about $175,000, including equipment, provides facilities for large-scale research in coking, briquetting, and improved preparation and combustion tests of the state's large resources of coal. A 44-car garage, constructed in 1942 for the use of both Surveys, also contains a special machine shop for the construction of research equipment which cannot be purchased on the open market.

In making these provisions for extensive and detailed research of its mineral resources, authorities and leading citizens of the state recognize the rank

of Illinois in its regional economic province—the Upper Mississippi Valley—and in the nation, and also the technologic requirements of the new era upon which we have entered. Even in the darkening days of the depression in 1931 the state aided the Survey with increased appropriations to set up chemical and physical laboratories of research in temporary quarters and to extend its field inquiries in both geology and geophysics.

The last session of the General Assembly appropriated $1,946,000 for three wing additions to the Natural Resources Building, affecting both the Geological Survey and Natural History Survey, and an additional $165,000 for two additions to the Geological Survey's applied research laboratory to provide for large-scale investigations of the industrial minerals of the state, for experiments in petroleum recovery methods, and for preparation rooms and storage.

The Geological Survey and its two sister divisions, the Natural History Survey and the Water Survey, are divisions of the State Department of Registration and Education, and their policies, programs, and appointments are under the control of the Board of Natural Resources and Conservation. This Board is composed of the director of the Department, who is chairman, ex officio; the president of the University of Illinois, member ex officio; and specialists in the fields of geology, chemistry, engineering, biology, and forestry, most of whom are senior members of the faculties of the University of Chicago and the University of Illinois.—*M. M. Leighton,* Chief.

Letters to the Editor

Inactive by Internal Compensation

Prof. Noller's quandary (*Science,* 1945, **102,** 508) concerning the rotatory compensation in meso compounds has, I suppose, perplexed teachers of stereochemistry as well as their students ever since the simplification was introduced that mirror images constituted the forms of enantiomeric pairs. This trick, of course, like the hydraulic analogy applied to electrical phenomena, has its limitations, which one is likely to forget during repeated usage.

The lecturer often uses his hands to illustrate nonsuperposability as well as mirror imagery but may forget to remind the student that not only are symmetrical objects both superposable and mirror images as well, but also that the test can apply only to configurations fixed with respect to some reference point. Thus, a shadowgraph of one's "asymmetric" hands, like stereographic projection formulas, does not illustrate configurational opposites unless it is understood that a reference point (*i.e.* the backs of the hands) is conventionally arranged.

In view of the student's ultimate introduction to modern concepts of optical rotatory power, this writer proposes that the qualitative concepts of these theories might profitably be introduced at the beginning of stereochemical instruction. Thus, by reference to Fig. 1, it can be shown that the arbitrary alphabetical order, b c d, indicates for the upper tetrahedron a counterclockwise sequence with respect to the fourth substituent, a. The lower tetrahedron exerts an opposite effect on the light beam owing to a clockwise sequence, b c d, with respect to a. Since these refractions are equal and opposite, it can in truth be said that meso compounds are optically inactive owing to internal compensation.

By contrast, the enantiomeric form shown in Fig. 2 can be analyzed from any arbitrary tetrahedral face, say a c d, with respect to the fourth substituent, b, as counterclockwise for both the upper and lower tetrahedrons. The refractions thus are in the same direction and support one another, to result in an optically active form.

Furthermore, if one substituent is hydrogen, the con-

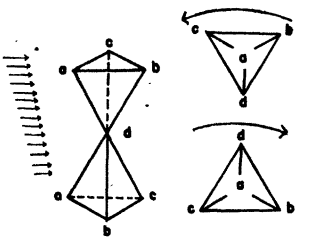

FIG. 1. Meso-form.

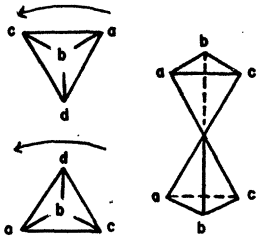

FIG. 2. d,l-form.

figuration can be assigned relative to glyceraldehyde, or to lactic acid by reference to such lists as that devised by R. E. Marker (*J. Amer. chem. Soc.,* 1936, 58, 976), thus to prepare the student for quantitative evaluations such as those of Born and of Kuhn, or the semiquantitative absolute configurational assignment of Boys (see Gilman's *Organic chemistry,* p. 1779).

Confusion for the student can indeed be avoided by advising him that enantiomerism is not a chemical phenomenon. This is further useful for his realization that enantiomerism is not bound by the fundamental concept of reversibility essentially inherent in every chemical change, and thus that a study of racemization can be superposed on any chemical process as an absolute and independent evaluation of that process.

If enantiomerism is thus defined and divorced from