devoted to the noble aim of upholding "the golden heresy of truth."

RECENT DEATHS

DR. CHARLES WALLIS EDMUNDS, professor of materia medica and therapeutics at the School of Medicine of the University of Michigan, died on March 1 at the age of sixty-eight years.

PROFESSOR ALBERT ROBERT ACHESON, head of the department of mechanical engineering in the College of Applied Science of Syracuse University, died on February 25. He was fifty-nine years old.

DR. ARTHUR ERICH HAAS, professor of physics at Notre Dame University, died on February 20 at the age of fifty-seven years.

DR. HENRY SELBY HELE-SHAW, emeritus professor of engineering at the University of Liverpool, died on February 3 at the age of eighty-six years. He was the first professor of engineering to hold the Harrison chair at University College, Liverpool. In 1905 he was appointed organizer of technical education in the Transvaal.

SCIENTIFIC NOTES AND NEWS

THE Council of the Geological Society, London, has awarded the Wollaston Medal to Dr. Arthur L. Day, who retired in 1936 as director of the Geophysical Laboratory of the Carnegie Institution of Washington.

PRESIDENT RAY LYMAN WILBUR, who observed his twenty-fifth anniversary as president of Stanford University on January 19, will retire at the close of the present academic year. Dr. Wilbur became president of Stanford in 1916, having previously been professor of medicine and dean of the Medical School.

DR. E. A. BIRGE, formerly president of the University of Wisconsin, who is now 89 years old, has received a specially printed copy of a joint resolution extending to him the congratulations of the Wisconsin Legislature. The resolution was adopted unanimously by both senate and assembly. It reads: "WHEREAS, the University of Wisconsin's President Emeritus E. A. Birge was honored last fall by national scientists and Wisconsin friends on the occasion of his eighty-ninth birthday; and, WHEREAS, this grand old man, known to so many as 'Dean Birge,' became associated with the University of Wisconsin in 1875 as instructor of natural history, and has an outstanding record of public service through these sixty-six years, probably equaled by no other Wisconsin citizen; now, therefore, be it *Resolved* by the senate, the assembly concurring, that the Wisconsin Legislature pause in its deliberations to extend sincere congratulations and felicitations to Dean Birge for his long continued, distinguished services to the university and to the State of Wisconsin."

ON the occasion of the eightieth birthday on February 15 of Dr. Alfred North Whitehead, professor of philosophy emeritus of Harvard University, a celebration, at which he was the guest of honor, was held at the Faculty Club by friends and associates. A bound book containing a birthday greeting, signed by five hundred of his colleagues and former pupils reads: "We who sign this greeting are your friends and students. No one can be your student without being your friend, or be your friend without learning from you unforgettable lessons of wisdom and kindness. During these dark days we think constantly of you, and derive courage from your high-mindedness and serenity. On this, your birthday, we join in sending to you and to Mrs. Whitehead the assurance of our devoted love."

THE retirement from active service is announced of Dr. N. H. Williams, since 1918 professor of physics at the University of Michigan. The retirement of Dr. H. M. Randall, also professor of physics and chairman of the department, has already been reported in SCIENCE.

DR. PAUL C. BUCY, assistant professor of neurosurgery at the University of Chicago, has been appointed associate professor of neurology and neurological surgery at the University of Illinois College of Medicine, Chicago. Dr. Bucy succeeded Dr. Percival Bailey as chief neurological surgeon at the University of Chicago when Dr. Bailey joined the staff of the University of Illinois in September, 1939. Both are now associated with Dr. Eric Oldberg, professor and head of the department of neurology and neurological surgery at the new Neuropsychiatric Institute which has just been completed for the University of Illinois at Chicago.

DR. R. A. GOODWIN, formerly of the North Dakota Agricultural College, has joined the department of physics of the Fort Hays Kansas State College.

JOHN DOUGLAS RYDER, of the Research and Development Laboratory of the Bailey Meter Company, Cleveland, Ohio, has been appointed assistant professor of electrical engineering at the Iowa State College.

DR. LUDWIG HEKTOEN, executive director of the National Advisory Cancer Council, was elected honorary

chairman of the board of governors of the Institute of Medicine of Chicago at its recent annual meeting. Dr. Hektoen, who has been chairman of the board, was succeeded by Dr. William M. Petersen.

DR. CHARLES FRANKLIN KETTERING, president of the General Motors Research Corporation, was recently elected a member for a seven-year term of the Board of Trustees of the Ohio State University.

DR. SHIRLEY W. WYNNE, formerly health commissioner of New York, was elected on February 4 president of the Associated Health Foundation, a non-profit medical service corporation. This foundation is conducted under the sanction of the New York State Department of Insurance and the Board of Social Welfare. It offers virtually complete medical, surgical, laboratory and x-ray care for individuals making less than $3,000 a year, where there are families to support, and $1,800 in the case of persons with no dependents.

DR. H. R. CRANE and Dr. James L. Lawson, of the department of physics of the University of Michigan, have leave of absence to serve on the National Defense Research Committee.

PROFESSOR HERBERT M. EVANS, director of the Institute of Experimental Biology at the University of California at Berkeley, has left for a goodwill tour of Latin America on behalf of the State Department. Dr. Evans, who will visit cultural and scientific centers, traveling by airplane, is an envoy of Secretary of State Cordell Hull and the university. The tour is a part of the program for cementing Pan American relations through cultural exchange. It is being financed principally by the government of Uruguay and the Guggenheim Foundation. The main purpose of the trip is the occasion of the Second Pan American Congress of Endocrinology, to be held at Montevideo from March 5 to 8. Dr. Evans will give one of the main addresses at the congress, and plans to speak at ten Latin American universities, including universities in Brazil, Argentina, Chile, Peru and Mexico.

DR. LANCELOT HOGBEN, Regius professor of natural history at the University of Aberdeen, author of "Mathematics for the Millions," who was last year guest professor of genetics at the University of Wisconsin, has sailed for England.

THE Geological Society of America has awarded a research grant to Professor John T. Lonsdale, head of the department of geology at the Iowa State College. This will enable Dr. Lonsdale to study the Chisos Mountains of Texas during the summer. These mountains have been the scene of intense volcanic activity. The project is included among the research studies of the Industrial Science Research Institute of the college.

DR. MEYER M. HARRIS, research associate of the New York State Psychiatric Institute, has received a grant-in-aid from the Committee on Scientific Research of the American Medical Association in support of studies on the effect of food factors in neuromuscular diseases.

DR. PETER K. OLITSKY, member of the Rockefeller Institute for Medical Research, New York City, addressed the University of Cincinnati Chapter of Sigma Xi (through the courtesy of the B. K. Rachford Lectureship Fund) on February 12, on "Hans Zinsser and His Studies on Typhus Fever."

DR. FARRINGTON DANIELS, professor of physical chemistry at the University of Wisconsin, will deliver the first John Howard Appleton Lecture for the year 1940–41 in the Metcalf Auditorium of Brown University on the evening of March 11. His subject will be "Photosynthesis."

PROFESSOR G. H. PARKER, of Harvard University, lectured in New Orleans on February 19 before the Physiological Department of Tulane Medical School on "The Control of the Human Body by Nerves and by Hormones." On February 20 he lectured at the Louisiana State University on "Recent Views on the Action of the Nervous System as illustrated by the Color Changes in Animals" and on the following day he conducted a seminar on the same subject.

REGINALD PATRICK LINSTEAD, professor of organic chemistry at Harvard University, formerly of the Imperial College of Science and Technology, London, will give from March 7 to 15 the seventh Connecticut Valley lecture series. He will speak on "The Pattern of Large Organic Molecules" at Mount Holyoke College on March 7; at Amherst College on March 8; at Smith College on March 14, and at the Massachusetts State College on March 15.

THE one hundred and twentieth anniversary of the founding of the Philadelphia College of Pharmacy and Science was observed on Monday, February 24. The principal address of the morning exercises was delivered by Henry B. Allen, director of the Franklin Institute of the Commonwealth of Pennsylvania.

THE first of a series of lectures designed to preserve the memory of Professor Henry Edward Armstrong, chief chemical adviser to the British Ministry of Home Security and past president of the Society of Chemical Industry, who has been described in recent years as "The father of British Chemistry," was given on February 3 by his son, Dr. Edward Frankland Armstrong, at the rooms of the Chemical Society, London. Professor Armstrong died in 1937 at the age of eighty-nine years.

THE twelfth annual meeting of the American Asso-

ciation of Physical Anthropologists will be held on April 7 and 8 immediately preceding the meetings of the American Association of Anatomists on April 9, 10 and 11. The meeting is held in conjunction with the fiftieth anniversary celebration of the University of Chicago. Symposia are being arranged on several topics, including anthropometric techniques and the physical anthropology of the American Indian. The annual dinner will be held on Monday evening, April 7. Following this, Dr. Aleš Hrdlička will give an address on "The Physical Characteristics of Alaskan and Siberian Peoples."

THE first annual meeting of the Collaborators of the U. S. Plant, Soil and Nutrition Laboratory was held at Ithaca, New York, on January 23 and 24. Collaborators were present from all parts of the country. The meeting was devoted to a detailed consideration of the objectives and procedures of the laboratory program. This program is broadly concerned with the plant and soil factors involved in the production of a food supply of a higher nutritional quality, and thus with the improvement of the nutrition and health of man and animals.

BY the will of Emil Bommer, a Brooklyn manufacturer, Dartmouth College receives $500,000 and an interest in his residual estate.

A DESERT MUSEUM at Palm Springs, Calif., was opened on February 19. It occupies a room in the Library Building and is concerned with the natural history of the desert areas, including anthropology. The director of the museum is Lloyd Mason Smith.

The New York Times reports that a decree vesting control over scientific expeditions engaged in research in Colombia in a group composed of representatives of the Foreign, Finance, Education, Commerce and War Ministries has been signed by President Eduardo Santos. This group will report to the government on all applications after study of the object of the expedition and the competence of members. The government will censor all photographs and written reports before they are permitted to leave the country.

THE London *Times* states that scientific apparatus used by Dalton, the chemist and mathematician who propounded the atomic theory of chemical action, are among treasures believed to have been destroyed in a recent raid in Manchester. The apparatus was one of the show pieces at the home of the Literary and Philosophical Society, which was wrecked.

MOUNT ZION HOSPITAL, San Francisco, opened on January 31 a Cardio-Vascular Research Laboratory under the direction of Dr. Meyer Friedman. The laboratory will be devoted solely to the investigation of diseases affecting the heart, the kidney and the peripheral blood vessels.

THE *News Edition* of the American Chemical Society gives an account of plans for the new analytical control laboratories to be built at the headquarters plant of Merck and Company at Rahway, N. J., the construction of which will require from six to eight months. The control division which will occupy the new building is responsible for testing all raw materials, ingredients, products and packages for the company, which turns out some 3,000 separate items in 13,000,000 containers per year. The main operating laboratory will be on the top floor where artificial lighting will be supplemented by skylight illumination of the saw-tooth type. Throughout the building, interior lighting will be achieved with fluorescent tubes. There are special laboratories on the second floor. Filtered fresh air will be forced into the building and distributed through a system of ventilating ducts, permitting change of air every five minutes. Reenforced concrete construction will be employed and the exterior walls will be of brick. Inside the building, floors will be of mastic tile, laid on concrete. The main floor area will be 72 x 140 feet.

DR. GEORGE GRANT MACCURDY, director of the American School of Prehistoric Research, writes to SCIENCE that he recently received notice of the discovery of a cavern near Montignac (Dordogne), containing numerous rare examples of paleolithic mural art. These can be described in the words of the prehistorian, Abbé Henri Breuil: "They are drawings, engravings and paintings in an extraordinary state of preservation, perhaps the most important series yet brought to light. We have found up to the present over 120 examples. Splendid artists have decorated these cavern walls with bison hunters and their composition is akin to that of the engravings at Les Eyzies, not far away. There are various ochre colors, the like of which are only found in the cavern of Altamira, Spain, and a sense of movement thus far unequaled anywhere. The paintings are at least 30,000, and perhaps 40,000 years old."

VOLUME 1, No. 1, pages 1 to 56, of the University of California Publications: Contributions of the Los Angeles Astronomical Department, was issued on December 26 from the University of California Press. The board of editors of the new series consists of the three permanent members of the department, Dr. Joseph Kaplan, Dr. Samuel Herrick, Jr., and Dr. Frederick C. Leonard, as chairman. Volume 1, No. 1, is entitled, "The Laplacian and Gaussian Orbit Methods," and is by Dr. Samuel Herrick, Jr. This series is designed to contain all papers originating in the department of astronomy at Los Angeles that are to appear in the publications of the University of California.

CHARLES STARLING CHILDS, '91, and Edward C. Childs, '28, have presented to the School of Forestry of Yale University a new site for its summer camp in the Great Mountain Forest in Norfolk and Canaan Townships.

THE Oklahoma State Planning and Resources Board has granted to the University of Oklahoma a ninety-nine-year lease on a three hundred-acre tract on the south side of Lake Murray for a summer camp of the School of Geology of the university. It is said that there are few places in North America where such a diversity of geological features may be observed in so small an area as that within a 25-mile radius of the new site. For more than twenty years a summer field course in geology has been conducted in the region. It is expected that instruction will be carried on throughout the entire summer under a group of instructors to be chosen from the various colleges and universities participating. Dr. A. J. Williams will represent the University of Oklahoma. The School of Geology of the university will maintain control and instructional supervision of the camp, but its facilities will be made available to any one interested in the purpose of the camp.

DISCUSSION

GENERAL OR SPECIAL IN THE DEVELOPMENT OF MATHEMATICS

MODERN mathematical advances are largely based on generalizations, and this has naturally led to an emphasis on what appears to be general in modern mathematical publications. It is not always observed that the generalizations of the earlier special cases are largely due to the fact that these cases are really more general than was at first observed so that their appearance as special was often due to a lack of foresight on the part of those who regarded them as special. For instance, when H. Cardan (1501–1576) included in his now famous "Ars Magna" (1545) the solution of a special quadratic equation having complex roots he took a very fruitful step forward, even if his later work seems to justify the view that this solution was not original with him. It inspired work which several hundred years later became the core of various fundamental developments.

The normal way in which mathematics has been developed is from the special to the more general, and hence it is somewhat striking that many are now inclined to dismiss various contributions merely on the ground that they are special. The much more important and more difficult question is whether they are apt to be fruitful. In the past various writers have purposely confined their remarks to the main points for the sake of simplicity and left to the reader obvious generalizations. For instance, at the close of his "La Géométrie" (1637), R. Descartes said, "I hope that posterity will judge me kindly, not only as to the things which I have explained, but also as to those which I have intentionally omitted, so as to leave to others the pleasure of discovery." In view of the very wide scope of the mathematical work at present nearly every individual contribution may reasonably be regarded as special, even when it is clothed in very general terms.

In the development of mathematics the pre-Grecian work is almost entirely concerned with the consideration of special cases, while Greek mathematics as it is represented by the "Elements" of Euclid (about 300 B.C.) is largely devoted to the consideration of general cases. This generalization in Greek mathematics does not extend as far back as was formerly supposed. The widely praised Greek rigor in geometry does not extend as far back as Pythagoras (about 580–501 B.C.) but began about a century later, according to recent critical studies of the ancient Greek mathematical literature. The systems of postulates as they have come down to us through Euclid's "Elements" seem now to be due to Euclid himself. In particular, they do not appear in the works of Aristotle, who was about twenty years older than Euclid and frequently referred to mathematics.

Notwithstanding the fact that the pre-Grecian mathematicians confined themselves almost entirely to the consideration of special cases in their extant publications, they developed one of the most fruitful abstract concepts, *viz.*, the concept of abstract numbers. It is not known that they formulated a definition of such numbers or emphasized the distinction between abstract and concrete numbers, but their use of abstract numbers is fully established. Just as abstract groups are now commonly called general groups, so abstract numbers may be regarded as general numbers in comparison with the more special concrete numbers. The ancient Egyptians are now known to have had the concept of general rational fraction, even if their publications mostly involve unit fraction. The special and the general therefore extend through the entire mathematical literature and both have been very fruitful.

The pre-Grecian rules that the area of a rectangle is equal to the product of two of its adjacent sides and that the volume of a rectangular parallelepiped is equal to the product of its three concurrent edges represent very fruitful general concepts. They exhibit the use of square units having linear units as edges