Engineering Council for Professional Development. A department of chemical engineering has been recently established.

N. S. H.

RECENT DEATHS

LAWRENCE BRUNER, since 1895 professor of entomology at the University of Nebraska, died on January 30 at the age of eighty years.

JOHN H. GREGORY, since 1921 professor of civil and sanitary engineering at the Johns Hopkins University, died on January 18 at the age of sixty-two years.

JOHN ALEXANDER MACWILLIAM, until his retirement in 1927 with the title emeritus professor of physiology at the University of Aberdeen, died on January 13 at the age of seventy-nine years.

THE death is announced at the age of sixty-eight years of Percy Andrew Ellis Richards, for over twenty years professor of chemistry at Queen's College, London, and lecturer in chemistry and metallurgy at the Royal Dental Hospital.

THOMAS CROOK, since 1928 principal of the Mineral Resources Department of the Imperial Institute, London, died on January 6.

ORSO MARIO CORBINO, formerly professor of experimental physics at the University of Messina and later at the University of Rome, died on January 23 at the age of sixty years. In 1920 he was appointed a senator and in 1921 became Minister of Education in Premier Bonomi's cabinet. After the rise to power of Mussolini, he served for two years, 1923 and 1924, as Minister of National Economy.

SCIENTIFIC NOTES AND NEWS

AT the Founders' Day celebration of the University of Wisconsin on February 6, which commemorated the eighty-seventh anniversary of the opening of the first class of the university, special honor was paid to Dr. Edward Asahel Birge, president emeritus of the university, who is now eighty-five years old. Hundreds of alumni took part in the celebration by attending dinner meetings which were held in all parts of the country. At Madison a testimonial was presented to Dr. Birge by the alumni association in recognition of his long service to the university and the state. Dr. Birge went to the state university in 1875 as an instructor in natural history. He was professor of zoology from 1879 to 1911, and served as dean of the College of Letters and Science from 1891 to 1918. He was acting president of the university from 1900 to 1903, and in 1918, following the death of President Charles R. Van Hise, he was elected president. He served until 1925, when he retired as president emeritus.

THE council of the Geological Society, London, has awarded the Wollaston Medal to Professor Waldemar Lindgren, of the Massachusetts Institute of Technology, for his researches concerning the mineral structure of the earth, and especially concerning the problems of mesasomatism, contact ore-deposits and the application of physical chemistry to ore-deposition.

AN award for distinguished service to agriculture was made to Maurice Adin Blake, professor of agriculture at Rutgers University, at the opening session of the State Agricultural Convention in the Assembly Chamber at the Capitol on January 26. Professor Blake has developed some 100 new varieties of peaches.

THE Bulgarian Order of Civil Merits with Golden Crown has been conferred by King Boris III on Dr. J. C. Th. Uphof, of Orlando, Fla., in recognition of his researches in botany. These have been published in the English, French, German, Dutch and Spanish languages.

THE British Royal Astronomical Society has awarded its Gold Medal to Dr. Harold Jeffreys, university reader in geophysics at the University of Cambridge, for his researches into the physics of the earth and other planets and for his contributions to the study of the origin and age of the solar system.

DR. VILHJALMUR STEFANSSON was elected president of the Explorers' Club, New York City, at a meeting held on February 3. Dr. Walter Granger, whom Dr. Stefansson succeeds as president, was elected *first vice-president;* Lowell Thomas was named *second vice-president;* H. R. Forbes, *third vice-president;* H. E. Winship, *treasurer,* and Joseph Robinson, *secretary.*

DR. ROGER W. TRUESDAIL, of the Truesdail Laboratories, Los Angeles, has been elected president of the Sigma Xi Club of Southern California, and J. A. Hartley, president of the Braun Corporation, Los Angeles, has been elected secretary-treasurer.

AT the thirty-ninth annual meeting of the Washington Academy of Sciences, held on January 21, the following officers were announced for 1937: *President,* Charles Thom, Bureau of Plant Industry; *Corresponding secretary,* Nathan R. Smith, Bureau of Plant Industry; *Recording secretary,* Oscar S. Adams, Coast and Geodetic Survey; *Treasurer,* Henry G. Avers, Coast and Geodetic Survey; to the *Board of Managers* for three years, F. G. Brickwedde, National Bureau of Standards, and J. F. Couch, Bureau of Animal Industry; *Non-resident vice-presidents,* Thomas Barbour, Cambridge, Mass., and P. W. Bridgman, Cambridge,

Mass. Vice-presidents nominated by the affiliated societies were elected as follows: Philosophical, Frank Wenner; Anthropological, F. H. H. Roberts, Jr.; Biological, H. C. Fuller; Chemical, J. H. Hibben; Entomological, C. F. W. Muesebeck; Geological, W. T. Schaller; Medical, H. C. Macatee; Historical, Allen C. Clark; Botanical, John A. Stevenson; Archeological, Aleš Hrdlička; Foresters, S. B. Detwiler; Washington Engineers, Paul C. Whitney; Electrical Engineers, H. L. Curtis; Mechanical Engineers, H. L. Whittemore; Helminthological, Emmett W. Price; Bacteriological, H. W. Schoening; Military Engineers, C. H. Birdseye; Radio Engineers, J. H. Dellinger.

DR. WILSON G. SMILLIE, professor of public health administration in the School of Public Health at Harvard University, has been appointed professor of public health and preventive medicine and head of that department in the Cornell University Medical College, New York City. He will represent Cornell University in the supervision of the health center in Kipps Bay, Yorkville, now being erected in cooperation with the Department of Health of New York.

DR. GEORGE H. GODFREY, of the Pineapple Canners' Experiment Station at the University of Hawaii, has joined the staff of the Division of Entomology and Parasitology of the University of California at Berkeley.

AT the Massachusetts State College, Dr. C. E. Gordon, in charge of entomology, zoology and geology since 1930, has, at his request, been relieved of the direction of the work in entomology. The trustees of the college have voted to reestablish the department of entomology.

DR. WILLIAM CHRISTINE ANDERSON will retire as dean of the Brooklyn College of Pharmacy on September 1 and will become dean emeritus.

CLIFFORD C. GREGG has been appointed acting director of the Field Museum of Natural History, Chicago, to take the place of the late Stephen C. Simms, who had been chief executive of the museum since 1928. Mr. Gregg has been a member of the staff since 1926, and has served as assistant to the director under both Mr. Simms and the preceding director, the late David C. Davies.

DR. WALDO R. WEDEL has been appointed assistant curator in the Division of Archeology of the U. S. National Museum.

NANDOR PORGES has been appointed assistant bacteriologist at the By-Products Laboratory of the Farm Wastes Investigation Division of the Bureau of Chemistry and Soils of the U. S. Department of Agriculture. He is stationed at Ames, Iowa.

DR. ARTHUR PAUL JACOT has been appointed a member of the Northeastern Forest Experiment Station, New Haven, Conn., where he will continue his work on the ecology of the fauna of litter and soil.

DR. BERWIND P. KAUFMANN, professor of botany at the University of Alabama, is on leave of absence for the second semester and will be a visiting investigator at the department of genetics of the Carnegie Institution of Washington at Cold Spring Harbor, Long Island, until September.

DR. MAX CUTLER, of the Medical School of Northwestern University, has a leave of absence, during which he will serve as visiting professor in surgery in the Peiping Union Medical College. He will conduct a tumor clinic under the auspices of the Rockefeller Foundation.

THE Committee on Scientific Research of the American Medical Association has made the following grants: Alexander S. Wiener, Jewish Hospital of Brooklyn, agglutinogens in human blood; Irving Graef, New York University, pulmonary reactions to instillation of lipids and mineral oils; Moore A. Mills, Northwestern University Medical School, experimental pulmonary tuberculosis in the dog; M. M. Wintrobe, Johns Hopkins University, red corpuscles; Edward S. West and G. E. Burget, diuretic action and chemical metabolism of sorbitol; S. J. Crowe, the Johns Hopkins University, physiology of hearing; Ernest Carroll Faust, Tulane University, epidemiology of trichinosis in New Orleans; George Herrmann, University of Texas, heart muscle chemistry; Paul M. Levin, the Johns Hopkins University, cerebral efferent tracts in primates.

DR. J. D. COCKCROFT will give a series of six lectures on the work on "Nuclear Physics and Low Temperature Research," carried out in the Cavendish Laboratory at the University of Cambridge, in the Jefferson Physical Laboratory, Harvard University, beginning on the afternoon of March 25 and continuing through the following week. Physicists who are able to attend these lectures will be welcome.

DR. THORVALD MADSEN, director of the Serum Institute, Copenhagen, will deliver the fifth Harvey Society lecture of the current series at the New York Academy of Medicine on February 18. Dr. Madsen will speak on "The Scientific Work of the Health Organizations of the League of Nations."

DR. T. WINGATE TODD, Henry Willson Payne professor of anatomy at Western Reserve University, will deliver the thirteenth Lewis Linn McArthur lecture of the Frank Billings Foundation before the Institute of Medicine of Chicago on Friday evening, February 26.

His subject will be "Objective Ratings on the Constitution, Based upon Examinations of Physical Development and Mental Expansion in the Growing Child."

DR. ALFRED C. LANE, professor emeritus of geology at Tufts College, lectured before the Society of Sigma Xi at the Ohio State University on January 7 on "Measurement of Geologic Time." Dr. Lane also spoke before the department of geology of the university on the afternoons of January 6 and 7 on "Radioactive Methods Applied to Pre-Cambrian Classification" and "Principles of Economic Geology."

PROFESSOR S. LEFSCHETZ, of Princeton University, gave recently a lecture in the Dohme series at the Johns Hopkins University on "What is Topology?" He also spoke before the Mathematics Club of the university on "Some Applications of Algebra to Topology."

PROFESSOR EDWARD KASNER, of Columbia University, gave two lectures in January at the University of South Carolina on "Infinity" and "Geometric Transformations."

DR. LEWIS W. HACKETT, assistant director of the International Health Division of the Rockefeller Foundation and representative of the foundation in Italy and Albania, is giving on Tuesdays and Fridays from February 2 to February 19 a series of six Lowell lectures entitled "Man against Malaria in Southern Europe."

THE Sigma Xi Chapter at the University of Rochester will hold its annual science exhibit on February 22. Dr. George Packer Berry, professor of bacteriology and associate professor of medicine in the School of Medicine and Dentistry, will speak to an audience of school children on "Viruses and Their Influence on Public Health." Dr. H. S. Gasser, director of the Rockefeller Institute for Medical Research, will deliver the evening address.

THE fourth annual meeting of the American Institute of Nutrition will be held in Memphis, Tenn., on April 21. Hotel headquarters will be at the Hotel Peabody. Officers for 1936–37 are: *President,* Dr. Eugene F. DuBois; *Vice-president,* Dr. Mary Swartz Rose; *Treasurer,* Dr. George R. Cowgill; *Secretary,* Dr. Icie G. Macy; *Members of the Council,* Drs. C. A. Elvehjem, R. M. Bethke and L. A. Maynard. There will be a luncheon and dinner at the hotel. The program will consist of approximately twenty scientific papers and the evening program will consist of six or eight discussion groups.

Nature reports that at the invitation of the Royal Society, the International Council of Scientific Unions will hold its triennial General Assembly at Burlington House, London, from April 27 to May 4. China, through the Academica Sinica of Nanking, has recently joined the council, which now includes forty-two countries in addition to the International Unions of Astronomy, Geodesy and Geophysics, Chemistry, Scientific Radio, Physics, Geography and the Biological Sciences.

THE Executive Committee of the International Union of Biological Sciences has decided to postpone the general assembly of the union from July, 1937, until the year 1940. The next assembly will be held at Stockholm immediately before the seventh International Botanical Congress, probably from July 11 to 20.

THE annual summer term of the American School of Prehistoric Research will open in Paris on July 1, 1937. The tentative program includes lectures, museum studies, practice in excavating and excursions in various parts of France, including the valleys of the Oise, Seine and Somme, the Dordogne region, the Pyrénées, etc. Excavations will be carried on at the important stations of La Quina (Charente) and Mas d'Azil (Ariège). The Abbé H. Breuil, foremost authority on old world prehistory, will be in charge of the course and will be assisted by Harper Kelley, associate director of the summer term, which will last for at least six weeks. Prospective students should apply for enrolment as soon as possible. Applications for enrolment and for further information should be addressed to: George Grant MacCurdy, director, American School of Prehistoric Research, Old Lyme, Conn.

THE Geological Society of America has recently authorized a grant assuring the publication of the seventh edition of the James D. Dana "System of Mineralogy," first published in 1877. This task of revision is expected to consume the time of two competent specialists for approximately four years. It is then to be published by John Wiley and Sons, New York, publishers of the original volume, and will take the place of the volume prepared under the direct supervision of the late Edward S. Dana, and published in 1892. The present work is being carried forward by Drs. M. A. Peacock and Harry Berman in the laboratories of Harvard University, under the supervision of Professor Charles Palache, of Harvard University, and Professor W. E. Ford, of Yale University.

BY the will of the late Miss Mary Lee Ware, of Boston, who made possible the glass flower collection at Harvard University as a memorial to her father, the sum of $300,000 is bequeathed to the university. The president and fellows of Harvard College are directed to divide the income from the $300,000—one

third going to the support of Rudolph Blaschka and Mrs. Blaschka, whose family made the glass flowers and models; one third to preserve the collection; and one third to pay the salary of officials of the museum in which the objects are housed. The will expresses the wish that the director shall give prominence in the museum to the educational and practical side, and shall endeavor to augment the usefulness of the museum of exploration and investigation. The wish is also expressed that the director have discretionary power under the president and fellows as to expenditures necessary. Other bequests include $40,000 to the Boston Lying-In Hospital; $20,000 to Harvard University for the work of the Cancer Commission; $40,000 to the Boston Athenaeum; $20,000 to the Massachusetts Society for Mental Hygiene; $10,000 to Berea College, Kentucky; $20,000 to the Massachusetts Eye and Ear Infirmary; $70,000 to the Boston Museum of Fine Arts, and $30,000 to Harvard College for the Fogg Museum of Art.

THE *Fondation Scientifique de Lyon et du Sud-Est* is offering a fellowship of 10,000 francs for a period of nine months to a graduate student of chemistry, preferably of industrial chemistry. A fellowship of 18,000 francs for nine months and free transportation in the Tourist Class of the French Line is being offered through the *Office National des Universités et Ecoles Françaises* to an advanced graduate student who has specialized in science, preferably one who has obtained a doctorate in mathematics, physical science, chemistry or biology.

DISCUSSION

HYDROPONICS—CROP PRODUCTION IN LIQUID CULTURE MEDIA

IN the late summer of 1935 a number of large growers of certain vegetables and flowers adopted liquid culture media on a large scale for the growing of crops and have (for two seasons) placed on the market products so grown to compete with those produced by agriculture. Thus further evidence has been established that production of certain crops without soil is practicable and it appears that the introduction into the economic field of a new method of production, essentially another origin of agricultural crops, may well be considered as the birth of a new art and perchance a new science which should be designated by a distinctive name. The first announcement of the probability of the economic feasibility of liquid culture media for production of some agricultural crops was in 1929—"Aquiculture a Means of Crop-Production."[1] This announcement was made about two years after the investigations were started to establish the basis for the use of liquid culture media for the commercial growing of crops. Liquid culture media had been extensively used for nearly three quarters of a century for the growing of plants for study, but until the above reference no mention is found in the literature of investigations designed to apply the principle of water culture in a practical way to grow crops without soil. It was of course evident at the outset of the investigations that cultural techniques had to be designed to establish the physiological basis for the method within the framework of economic feasibility. The physiological basis is the markedly greater productive potentiality of certain crops grown on a per unit area of specially prepared nutrient water surface than that of a similar area soil. It is the manyfold larger production of some crops per unit area of water surface than that of soil which makes water culture economically feasible. A different point of view was required for the organization of the investigations leading to establishment of a method of crop production without soil, than that which prevailed in classical plant physiology using nutrient solutions for growing plants as material for experimental study.

As it is the purpose of this paper to give a name to this new method of production, no discussion will be entered into concerning the physiological basis on which it is founded. In other papers, consideration will be given to this and also to the economic and to the sociological features arising out of the development. However, a brief statement of the historic aspects of water culture experimentation appears in order in considering a name.

While it had been known before modern science took form that certain plants would develop roots and make some growth in water, nevertheless water culture proper dates from those experiments in which the elements found in plants and known to be derived from the soil were added to water to make a nutrient solution. The credit for such experiments is generally accorded to Knop, whose first paper in Landwirtschaftlichen Versuchsstation appeared in 1859. Other names would be mentioned in a complete treatise on the origin and development of water culture experimentation, and cognizance given to the spirit of the day, the methods of the time and the view-point of agricultural chemists and plant physiologists for their part in the development. Knop, an agricultural chemist, conceived water culture as a means of elucidating soil processes in relation to plant growth, and such also has been the

[1] *American Journal of Botany*, 16: 862.