istry and sanitary engineering, has been elected president of the Drexel Institute of Art, Science and Industry.

John Ellsworth Hartzler, the newly elected president of Goshen College, was inaugurated on November 7. President Winthrop E. Stone, of Purdue University, and President Robert L. Kelly, of Earlham College, represented the universities and colleges on the program on this occasion.

The following appointments have been made in the school of civil engineering, Purdue University: H. B. Smith, instructor in railway engineering; A. L. Dierstein, instructor in structural engineering; W. E. Stanley, assistant in surveying.

Recent appointments in science in West Virginia University are as follows: Wm. Henry Schultz, Ph.D., professor of pharmacology and materia medica; Aaron Arkin, M.D., Ph.D., professor of bacteriology and pathology; A. H. Foreman, E.E., M.E., Ph.D., assistant professor of electrical and experimental engineering; L. I. Knight, Ph.D., plant physiologist in the experiment station, in cooperation with the University of Chicago; E. L. Andrews, assistant professor of poultry husbandry; Isaac B. Johnson, B.S.Agr., instructor in animal husbandry; Oliver Smith, B.S.-Agr., instructor in agronomy; W. B. Kemp, B.S.Agr., instructor in agronomy; O. M. Kile, B.S.Agr., agricultural editor; John Heron Illick, M.S., instructor in zoology; Joseph W. Hake, M.S., instructor in physics; Hubert Hill, B.S., instructor in chemistry; W. A. Price, Ph.D., instructor in geology; Edward F. Woodcock, M.A., instructor in botany.

Recent appointments at the University of Florida include: L. W. Buchholz, A.M., and W. S. Cawthon, A.M., as professors of education in the newly organized teacher's college; R. R. Sellars, B.S. (Bucknell), instructor in civil engineering; A. J. Strong, B.S. (Mich. Agr.), instructor in mechanic arts, both in college of engineering; Ira D. Odle, B.S. (Purdue), instructor in botany and bacteriology; J. F. Duggar, Jr., M.S. (Ala. Poly.), instructor in agronomy, in the College of Agriculture. In the Agricultural Experiment Station, laboratory assistants have been appointed as follows: A. C. Mason, B.S. (Mich. Agr.), in entomology, J. Matz, B.S. (Amherst), in plant pathology. O. F. Burger, assistant plant pathologist, has been granted leave of absence for study at Harvard University.

The extension division of the University of Florida was made a separate and independent portion of the university organization, with P. H. Rolfs, as director, and A. P. Spencer, as vice-director. All extension service will be concentrated in this division, including farmers' institutes; farmers' demonstration and boys' and girls' club work, in cooperation with the Bureau of Plant Industry of the United States Department of Agriculture; literary and scientific lecture bureau; instruction for teachers and county institutes; correspondence courses, etc.

Mr. A. G. Steele has been appointed head of the department of psychology in Temple University, Philadelphia, Pa.

Professor Franz Cosmat, of Gratz, has been called to the chair of geology at Leipzig.

Dr. Adolf Windaus, of Freibourg, has accepted the chair of chemistry at Innsbruck.

Discussion and Correspondence

Absorption of the Sun's Energy by Lakes

To the Editor of Science: The Wisconsin Geological and Natural History Survey has been making a study of the rate at which the energy of the sun's rays is absorbed as they penetrate the water of lakes. Two instruments have been used for this purpose. The first is a black-bulb thermometer *in vacuo;* a so-called solar thermometer. The instrument is exposed to the action of the sun at different depths, say 1 m. and 2 m. from the surface. The rate of rise of the mercury is noted and from the relation of the rates at the two depths can be computed the amount of absorption of heat in the stratum between them. The second instrument is a thermopile and galvanometer, designed for the purpose by Professor C. E. Mendenhall, of the department of physics, University of Wisconsin, and constructed in

the university shops. The method of observation is much the same as with the solar thermometer, but the instrument is much more sensitive and rapid in its action. Readings are made in a few seconds and the instrument will easily record an amount of heat as small as 1 per cent. of that present at the surface. The results obtained by the two instruments are in substantial agreement. Observations have been made on a stratum of water of considerable thickness (1 m. or 0.5 m.) and have usually dealt with strata beginning at 0.5 m. or 1 m. below the surface—a depth at which all, or nearly all, of the invisible part of the spectrum has been absorbed.

It has long been known that a stratum of optically pure water 1 m. thick absorbs about 60 per cent. of the sun's energy, including nearly all of that below the *A* line. In pure water the absorption below one meter would amount to less than 12 per cent. of the energy present at a given depth in the 1 m. stratum immediately subjacent. These figures are subject to variation, depending on the altitude of the sun and the form of the energy spectrum.

Lake water is optically very different from pure water. The inland lakes of Wisconsin are not very transparent; the transparency, as shown by Secchi's disk, varying from less than 1 m. to about 7 m. The transparency is affected both by turbidity, due to suspended matter, and to stain, occasioned by matters extracted from peat, etc.

Observations made on more than twenty-five lakes showed that not more than 20 per cent. of the sun's energy present at the surface is found at a depth of 1 m., and the amount is usually much less; sometimes as low as 2 per cent. or 2.5 per cent. Not less than 30 per cent. of the energy present at 1 m. is absorbed by the stratum of water between 1 m. and 2 m.; usually as much as 40 per cent. to 50 per cent. is absorbed; and the amount may be as great as 85 per cent. to 95 per cent. The rate of absorption per meter is substantially the same in subjacent meters as it is between 1 m. and 2 m. No readings have been made at a greater depth than 6 m., since at greater depths the energy was always too small for accurate measurement.

From these observations it follows that the heat of the sun's rays is practically absorbed entirely by the upper meters of the lake. So much as 1 per cent. of the energy present at the surface is rarely found at a depth so great as 5 m., and usually the 1 per cent. point is reached between 3 m. and 4 m., or even higher. It is quite impossible that an appreciable diurnal rise in temperature should be found in these lakes at the depth of 5 m., and practically the entire seasonal rise of temperature at 5 m. and below is due to mechanical agencies—chiefly, if not wholly, wind—rather than to insolation. It follows also that there is in general no relation between the depth to which the heating of the sun's rays penetrates and the thickness of the epilimnion.

An interesting and (to me) unexpected result of these observations is the not uncommon absence of correlation between the transparency of the water, as shown by Secchi's disk, and the rate of absorption of energy. Stained water may be much more transparent, as measured by the disk, than turbid water which is not stained, but in such cases the rate of absorption of energy may be relatively, or absolutely, greater in the stained water. For instance, Marl lake, whose water is clear but turbid with marl, had on August 21, 1912, a transparency of 1.8 m. and a rate of absorption of the sun's energy below 1 m. of about 55 per cent. per m. On August 17, 1912, Otter lake, a near neighbor, whose water is stained but not turbid, had a transparency of 5.2 m. and an absorption of about 54 per cent. Numerous observations have been made, which give similar results. It may be noted also that bottom growing plants were found abundant to substantially the same depth in these two types of lakes.

This work is still in progress and when completed will be incorporated in a general report on the temperatures of Wisconsin lakes.

I may add that for three years past the heat delivered by sun and sky at Madison has been recorded at the United States Weather

Bureau by a Callendar sunshine receiver and recorder. The temperature of Lake Mendota, on whose shore is situated the station of the Weather Bureau, is ascertained by daily series of observations, taken in the deepest part of the lake. In this way are determined not only the amount and rate of the gain and loss of heat by the lake, but also the relation between the heat absorbed by the lake and that furnished to its surface by the sun.

E. A. Birge

Madison, N. J.,
October 3.

QUOTATIONS

SPECIAL TRAINING FOR HEALTH OFFICERS

A long step forward in the special training of health officers has just been taken in the organization of the "school for health officers" of Harvard University and the Massachusetts Institute of Technology.

By cooperation, especially arranged between the two institutions, it now becomes possible for properly qualified persons on payment of an annual fee of $250 to obtain access to the remarkable resources of the Harvard Medical School and other departments of our oldest university, as well as to the chemical, biological, sanitary and engineering opportunities offered by a great modern technical school. How remarkable these opportunities offered are can only be appreciated by an examination of the announcement itself, copies of which may be obtained on application to the director, Professor M. J. Rosenau, of the Harvard Medical School.

No single curriculum is laid down which all must follow, but from the many courses offered members of the school will be expected to choose such as their preparation warrants or their needs indicate. No degree of any kind is required for admission, and no degree will be awarded for the completion of the course but, instead, a certificate to be known as the certificate of public health (C.P.H.) will be given to all who complete satisfactory courses and requirements. In order to obtain the certificate in one year it will in general be required that the candidate shall be either a graduate in medicine, or in biology and public health, or be otherwise highly qualified. Failing these special qualifications, two or more years will ordinarily be necessary in order to obtain the certificate.

No one will be admitted to the school who has not completed at least two years of ordinary college work including chemistry, physics, biology and French and German, or who is not otherwise specially qualified.

Persons already engaged in public health work will be admitted under certain conditions to special courses, and every facility will be offered for obtaining equipment in public health administration and other aspects of the health officers' profession.

It is hardly necessary to say that the organization of this high-grade school marks a distinct epoch in the American public health service. It still remains, however, for the public, which is interested in the success of schools of this sort, to make sure that a reasonable tenure of office and proper salaries shall await those who are ready to devote their lives to the new profession, and much popular education along this line needs to be done.

The actual conduct of the affairs of the school has been placed by Harvard University and the Massachusetts Institute of Technology in the hands of an administrative board, composed of Professor W. T. Sedgwick, Sc.D., of the Massachusetts Institute of Technology, chairman; Professor M. J. Rosenau, M.D., of the Harvard Medical School, director, and Professor George C. Whipple, S.B., member of the American Society of Civil Engineers, secretary.—*Journal of the American Public Health Association.*

PENSIONS AT BROWN UNIVERSITY

An announcement of the new pension rules for members of the faculty of Brown University was made yesterday at the annual meeting of the corporation. That is about the only one of the great institutions in this part of the country that is not eligible to the benefits of the Carnegie Foundation, and while that might seem to place it at a disadvantage in general competition, its alumni and friends