UNIVERSITY AND EDUCATIONAL NOTES

YALE UNIVERSITY will receive $600,000 and the Sheffield Scientific School $300,000 under the will of George St. John Sheffield, of Providence.

A GIFT of $250,000 for the erection of a medical clinic building at the University of Pennsylvania has been made by Martin Maloney, of Philadelphia.

BOWDOIN COLLEGE receives $250,000 by the will of the late Frank A. Munsey, of New York.

CORNELL UNIVERSITY has received a gift of $50,000 from the Robert Boyd Ward Fund, Inc., of New York City. Income from the gift is to be available to the president for meeting emergency needs not provided for in the university's annual budget, such as the purchase of scientific apparatus or supplies, publication of the results of research in the university and lectures in the advancement of science.

THE Massachusetts Institute of Technology will receive $25,000 for "its general uses and purposes" under the will of Kenneth F. Wood.

A NEW course surveying the whole field of science has been organized at the University of New Hampshire by the cooperation of nine departments, representing all the natural sciences and mathematics, and will be offered to freshmen beginning with the winter term. The aims of the course are to give the freshmen a unified view of the whole field of science, showing the interrelations of the several physical sciences, to survey briefly each main division, and to familiarize students with scientific methods.

THE teaching in public health and preventive medicine at Stanford University has been completely reorganized and Professor E. C. Dickson, of the department of medicine, has been placed in charge as acting executive.

FRANCIS L. WHITNEY has been made professor of geology and paleontology at the University of Texas, having been promoted from the rank of associate professor.

DR. WILLIAM E. BROWN has been appointed assistant professor of preventive medicine at the University of Cincinnati College of Medicine.

A. M. ALVARADO, formerly professor of chemistry at the Waukon Junior College, Waukon, Iowa, has been appointed associate professor of chemistry at Loyola University, New Orleans, La.

DR. EDWARD TAYLOR JONES, professor of physics in the University College of North Wales, has been appointed to the chair of natural philosophy at the University of Glasgow, in succession to Professor Andrew Gray.

AT the University of Liverpool, Dr. T. P. Hilditch has been appointed to the Campbell Brown chair of industrial chemistry and Professor S. H. Gager, of the University of Edinburgh, has been appointed to the William Prescott chair of the care of animals with special reference to the causation and prevention of disease.

DISCUSSION AND CORRESPONDENCE

MILLIKAN RAYS AND THE ACCELERATION OF RADIOACTIVE CHANGE

SOME weeks ago (*Nature,* September 12, 1925), A. Gaschler reported that he had succeeded in accelerating the change of uranium to uranium X by submitting uranium oxide to "strong rushes of momentary high-tension currents." One may suppose that, in any group of uranium atoms, the nuclei of a certain number reach a state of unstability in each unit of time, and that these decompose. But, at the same time, other nuclei may closely approach the verge of unstability, and these also may be caused to decompose under the influence of a sufficient disturbing force from outside. For this reason, the idea of artificial transmutation of uranium is usually entertained more favorably than that of the transmutation of mercury to gold; although, it may be added, mercury atoms, while never crossing the verge of unstability of themselves, may, in like manner to uranium atoms, closely approach it. In either case, the force from outside must apparently be greater than such as would operate a hair trigger effect. The trigger has a heavy pull, and the conservative objectors to the reported mercury transmutation have pointed out that the intensity of the energy applied falls far short of that associated with changes in the nucleus.

Such a defect in intensity can not, however, be charged against Millikan rays as described in SCIENCE for November 20. The energy associated, for example, with alpha particles ejected from the nuclei of the radioactive elements may conveniently be stated as lying between four and nine million equivalent volts. This is exceeded many fold by the energy corresponding, on the quantum theory, to radiation of the high frequency of the Millikan rays. One is therefore reminded of the experiments of A. Nodon (*Compt. rend.,* 176, 1705 (1923)) who brought forward evidence of an increase of the activity of radioactive substances when outdoors and enclosed by envelopes of small absorbing power for gamma rays as contrasted to the smaller radioactivity of the same

substances in cellars and when heavily enveloped by lead. Nodon, it is true, attributed his "ultraradiation," as he called it, to the sun; but he reports some effect even at night (which he is at pains to interpret), as one would anticipate from the results of Millikan.

It may be recalled that rock analysis shows that, assuming percentage composition similar to that on the surface, there is enough radioactive material in a depth of only twelve miles of the earth's crust to supply by its daily disintegration all the heat the earth radiates daily into space. If atoms of number above eighty-two exist beneath this twelve-mile shell, and if they are distintegrating as actively as at the surface, we are forced to the logical conclusions of Joly, who supposes that the heat of radioactive origin will accumulate until the earth's hot interior, after a process of eversion, will disburden itself of its store of heat by radiation into space during one of the earth's "incandescent periods," and thus make ready for a fresh geological aeon. Such catastrophic events are, however, no longer inevitable if we alter one of the premises in the logic, and grant that the radioactivity of the heavy chemical atoms is not entirely spontaneous but is conditioned, in part at least, by irradiation by Millikan rays, which would penetrate only a limited distance into the earth's crust. One must suppose that workers in laboratories are so well and so constantly screened that fluctuation in rate of radioactive change has escaped them.

However this may be, further experiments on the possible acceleration of radioactive change by these very high frequency radiations would appear to be of great interest, and we hope Professor Millikan is planning such experiments.

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INSECT TOXICOLOGY

THERE is a growing tendency to supplement field experiments on insecticides with tests and comparisons in the laboratory where, under controlled conditions, more exact observations and deductions may be made. This development in economic entomology is exemplified particularly by the work of Moore, Richardson, McIndoo and Tattersfield. The writer believes that laboratory research on the effects of insecticides would develop more rapidly and fruitfully if laboratory and field workers alike had a single, definite conception of its purpose and potential importance.

The purpose of laboratory research on the poisoning of insects has been obscured in part by the lack of a significant name for it. At times it has been classed under insect physiology; again it has been allied with chemical field control work in economic entomology. The writer proposes for it the name, *insect toxicology*,[1] to include the results of all investigations which deal in a quantitative manner with the effects of insecticides on insects. The term, insect toxicology, is not entirely free from ambiguity, because it also suggests the effects of poisons elaborated by the insects themselves; but, with the foregoing definition, it should be satisfactory.

Insect toxicology should have for its purpose the development of a body of knowledge comparable to vertebrate toxicology or pharmacology. Just as in medicine, pharmacology supplies a rational, scientific basis for applied therapeutics, so in entomology, insect toxicology should be expected to supply a similar sound basis for insecticide practice. The need for an insect toxicology fashioned in the manner of pharmacology has been recognized, consciously or unconsciously, by workers with insecticides who turn to manuals of pharmacology for suggestions, although they know that the vertebrate toxicology of such manuals may not be applicable to insects, even in a qualitative sense. The quantitative conception of insect toxicology is especially important. Innumerable insecticide "cage experiments" have been carried out by many workers. The results have been more or less useful at the time and place of completion, but because they were not obtained under carefully controlled conditions by quantitative methods they have no value for building up the fundamental laws of insect toxicology which could be applied to the analysis of insecticide poisoning under any combination of natural conditions.

The writer has been devoting his time and thought to insect toxicology for several years, and has become convinced that it is practicable to build up a quantitative system of insect toxicology both for stomach-poison and contact insecticides on a few suitable laboratory insects. This conviction, for stomach-poisons at least, will be supported by subsequent publication of methods and results, which the writer believes compare favorably with those of vertebrate toxicology.

If the objection be made that the analogy between insect toxicology and pharmacology is not sufficient proof for the potential importance of the former, instances may be cited of the practical results already secured through insect toxicology. The impulse for the development of coated arsenicals for the Japanese beetle sprang from William Moore's observations on the repellant effect on the beetle of sublethal doses of

[1] This term does not conflict with *economic toxicology* proposed by M. R. Miller (SCIENCE, XLIV, p. 264) to include all aspects of work in which poisons are employed to economic advantage.