eral government, except in the case of commitments already made to bring new areas under cultivation.

UNIVERSITY AND EDUCATIONAL NOTES

HARVARD UNIVERSITY has received an anonymous gift of $3,000,000 to build and endow a residence college of the type of the colleges of the Universities of Oxford and Cambridge.

Two bequests amounting to $700,000 contained in the will of Charles Lennig, who died thirty-seven years ago, have become available to the University of Pennsylvania at the final distribution of the estate. One bequest of $500,000 creates the "Charles Lennig Fund in Aid of Instruction in Theoretical and Practical Mechanics." Its income will be used for the acquisition of scientific works, structures, instruments, machines and material for the Towne Scientific School of the university. The other bequest of $200,000 establishes the "Charles Lennig Beneficiary Fund," the income from which will be devoted to providing free scholarships.

GROUND has been broken on the Columbia University campus for a new building to house the natural science department, which will be erected at a cost of $1,000,000. It will be situated in the southeast corner of the Grove on Amsterdam Avenue, facing 119th Street, and will be ten stories in height. Architecturally it will be almost identical with the Chandler Chemical Laboratories.

DR. ALEXANDER RUTHVEN has been appointed dean of administration with the duties of vice-president of the University of Michigan.

DR. LEON E. SMITH, of the Randal Morgan Laboratory of Physics of the University of Pennsylvania, has accepted the position of professor of physics and head of the department of physics at Denison University, Granville, Ohio.

DR. AMOS M. SHOWALTER, National Research Fellow, 1924–27, has been appointed assistant professor of botany in Washington University.

DR. HARRY HELSON, of the department of psychology of Cornell University, is now associate professor of experimental psychology in Bryn Mawr College, taking the place of Dr. Clarence E. Ferree, who is now at the Johns Hopkins University.

DR. GUY HAROLD SMITH, who was a member of the department of geography of the Ohio State University last year during the absence of Dr. Roderick Peattie, has joined the faculty of the department of geology and geography of the University of Illinois. He will have charge of the courses on weather and climate and geomorphology.

DISCUSSION AND CORRESPONDENCE

ON NUCLEAR DERIVATIVES AND THE LETHAL ACTION OF ULTRA-VIOLET LIGHT

THE bactericidal action of ultra-violet light has been known for fifty years, and has been repeatedly investigated. But few investigators have sought the mechanism of the reaction or the chemical units of the bacterial protoplasm so affected by the ultra-violet energy as to prevent the subsequent multiplication of the cells.

If measured monochromatic ultra-violet energy is used to kill bacteria such as *S. aureus*, lying in a single plane, and its effect is recorded statistically, characteristic and similar curves are produced at each wave-length studied. These curves show that an appreciable amount of energy must be incident on the bacteria before any of them succumb. With longer exposures they succumb along a gradient that is for the most part apparently exponential, but experimental evidence indicates that its course is determined by differences in the resistance of single bacteria, and that the curve is therefore one of probability. Wide differences are found in the incident energies required to produce these curves at different wave-lengths, and if the same points on each gradient (say 50 per cent. destruction) are joined by a smooth curve, its shape is such as to suggest immediately that it is reciprocally related to the absorption of ultra-violet energy by some sensitive element in the bacterial protoplasm.

In 1917 Harris and Hoyt[1] suggested that "the susceptibility of protoplasm to ultra-violet light is conditioned by the selective absorption of the toxic rays by the aromatic amino acid radicals of the proteins." Their conclusion was based on the observation that a screen or filter of an aromatic amino acid solution—tyrosine or aminobenzoic acid, for example—greatly prolonged the exposure to the quartz mercury arc necessary to kill Paramecia, and that therefore these substances must be absorbing the very wave-lengths responsible for the lethal changes in these organisms.

Such a conclusion, however, does not exclude the possibility that other biochemical entities essential to life may also show a selective absorption over the toxic range, and it may be that the lethal reaction is due to some, or some one, of these other substances.

Recently a further search has been made for the substance most probably involved. Since the nucleus

[1] F. I. Harris and H. S. Hoyt, SCIENCE, 1917, N.S. 46: 318.

is recognized as the structural element in the cell on which growth and reproduction depend, attention was naturally directed to nuclear derivatives, and it was found that the reciprocal of the bactericidal curve matches the absorption curves for certain derivatives of the nucleoproteins—cytosine, thymine and uracil—more closely than it does those for various aromatic amino acids, such as tyrosine, tryptophane or phenylalanine, suggested by Harris and Hoyt.

The close reciprocal correspondence between the curve of bactericidal action and the curves of absorption of ultra-violet energy by these nuclear derivatives not only promotes the probability that a single reaction is involved in the lethal action of ultra-violet light, but has a wider significance in pointing to these substances as essential elements in growth and reproduction. This conclusion is in harmony with the observations of other writers. Thus, Murphy, Helmer and Sturm,[2] by electrodialysis, have effected a marked concentration of the active agent in transplantable tumors of fowls. The material which, as they are careful to say, "carries" the active agent, appears to be a nucleoprotein, and gives "a uniform Feulgen reaction[3] of the so-called thymonucleic acid group."

And now Cowdry[4] has applied the Feulgen reaction to tissue cultures of normal fibroblasts and of various sarcomata, and finds that under these experimental conditions the nuclei of both rat and chicken sarcomata are much richer in the substance giving the Feulgen reaction—presumably thymonucleic acid. Cowdry also studied various neoplastic tissues obtained from mice in comparison with normal tissues similarly stained. As was to be expected, "the thymus gland always gave a more pronounced Feulgen reaction than the tumors," but in the other fragments of tissue "the nuclei of the tumor cells were more strongly stained so that the extent of the neoplasms could be readily seen by naked-eye inspection of the slides." Under the microscope, however, this difference between the nuclei of tumor cells and of normal cells could not be made out, and Cowdry does not attempt an explanation of the discrepancy between the results obtained in tissue cultures and those obtained with excised material.

Thus, while the relation of thymonucleic acid to cell growth and reproduction remains a matter of conjecture, nevertheless its high concentration in the thymus gland and the coincidence of the evidence from these three independent series of experiments seem worthy of note, without further comment at present.

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[2] J. B. Murphy, O. M. Helmer and E. Sturm, SCIENCE, 1928, N.S. 68: 18.

[3] R. Krause, *Enzyk. f. Mikr. Tech.*, 1927, 3: 1729.

[4] E. V. Cowdry, SCIENCE, 1928, N.S. 68: 138.

NOMENCLATURE OF THE ACCESSORY FOOD FACTORS

THE science of chemistry, broad in scope and voluminous in terminology, requires that the names by which substances are known shall be chemically correct and indicative of certain class relationships between compounds. To this end there has grown up the custom of indicating the chemical structure of compounds in the first part of the name applied thereto and of showing class relationships by a similarity in the ending of the name. Examples of this are too numerous and familiar to require mention here. What is true for the entire body of chemistry is correct to an equal degree for the divisions thereof and should apply likewise to related fields.

At the present time there is a cycle of confusion in the field of nutritional chemistry because of failure to apply the principles mentioned above. The fact that this failure has been, in part at least, unavoidable does not alleviate the difficulty and the rapidity with which research is moving forward makes very necessary the adoption of a more suitable system of naming the known accessory food factors, the so-called "vitamins."

Funk[1] in 1913 applied the term *vitamine* to a group of nutrient principles, then only two in number, the existence and necessity of which had been previously proven. This term, as Funk used it, meant literally substances associated with life processes and chemically closely related to the amines, inasmuch as Funk believed them to be amine-like in structure. This theory, unfortunately for present-day terminology, has not been borne out and it was long ago recognized, as pointed out by McCarrison,[2] that the name *vitamine* was a misnomer. In fact the abridgement of the term *vitamine* to *vitamin*, while in accordance with the policy of the Chemical Society (England) and conforming to the American method of naming the hormones, was a tacit admission of the incorrectness of Funk's terminology.

The proposal of McCollum and Kennedy[3] in 1916, that the two "vitamins" known at that time be desig-

[1] C. Funk, "Die Vitamine," Wiesbaden, 1913.

[2] McCarrison, Robert, "Studies in Deficiency Disease," Oxford Med. Public., 1921.

[3] E. V. McCollum and Cornelia Kennedy, "The Dietary Factors Operating in the Production of Polyneuritis," *J. Biol. Chem.*, 1916, xxiv, 491.