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No. 2204

<i>Large Molecules in Science and Life:</i> PROFESSOR HUGH S. TAYLOR	299	<i>Special Articles:</i>	
<i>Engineering in an American Program for Social Progress. II:</i> DR. KARL T. COMPTON	301	<i>The New Discovery of Three Skulls of Sinanthropus Pekinensis:</i> DR. FRANZ WEIDENREICH. <i>Exchanges between Blood Plasma and Tissue Fluid in Man:</i> DR. ANCEL KEYS. <i>The Plant Origin of a Vitamin D:</i> DR. H. H. DARBY and PROFESSOR H. T. CLARKE	316
<i>Obituary:</i> <i>Bohumil Shimek:</i> PROFESSOR W. F. LOEHWING. <i>Wesley M. Coates:</i> F. C. W. <i>Recent Deaths</i>	306	<i>Scientific Apparatus and Laboratory Methods:</i> <i>The Use of Bromine in the Sterilization of Fruits and Seeds:</i> PROFESSOR CARL D. LA RUE. <i>To Keep Culture-Media from Drying Out:</i> DR. M. C. TERRY. <i>Declivity Maps:</i> FLOYD E. MASTEN	319
<i>Scientific Events:</i> <i>The Field Museum of Natural History; Exhibit of Scientific Photography; The Wildlife Society; The Vice-president of the University of California at Los Angeles</i>	307	<i>Science News</i>	6
<i>Scientific Notes and News</i>	309		
<i>Discussion:</i> <i>The "Primary Change" in Adrenal Insufficiency:</i> DR. ROBERT F. LOEB and DR. DANA W. ATCHLEY. <i>"Migration" and "Homing" of Salmon:</i> PROFESSOR A. G. HUNTSMAN. <i>A Whale Shark Impaled on the Bow of a Steamer:</i> DR. E. W. GUDGER. <i>Jellyfish from Grand Canyon Algonkian:</i> C. E. VAN GUNDY	312		
<i>Reports:</i> <i>Activities of the Engineering Foundation</i>	315		

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LARGE MOLECULES IN SCIENCE AND LIFE¹

By Professor HUGH S. TAYLOR
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IT is a striking characteristic of the gaseous substance, acetylene, with which Father Nieuwland spent so much of his later scientific life, that, under the influence of a variety of agencies, light, radioactive rays, cathode rays, the silent electric discharge and, also, even contact agents such as a copper catalyst, the gas changes to an insoluble yellowish solid known as euprene. It received its name because Sabatier, who prepared it from acetylene with the aid of a copper catalyst, thought that it contained copper. It is now known that it contains no copper, but, within the error of analysis, a one to one ratio of carbon to hydrogen, as does acetylene. How different the properties! In place of a highly reactive gas we have a chemically inert solid, the linkages of which are all so mutually satisfied that it has hitherto resisted all efforts to bring it into solution in any known solvent, although hun-

dreds of such have been tried. All the properties of the simple molecule, with the study of which Father Nieuwland spent so many happy and fruitful days, have disappeared in the formation of something which we may speak of as giant molecules, each particle of the euprene composed of three-dimensional arrays of the carbon and hydrogen atoms of which it is composed. Acetylene is the simplest of the compounds from which, in these hectic days of industrial scientific progress, large molecules or polymers, with a fascinating range of properties, may be prepared, synthetic rubbers, plastics, fibers and the like.

It is not alone, however, in the industrial scientific field that the large polymeric molecules possess great significance. In biological systems and in organic matter generally, it is now known that highly polymerized systems constitute an important fraction of such material and that their properties, including tensile strength, elasticity and flexibility, durability, resistance to chemical change, hardness, confer on such bodies a

¹ An address delivered at the Father Nieuwland Memorial Exercises at the University of Notre Dame on January 10, 1937.

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Vol. 66

Contents for April, 1937

No. 2

- P. WEISS. Further experimental investigations on the phenomenon of homologous response in transplanted amphibian limbs. II. Nerve regeneration and the innervation of transplanted limbs. Five plates.
 P. WEISS. Further experimental investigations on the phenomenon of homologous response in transplanted amphibian limbs. III. Homologous response in the absence of sensory innervation. One text figure.
 T. A. WEAVER, JR. Anatomical relations of the commissures of Meynert and Gudden in the cat. One text figure and three plates.
 L. E. WILEY. A further investigation of auditory cerebral mechanisms. Thirteen text figures.
 J. F. BARNES and H. A. DAVENPORT. Cells and fibers in spinal nerves. III. Is a 1:1 ratio in the dorsal root the rule? One plate.
 K. S. LASHLEY. The mechanism of vision. XIII. Cerebral function in discrimination of brightness when detail vision is controlled. One text figure.
 S. L. CLARK. Innervation of the intrinsic muscles of the eye of the cat. Two plates.
 E. DELORENZI. Bilateral inequality in the number of sensory neurons in the trunk of vertebrates.
 R. ELLIOTT. Total distribution of taste buds on the tongue of the kitten at birth. Five text figures.
 A. O. CURWEN. The telencephalon of *Tupinambis nigropunctatus*. I. Medial and cortical areas. Fifteen text figures.
 W. H. WALLER. A cortical lesion causing cell reaction in the anteromedial thalamic nucleus. Two text figures and one plate.
 K. B. CORBIN, W. T. LHAMON and D. W. PETIT. Peripheral and central connections of the upper cervical dorsal root ganglia in the rhesus monkey.
 J. H. WELSH and C. M. OSBORN. Diurnal changes in the retina of the catfish, *Ameiurus nebulosus*. Four text figures.
 L. A. PENNINGTON. The function of the brain in auditory localization. II. The effect of cortical operation upon original learning. Four text figures.
 A. C. BUCKLEY. Myelination in the central nervous system of the albino rat, treated with thymus extract (Hanson). One plate.

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Contents of Volume 20, No. 4, March 20, 1937

- WOLF, ERNST, and ZERRAHN-WOLF, GERTRUD. Flicker and the reactions of bees to flowers.
 WILBRANDT, W. The effect of organic ions on the membrane potential of nerves.
 EAGLE, HARRY, and HARRIS, TZVEE N. Studies in blood coagulation. V. The coagulation of blood by proteolytic enzymes (trypsin, papain).
 ANSON, M. L. The estimation of papain with hemoglobin.
 ANSON, M. L. The estimation of cathepsin with hemoglobin and the partial purification of cathepsin.
 ANSON, M. L., and NORTHROP, JOHN H. The calibration of diffusion membranes and the calculation of molecular volumes from diffusion coefficients.
 HERČÍK, FERDINAND. Action of ultraviolet light on spores and vegetative forms of *B. megatherium* sp.
 CROZIER, W. J., and ENZMANN, E. V. Concerning critical periods in the life of adult *Drosophila*.
 SIMMS, HENRY S., and STILLMAN, NETTIE P. Substances affecting adult tissue *in vitro*. I. The stimulating action of trypsin on fresh adult tissue. Plate 1.
 SIMMS, HENRY S., and STILLMAN, NETTIE P. Substances affecting adult tissue *in vitro*. II. A growth inhibitor in adult tissue.
 STERN, KURT G. Spectroscopy of catalase.

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