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LARGE MOLECULES IN SCIENCE AND LIFE[1]

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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 cuprene. 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 hundreds 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 cuprene 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.