in structure and that the former are steps in the upbuilding of the latter.

The advances in physical chemistry have taken a part equal to those in organic chemistry in elucidating the phenomena of metabolism and of disease.

The importance of osmosis in explaining physiological processes was recognized by Dutrochet as early as 1826. In 1861 Graham made an exhaustive study of the subject. He tested many substances with regard to their diffusibility through animal and parchment membranes, and found that some substances diffuse very slowly or not at all, while others pass through quite freely. To the former he gave the name colloids and to the latter crystalloids. Graham thought these two classes were distinct, and this view was held until comparatively recent times.

In 1877 Pfeffer published an excellent monograph on the subject of osmotic pressure, in which he gave a history of the development of the subject, and, in addition, the results of a number of quantitive measurements carried out by himself. In his experiments a membrane of copper ferrocyanide was used, supported on a porous earthenware cup. This is permeable to water, but impermeable to many crystalloids; and by its use pure water may be "filtered" out from a solution of cane sugar, glucose, etc. When such a "semipermeable" cell is filled with a solution, closed, and immersed in water, the latter enters through the ferrocyanide membrane and creates a hydrostatic pressure in the interior of the cell. This is known as the "osmotic pressure."

Ten years later van't Hoff showed from Pfeffer's data that the osmotic pressure is proportional to the concentration of the solution employed, and to the absolute temperature (degrees centigrade plus 273); and in the case of many chemicals the pressure was the same when equi-molecular quantities were dissolved in the same volume. This last generalization, however, was not found to hold for electrolytic solutions, *i.e.*, for such as conduct electricity; but the exceptions were later explained by the hypothesis of ionization, according to which the number of particles—molecules and ions together—is greater in these latter cases than is suggested by the ordinary chemical formula.

Many explanations of the nature of the ferrocyanide membrane have been offered. At first it was thought to be porous, permitting the passage of the particles of water but holding back the larger sugar molecules. Recently, however, as a result of many experiments by Kahlenberg and others, with