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MOLECULAR WEIGHT ANALYSIS IN CENTRIFUGAL FIELDS[1]

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FROM the point of view of statistical mechanics there is no difference qualitatively between a molecule of, say, cane-sugar "dissolved" and a clay particle "suspended" in a liquid. They both possess the same kinetic energy and exert the same osmotic pressure on a semipermeable membrane. This so-called molecular-kinetic theory has been amply corroborated by the experimental work on Brownian movements. From the chemical point of view, however, a qualitative distinction based upon the construction of the particle in question is justified. Any quantity of matter separated from the surroundings by a boundary might be called a physical molecule. A chemical molecule, on the other hand, is characterized by a special kind of discontinuity. The mass of a chemical molecule can not be changed continually. It has a finite stability range with regard to the surroundings, and under given conditions it comes into existence spontaneously.

Recent work on high molecular organic compounds has demonstrated the existence of well-defined individual structures of enormous mass. There has been much discussion about the question whether these structures should be called particles or molecules, or whether such a distinction is futile. The determinations of sedimentation in strong centrifugal fields which have been carried out on artificial colloids, such as gold sols, and on native substances, such as proteins, have shown that this distinction is not futile. Synthetic systems, like the gold sols, contain a continuous series of particles of varying mass and form,

[1] Based on a paper read before a joint session of the Sections of Chemistry and of the Medical Sciences, at the Century of Progress Meeting of the American Association for the Advancement of Science, Chicago, June, 1933.