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A GEOMETRIC BASIS FOR PHYSICAL AND ORGANIC PHENOMENA

THE following notes refer to certain ideas which the writer has had in mind for many years, but in the form now submitted they are immediately suggested by a recent casual examination of D'Arcy W. Thompson's "Growth and Form" (Cambridge University Press, 1917) and particularly by reading certain paragraphs in this book relating to the various possible divisions of space by systems of surfaces or material films and membranes, in connection with a discussion of the internal structure of organic bodies.

A number of years ago the present writer submitted a brief paper to the American Physical Society under the title "A simple geometrical principle and its possible significance in connection with a general physical theory." The principle was stated as follows: "In any aggregation of an indefinite number of equal spherical bodies an arrangement giving minimum total volume occupied and perfect symmetry throughout is impossible." The quotations are from memory. An abstract of the paper was published at the time in the *Physical Review*.

Of course this principle might be dealt with by geometrical construction and mathematical analysis, but it can be demonstrated experimentally and in a simple and practical way by means of a number of balls of equal diameter like the hollow celluloid "ping-pong" balls, or the rubber balls sold as children's playthings. Thick mucilage, varnish, collodion, sealing wax or any other available adhesive substance may be used for sticking the balls together. Perhaps what follows may seem at first too elementary to be regarded as something of real scientific interest, but it is a matter of some surprise to find how many erroneous and confused ideas on so simple a