A MECHANICO-PHYSIOLOGICAL THEORY OF ORGANIC EVOLUTION

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ORGANIC EVOLUTION

BY

CARL VON NÄGELI

SUMMARY

CHICAGO

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PREFATORY NOTE.

Mr. V. A. Clark, as a student in horticulture in the University of Vermont, first undertook a critical examination of Nägeli's *Mechanico-Physiological Theory of Evolution* as a part of his regular junior work. After a half year's study and the preparation of a short thesis, Mr. Clark had become so far intimate with Nägeli's work as to make it seem best for him to continue the study through his senior year. This study involved extended translations from the text, including Nägeli's *Summary*, which, considering its difficult accessibility to American students, has been chosen for publication. The work has been done chiefly by Mr. Clark, but has all been under my immediate supervision, and I have given the whole matter a final restudy and revision. Those who have had any experience with similar work will know how impossible it is that all mistakes should have been avoided, and it would be a kindness to the translators if readers would point out any defects, in order that they may be corrected.

F. A. WAUGH.

University of Vermont,
July 1, 1898.

A MECHANICO-PHYSIOLOGICAL THEORY OF ORGANIC EVOLUTION.

SUMMARY.

IN this summary I shall in general pursue a course the reverse of that which my main work follows.* I shall proceed from the primitive, unorganized condition of matter and endeavor to show how organized micellar substance has arisen in it, and how, from this micellar substance, organisms with their manifold properties have arisen. Since such a synthesis of organisms out of known forms of matter and force is still far removed from a conclusion strictly in accord with physical law, the process becomes comprehensible and obvious only by exact knowledge of the discussion that has preceded. Although the synthetic method reveals more clearly the weaknesses of the theory than do analytic investigations, yet I considered it helpful

* See Appendix, Translators' Notes.

to make this presentation in order to give a clearer idea of the mechanico-physiological theory, and at the same time to test its worth.

1. FORMATION OF UNORGANIZED BODIES (CRYSTALS).

When separated and promiscuously moving molecules of any substance in solution or in a melted condition pass into the solid form by reason of removal of the causes of separation and motion (warmth or solvent), they arrange themselves into solid masses impermeable to liquids. These minute bodies grow by accretion, and when molecular forces are permitted to act undisturbed, assume the regular outer form and inner structure of crystals. The number of crystals, their size, changes of form and growth, all depend on external conditions.

2. FORMATION OF LIVING ORGANIZED (MICELLAR) BODIES.

Certain organic compounds, among them albumen, are neither soluble, despite their great affinity for water, nor are they fusible, and hence are produced in the micellar form. These compounds are formed in water, where the molecules that arise immediately adjoining each other arrange themselves into incipient crystals, or micellæ. Only such of the molecules as are formed subsequently and come in contact with a micella contribute to its increase in size, while the others, on account of their insolubility, produce new micellæ. For this

reason the micellæ remain so small that they are invisible, even with the microscope.

On account of their great affinity for water the micellæ surround themselves with a thick film of it. The attraction of these micellæ for matter of their own kind is felt outside this film. Hence the micellæ with their films unite themselves into solid masses permeated with water, unless other forces overcome attraction and re-establish a micellar solution (as in albumen, glue, gum), where the slightly moving micellæ show a tendency to cling together in chain-like and other aggregations. Very often there are found, especially in albumen, half liquid modifications intermediate in fluidity between the solid masses and the micellar solution.

The internal and external constitution of micellar bodies depends essentially on the size, form and dynamic nature of their micellæ, since these efficients condition the original arrangement of the micellæ and the insertion in proper order of those formed later. External conditions have slight influence on structure, and affect outer form chiefly in so far as they can mechanically hinder free development.

The micellæ of albumen or plasma are susceptible of the greatest diversity of form, size and chemical composition, since they originate from unlike mixtures of various albumen compounds, and besides are mixed with various organic and inorganic sub-