

a peculiar fascination as forming the transition from the abstract science of geometrical forms and statical equilibrium to the study of the actual forms of real things. Here, if anywhere, it seemed as if we might discover the link that connects the theoretically calculable with the actually existing, the possible with the real. Accordingly, we find a very general and recurring tendency to carry over the notions of crystallography into other sciences — into the morphology of plants and animals. The planes and axes of geometry, and the forces of attraction between particles of matter, have formed a theme which has been endlessly repeated and varied in explaining the elements and the forms of living matter. But whilst these fanciful analogies<sup>1</sup> of organic crystals, of polar distribution, and the network of tissues, to which are also allied the spiral theories of leaves and branches in plants and other geometrical arrangements, have at times attracted much attention,<sup>2</sup> and have served to give at least the

<sup>1</sup> "Ces comparaisons entre les formes minérales et les formes vivantes ne constituent certainement que des analogies fort lointaines, et il serait imprudent de les exagérer. Il suffit de les signaler. Elles doivent simplement nous faire mieux concevoir la séparation théorique de ces deux temps de la création vitale: la création ou synthèse *chimique*, la création ou synthèse *morphologique*, qui en fait sont confondues par leur simultanéité, mais qui n'en sont pas moins essentiellement distinctes dans leur nature" (Claude Bernard, 'Leçons sur les Phénomènes de la Vie,' &c., vol. i. p. 296). See also on the extravagances of such search

for analogies, Jul. Sachs, 'Gesch. d. Botanik,' p. 173, &c.

<sup>2</sup> I shall revert to this subject when speaking of the elder De Candolle. Here only a passing remark on the "spiral theory," which was mainly developed by K. F. Schimper and Alexander Braun, after the regular geometrical arrangement of leaves around their stalks had already been noticed in the eighteenth century by Charles Bonnet, following Cæsalpinus. For about thirty years, from 1830 onward, the spiral theory was very popular in Germany. In France, the somewhat related theories of symmetry of De Candolle, of metamorphosis of Goethe and of spiral