

complete if it were to omit a consideration of these forces, and of the substances which enter into solid and fluid combinations in organic tissues, under conditions which, from our ignorance of their actual nature, we designate by the vague term of *vital forces*, and group into various systems, in accordance with more or less perfectly conceived analogies. The natural tendency of the human mind involuntarily prompts us to follow the physical phenomena of the Earth, through all their varied series, until we reach the final stage of the morphological evolution of vegetable forms, and the self-determining powers of motion in animal organisms. And it is by these links that *the geography of organic beings—of plants and animals*—is connected with the delineation of the inorganic phenomena of our terrestrial globe.

Without entering on the difficult question of *spontaneous motion*, or, in other words, on the difference between vegetable and animal life, we would remark, that if nature had endowed us with microscopic powers of vision, and the integuments of plants had been rendered perfectly transparent to our eyes, the vegetable world would present a very different aspect from the apparent immobility and repose in which it is now manifested to our senses. The interior portion of the cellular structure of their organs is incessantly animated by the most varied currents, either rotating, ascending and descending, ramifying, and ever changing their direction, as manifested in the motion of the granular mucus of marine plants (Naiades, Characeæ, Hydrocharidæ), and in the hairs of phanerogamic land plants; in the molecular motion first discovered by the illustrious botanist Robert Brown, and which may be traced in the ultimate portions of every molecule of matter, even when separated from the organ; in the gyratory currents of the globules of cambium (*cyclosis*) circulating in their peculiar vessels; and, finally, in the singularly articulated self-unrolling filamentous vessels in the antheridia of the chara, and in the reproductive organs of liverworts and algæ, in the structural conditions of which Meyen, unhappily too early lost to science, believed that he recognized an analogy with the spermatozoa of the animal kingdom.* If to these

* [“ In certain parts, probably, of all plants, are found peculiar spiral filaments, having a striking resemblance to the spermatozoa of animals. They have been long known in the organs called the antheridia of mosses, Hepaticæ, and Characeæ, and have more recently been discovered in peculiar cells on the germinal frond of ferns, and on the very young leaves of the buds of Phanerogamia. They are found in peculiar cells, and when these are placed in water they are torn by the