

the rest, for though it may produce any of the rest, yet any of the others may also produce it.\*

As for the abstract nature of matter and force, and their relation to one another, it matters little what view we take, and whether following Boscovich,† we conceive matter to be made up of mathematical points without form or size, acting on each other by attractions and repulsions; whether with Grove‡ we consider all forces as properties of matter, and therefore inseparable from it; or taking the more generally received opinion, we suppose matter to be one distinct entity, and force another acting upon it, the question before us remains the same and unaffected.

Now the whole subject of the correlation of forces naturally divides itself into three parts, as follows: 1. The correlation of the physical forces; 2. The correlation of the vital forces; and 3. The correlation of the vital and physical forces.

The first is often considered as proved, || and there can be no harm in taking it as a postulate, and as such using it in the argument before us. Of course it would be impossible to enter into the proofs of it in this place, and after Prof. Grove's treatise on the subject, anything that I could say would be probably something worse than superfluous.

Though the second division, the correlation of the vital forces, does not properly form part of my thesis, yet for the sake of making the latter more complete than it would otherwise be, I shall say a very few words upon it before proceeding to the main object of inquiry.

The growth of all organized beings, from the simplest vegetable to the most complex animal, essentially consists in the multiplication of cells; all organized beings originating in this, the most simple structure endowed with life. All the forces of every kind which are manifested by organized beings are evolved through the instrumentality of cells, or by tissues which have originated in these, and retain, more or less completely, their cellular character; and further, all the most active vital operations are performed by tissues which retain, with little or no change, the perfect cell as their chief constituent.§ This has given

\*"It," the conservation of force, "must be considered as a necessary truth, and as such is a sound basis of deductive reasoning." Prof. Joseph Leconte. "On the correlation of vital and physical forces." Amer. Jour. of Science and Art, Vol. XXXVIII, p. 305. Though in this instance I quote from Prof. Leconte's paper, it will be readily seen by consulting it that on the most important points I differ from him very materially. On the conservation theory see also Dr. Wood, Phil. Mag., Vol. III. p. 46, 1852. Buckle's "History of civilization in England," Vol. II, p. 384, where he also quotes from Faraday's "Discourse on the conservation of force." "Faraday," says he, "agrees with those who admit the conservation of force to be a principle in physics as large and sure as that of the indestructibility of matter."

† Boscovich's theory of the universe. Ency. Brit. Seventh edition, Vol. I, p. 606.

‡ Grove "Correlation of the physical forces." Third edition.

|| As by Faraday in his "Discourse on the conservation of force," Buckle, "Hist. of civilization in England," Vol. II, p. 384. Wood, Phil. Mag. Vol. III, p. 64, 1852. Leconte, Amer. Jour. of Science and Art. Vol. XXXVIII, p. 305, &c., &c.

§ Carpenter's "Elements of Physiology," p. 49.