

metic, algebra, geometry, and the application of the analytical method, as well as mathematics applied to matter and force or statics and dynamics, furnishes the peculiar study that gives to us, whether as children or as men, the command of nature in this, its quantitative aspect. Mathematics furnishes the instrument, the tool of thought, which gives us power in this realm. But useful, nay essential, as this mathematical or quantitative study is for this first aspect of nature, it is limited to it, and should not be applied to the next phase of nature, which is that of organic life; for we must not study in the growth of the plant simply the mechanical action of forces, but we must subordinate everything quantitative and mathematical to the principle of life or movement according to internal purpose or design. The principle of life or biology is no substitute, on the other hand, for the mathematical or quantitative study. The forces, heat, light, electricity, magnetism, galvanism, gravitation, inorganic matter—all these things are best studied from the mathematical point of view. The superstitious savage, however, imposes upon the inorganic world the principle of biology. He sees the personal effort of spirits in winds and storms, in fire and flowing streams. He substitutes for mathematics the principle of life, and looks in the movement of inanimate things for an indwelling soul. This is the animistic standpoint of human culture—the substitution of the biologic method of looking at the world for the quantitative or mathematical view.

The second group includes whatever is organic in nature—especially studies relating to the plant and the animal—the growth of material for food and clothing, and in a large measure for means of transportation and culture. This study of the organic phase of nature forms a great portion

of the branch of study known as geography in the elementary school. Geography takes up also some of the topics that belong to the mathematical or quantitative view of nature, but it takes them up into a new combination with a view to show how they are related to organic life—to creating and supplying the needs of the plant, animal and man. There is, it is true, a "concentration" in this respect that the mathematical or quantitative appears in geography as subordinated to the principle of organic life, for the quantitative—namely, inorganic matter and the forces of the solar system—appear as presuppositions of life. Life uses this as material out of which to organize its structures. The plant builds itself a structure of vegetable cells, transmuting what is inorganic into vegetable tissue; so, too, the animal builds over organic and inorganic substances, drawing from the air and water and from inorganic salts and acids, and by use of heat, light, and electricity converting vegetable tissue into animal tissue. The revelation of the life principle in plant and animal is not a mathematical one; it is not a mechanism moved by pressure from without or by attraction from within; it is not a mere displacement or an aggregation, or anything of that sort. In so far as it is organic, there is a formative principle which originates motion and modifies the inorganic materials and the mere dynamic forces of nature, giving them special form and direction, so as to build up vegetable or animal structures.

Kant defined organism as something within which every part is both means and end to all the other parts; all the other parts function in building up or developing each part, and each part in its turn is a means for the complete growth of every other part. These two phases of nature,