

4. *But the Method of Mathematics is as rigorous as its principles are sure.* Proceeding from intuitive truths by logical reasoning, we discover new truths which are in turn to become the *data* for higher and more complicated results. Not only the premises but every succeeding step in the reasoning is cautiously examined. In all mathematical investigations, "even those of the poorest and most meagre form" the mind is *habituated* to resolve every train of reasoning into steps, and to make sure each step before proceeding to another. If practice in such reasoning "gives us nothing else, it gives us wariness of mind," it accustoms us to demand a sure footing: and though it leaves us no better judges of ultimate premises than it found us (which is no more than may be said of almost all metaphysics) at least it does not suffer us to let in, at any of the joints of the reasoning, any assumption which we have not previously faced in the shape of an axiom, postulate, or definition." Nor can any error be *incorporated* into the science; for though a mistake may be made in effecting the synthesis between the known and the unknown terms of a proposition, the results, either directly or indirectly, indicate a fallacy in the reasoning, and the error must be corrected before further progress can be made. Such then, being the nature of Mathematics, and such the character of *their method*, we are prepared to understand their perfection as a science. It is a science whose foundations cannot be shaken by any possible revolutions of experience, and whose symmetry and beauty can never be obscured by the gloom of scepticism: it stands forth, a world of pure ideas, supreme over the fluctuations of the world of sense—the genuine creation of the understanding.

Having thus glanced at the nature and method of Mathematical Science, let me refer briefly to the *general*-influence which they may be supposed to exert on the mind.

When uncertainty and contradiction in so many other departments of investigation, incline us to despair of the attainment of truth, Mathematics in their wonderful certainty, in the almost measureless extent of the truths they reveal, in the marvellous power over the secrets of the universe which they give, furnish undoubted evidence of the possibility of knowledge, and a standing refutation of philosophic scepticism. Dealing with necessary truths, in the study of Mathematics, the mind becomes familiar with their nature as independent of sensuous impressions, and acquires a knowledge that has all the marks of a true science. Instead of looking in bewilderment at the ever-varying phenomena of the external world, we are enabled to discover, by the application of Mathematics, the general laws which underlie all changes, and clear and abiding knowledge takes the place of isolated, perplexing facts. Looking towards the arena of Metaphysics and beholding the unending warfare of systems which is there exhibited—a warfare in which no victory has ever yet secured permanent possession—we may well doubt the possibility of a true science of mind. But turning towards the brilliant success of Mathematical science, which like Metaphysics, is a science of *a priori* truths, we confidently look for the time when a true method shall be found to guide us to the solution of the great problems which have so long baffled human reason and which still knock for answer at the human heart.

To this result I have no doubt, the judicious study of mathematics will contribute. Elevated beyond mere sensuous impressions, the mind is constantly contemplating those pure forms which are its own creation, and therefore independent of matter and its phenomena. Does not this contemplation of the pure ideal, qualify the mind for the examination of its own attributes? To grasp and analyze the phenomena of mind, we must rise above the physical and concentrate attention on the mental—the world of thought; and to accomplish this the highest degree of the power of abstraction is required—abstraction is the only method, the only guide to success. And thus the processes of mathematics which, as already said, are constantly familiar with a world of supersensuous ideas, and which develop to its highest range the abstractive powers of the intellect, must eminently prepare the mind for the investigation of its own activities, and contribute materially to the development of a true science of mind.

It has been said that, "in consequence of their disqualifying us for the examination of moral liberty in the soul, and familiarizing us with the phenomena of a mechanical necessity in nature," mathematics induce

scepticism relative to the spiritual or moral world. Now, there is nothing in the habits of thought engendered by the study of either pure or applied mathematics that would predispose the mind to such scepticism. On the contrary, I hold that, the very reverse is the case because the study of mathematics, pure and applied, tends to the *exaltation of mind* and the *subordination of matter*—to magnify the spiritual and subordinate the material. The voluntary energies of mind are necessarily brought into prominence by the study of pure mathematics. Independently of the material world, the mind by its own creative energies, constructs a supersensible world—does the process tend to the "negation of a hyper-physical and immaterial principle of thought?" In fact mathematical idealism is opposed to metaphysical materialism. After contemplating the eternal truths of the pure mathematics—exploring a boundless world of the pure ideal called into being by its own free and independent energies—the mind becomes conscious of its creative energy—of its personality—and feels its worth as an intelligence elevated even to infinitude.

With reference to the phenomena of the material world, it might seem that their exclusive study by giving undue prominence to the physical, may tend to degrade the immaterial. But these phenomena can be profoundly investigated only by the application of pure mathematics, and therefore it may be replied that mathematical idealism will correct the tendency, if such exist, towards materialism induced by the earnest investigation of external phenomena: While, therefore, the exclusive study of these phenomena may induce, in the mind of the non-mathematical observer, the belief that everything is the result of a "mechanical necessity in nature,"—the decree of an inexorable fate—a different effect is produced in the mind of the mathematical observer.

But I hold that in the *applications* of mathematics to investigate nature, the dignity and superiority of MIND are still proclaimed. For the triumphs which the human race has won are still the triumphs of *mind*. It is *mind* that passes in review nature's grand domain and with authority demands the surrender of her secrets and her treasures. It is *mind* that has penetrated the star-depths, where suns and systems pursue in harmony their everlasting march. It is *mind* under whose forming power the world wears the aspect of a new creation, in which the impress of the finite *human mind* blends with that of the Infinite and Divine.

Since, then, the study of mathematics tends to give preeminence to the mind—to demonstrate the transcendent power of the thinking principle whatever that may be—it cannot fairly be maintained that they predispose to scepticism as to the spiritual or moral world, and to a denial of the existence of the ETERNAL MIND, whose thoughts are embodied in the universe, and of which the investigating mind is but the finite reflex—the dim and shadowy reflection. Nor do I believe that applied science, by revealing the mysteries of nature to the common gaze, will so "reave the heaven of its divinities and disenchant the universe," that admiration and reverence shall find place no more in the human heart. On the contrary, seen under the light of science, the manifold wonders of the world around us, and the majesty of the heaven above us, kindle a sublimer admiration, and become objects of a still profounder "adoration to an infant world." Guided by the light of science, the mind surveys the phenomena of nature, and beholds in the impress of intelligence everywhere apparent—not the mere reflex of organization—but the wisdom of the Great First Cause. If the wondrous mechanisms displayed in material organisms suggest the operation of a personal intelligence to the ordinary observer, probability gives place to demonstration under the clear, steady light of mathematical science.

If, for example, the human eye alone, as has been said, be a cure for atheism, how sublime its teachings when all its perfection, as exhibited in the adaptability of means to end, is revealed by the magic hand of science! It is capable of demonstration, that in all the varied organizations of the natural world, wherever velocity is to be secured, or power generated, or adaptation to natural laws effected, the most perfect means are adopted—means whose conception indicates omniscience, their execution, omnipotence. Thus the application of mathematics to the familiar phenomena daily within the scope of our observation, brings into a pre-eminence attainable by no other means, the wondrous *design* universally exhibited and leads the mind from the design to the all-wise Designer—from the law to the ETERNAL LEGISLATOR. Passing beyond the phenomena of our earth