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THE VALUE OF MATHEMATICS AS AN INSTRUMENT OF EDUCATION.

AN ADDRESS

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In discussing Education, one of the most important questions that has arisen is: *Which branches of study possess the greatest educational value as tending at once to secure the highest development of mental power, and contribute most largely to human progress?* From the variety of the intellectual powers, it may be fairly inferred that different subjects of study produce different results, and that it is absurd to expect to accomplish the great end of education by the exclusive study of any single department of human knowledge. But there are some subjects which educate the powers of the mind to a pre-eminent degree of activity and energy; and as I believe that the Mathematical Sciences can claim a high place among these, it is my present purpose to point out, in part, their beneficial influence as a discipline of the mind, and as an instrument of progress. I shall consider the subject under the following heads.—

I. THE CHARACTER OF MATHEMATICAL KNOWLEDGE, AND ITS GENERAL INFLUENCE ON THE MIND

II. THE VALUE OF MATHEMATICS AS A MEANS OF INVIGORATING THE INTELLECTUAL POWERS.

III. THEIR VALUE AS A LOGICAL EXERCISE OF MIND.

IV. THEIR VALUE AS AN INSTRUMENT OF MATERIAL PROGRESS.

I. THE CHARACTER OF MATHEMATICAL KNOWLEDGE AND ITS GENERAL INFLUENCE ON THE MIND.

Compared with Mathematics, no other department of knowledge so clearly illustrates the processes of the human mind in the establishment of true science, in none, has investigation led to the discovery of so great a number of important and recondite truths. This is no doubt due to their *method* and the nature of their principles. The value of any system of knowledge and its influence in education, depend upon the nature of its first principles and the mode of its development. If these principles be founded on imperfect observation or hasty generalization, the superstructure reared upon them, though possessing an external aspect of solidity and beauty, and dignified by its builders with the name of Science,

will partake of the instability of its basis, and crumble into ruins before the inevitable progress of true philosophy. But, if they bear the impress of indubitable truths, and be developed by a strictly scientific method, there will result a knowledge that can be shaken neither by the attacks of scepticism, nor the cavils of ignorance—a knowledge which is indeed worthy of the name of Science. Now, the principles of pure Mathematics are necessary truths, and consequently the knowledge founded upon them is a science of pure reason. It has indeed been asserted that the Mathematician has no right to enquire into the nature of the first principles of the science, and that a clear apprehension of their character as universal truths cannot produce any modification of their influence in education. The former assumption is partly wrong, the latter entirely so. For, though the Mathematician has no right to enquire *how* pure synthetic propositions are possible as the offspring of the understanding—this being properly the province of the metaphysician—he has a perfect right, since his science is *demonstrative*, to enquire into the validity of the principles which underlie his demonstrations, or form his links of method. And again, if the first principles are considered as empirical, the entire science is viewed as empirical; the necessary is sacrificed to the contingent, the mental to the material, a standing doubt as to the possibility of knowledge is likely to be generated in the mind, and a foundation laid for an unimproving connection with all its consequences. Hence, a clear apprehension of the nature of the first principles of the science, is necessary to the recognition of its real nature as a production of the understanding, and the science itself is thus enabled to exert a beneficial influence on the mind, by familiarizing it with a body of truths not derived from experience.

There are some philosophers who maintain that the first principles of Mathematics are merely generalizations from experience—a view which reduces the science to empiricism, and virtually implies the impossibility of any knowledge independent of sensory impressions. If the meaning be, that these principles are first made manifest through the agency of something out of the mind, it may be readily admitted, since there is no knowledge developed in the mind in point of time absolutely antecedent to experience.

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