

**A SHORT VIEW OF THE  
FIRST PRINCIPLES OF THE  
DIFFERENTIAL CALCULUS**

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A Short View of the First Principles of the Differential Calculus by Arthur Browne

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**ARTHUR BROWNE**

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SHORT VIEW

OR

THE FIRST PRINCIPLES

OF THE

**Differential Calculus.**



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## PREFACE.

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**O**BJECTIONS have frequently been raised against the study of Mathematics, as pursued at the University of Cambridge. It has been urged, that since the truths, which this study unfolds, have no relation to the concerns of common life; and, that since a knowledge of the abstract properties of Geometrical figures, and Analytical symbols, has no tendency to make us either wiser or better than we were before, Mathematics must of all subjects be least calculated to prepare the minds of students, for whatever station in life they may hereafter be called upon to fill. It has been insinuated, that while, amid the variety of learned professions, it would have been impossible to select a subject, equally adapted to the wants of every student, we have, with singular impartiality, selected one, which is perfectly useless to them all. These objections have derived additional force, from its being observed, that the three years, which are spent at Cambridge, are, as far as education is concerned, the three best years of our life; and, that many, when they have completed their career at the University, become so occupied in the duties and business of their station, as to have no leisure for more useful and important studies. In answer to these objections it has been stated, that those young men, who

annually resort to Cambridge, for the benefit of a University education, are mostly intended for one of the three learned professions, and that, in order successfully to prosecute the studies which belong to their profession, it is requisite, that their minds should be well habituated to thinking, acute in the detection of fallacious reasoning, capable of retaining and arranging their ideas, and of conveying the truths, which are perceived, into other minds, by clear and legitimate argument.

Now, if we consider the nature of Mathematical pursuits, we cannot fail to perceive, how admirably they are fitted to discipline the mind, and to give it those various qualifications, which are required in the prosecution of other studies. While, in such sciences as Chemistry and Geology, the information we derive, depends less upon the exercise of our intellectual powers, than upon the judicious selection and arrangement of experiments, the science of Mathematics consists of pure and abstract reasoning; starting from the knowledge of a few truths, respecting the laws of motion, and the properties of matter, sufficiently established by experiment and observation, it enables us, by a series of legitimate inferences, to arrive at the knowledge of other truths, so vast in their nature, that we might well have imagined them to lie beyond the reach of science.

Though Mathematics may have been sometimes debased by being employed in the discovery of un-

important truths, and in the solution of useless, though curious, problems\*; yet, considering the insight they have given us into the laws of nature, and into the manner, in which the bodies, which compose our system, are mutually affected, we cannot but regard them as wonderful evidences of the power of the human understanding. That planetary influence should in one sense exist, that bodies, separated by a distance to us inconceivable, should yet act upon each other, and that the same power, which gives to all substances upon the earth, a tendency to fall downwards, should be that, which guides the planets in their orbits, are truths well calculated to excite our astonishment; but it is still more astonishing, that the ingenuity and research of man, should ever have been able to discover them. These truths have, however, been discovered, and it is one of the great objects of the Cambridge system of education, to bring the minds of students into an acquaintance with the whole train of reasoning, upon which they are established. The advantages of this system are manifest. Though the investigation of these truths does not, as it might seem, lie beyond the limits of our mental faculties, yet, it must still be remembered,

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\* These, I imagine, are the kind of problems, which Eubulus stigmatizes as being mere puzzles. To this class belongs the integration of many differentials and differential equations. Such questions require from the student the same kind of quickness and ingenuity, that is required in guessing rebuses and charades, and, like them are sometimes amusing from the neatness of their answers.



it exerts those faculties to the very utmost, and is only to be effected by means of such continued and laborious thinking, as is inconceivable to those, who are occupied in the business of the world. It is on this account, that it becomes so well calculated to discipline the mind. If, in the studies of after life it is required, that the mind should be well inured to thought, powerful in the combination and arrangement of its ideas, and skilled in distinguishing between specious sophistry, and legitimate argument; who, I would ask, is so likely to rise to future eminence, as he, who in early life has made himself master of the works of Newton, and, by repeated and laborious thinking, familiarized himself with the whole train of reasoning and demonstration, by which the truth of his system is established? The Cambridge student, who is destined for one of the learned professions, may, perhaps, when he has finished his mathematical career, find that other competitors in the same profession, have applied themselves earlier to the requisite studies, and have, consequently, got the start of him with respect to time; but he will also find, that the habits of study and of thought, which he acquired at the University, will give him such a decided superiority over others of equal talent, who have not received the same mental discipline, that he will soon be able to rival and surpass them. Agreeably to this, I think it will be found, that the names of many of our best lawyers and soundest divines, rank high among the Cambridge Honors, and, (what is still more to the point), they are, I believe, seldom or never known to regret

the time and labour which they once employed in mathematical pursuits.

There is also another advantage arising from mathematical pursuits. In studying the writings of a man of genius, who, though his mind may not have been disciplined by severer studies, yet possesses in himself a copiousness of pleasing and instructive reflections, we are often, while the book is before our eyes, delighted with the ideas it suggests, but no sooner is it closed, than those ideas are forgotten, and we rise from the perusal of what once amused us, no wiser than we were before. Those writers, however, who have been habituated to mathematical thinking, and with minds thus strengthened, have entered upon the investigation of other subjects, are generally found to have the art of making their instructions more lastingly impressive. Their writings, (if the nature of the subject at all admits it,) are mostly characterized, not merely by the excellence and justness of each separate idea, but also by the obvious connection which exists between them, and by the skill, with which they are arranged. Hence it is, that, after we have risen from the perusal of the writings of such men, we can easily recal to our minds the ideas that were suggested; and, by frequently recalling them, familiarize ourselves with the whole train of thought, which it was the intention of those writings to convey. The utility of Mathematics, considered in this point of view, to those, who are intended for the law, is manifest; but they are, perhaps, still more useful to those, who are intended

for the Church. The great fault of some modern discourses, is their want of arrangement; for, with all their artificial divisions, it will frequently be found, that there is no real connection between their several parts. Their authors, perhaps, have, by study and meditation, acquired an abundant store of religious ideas, and can express them in classical and elegant language; each separate sentence, therefore, in their discourses, is good, and, at the time of delivery, is felt by the hearers to be so; but, when the discourse is finished, there are few, who can remember the series of unconnected, though important truths, which they have just been hearing; and thus it is, that owing in a great measure to the want of a qualification, which the study of Mathematics is well calculated to give, the impression, which many a preacher produces, is neither so strong nor so lasting, as he could wish.

The utility, then, of mathematical pursuits, when considered as a discipline, by which the mind is fitted for other and more useful studies, is the principal ground upon which we can justify the great, and almost exclusive encouragement, which is given to them at Cambridge. That the student should be obliged to devote to them so large a portion of that time, which might be spent in pursuits, more closely connected with his future profession, is, we must confess, an evil; but, since the study of Mathematics has a tendency to strengthen and improve the thinking powers, we consider the advantage, as more than sufficient to counterbalance the evil.