

**EUCLID'S ELEMENTS  
OF GEOMETRY, THE  
FIRST FOUR BOOKS**

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Euclid's Elements of Geometry, the First Four Books by Robert Potts

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**ROBERT POTTS**

**EUCLID'S ELEMENTS  
OF GEOMETRY, THE  
FIRST FOUR BOOKS**



EUCLID'S  
ELEMENTS OF GEOMETRY,

THE FIRST FOUR BOOKS,

CHIEFLY FROM THE TEXT OF DR. SIMSON,

WITH EXPLANATORY NOTES;

A SERIES OF QUESTIONS ON EACH BOOK;

AND A SELECTION OF GEOMETRICAL EXERCISES FROM THE

SENATE-HOUSE AND COLLEGE EXAMINATION

PAPERS; WITH HINTS, ETC.

DESIGNED FOR THE USE OF THE JUNIOR CLASSES IN PUBLIC AND  
PRIVATE SCHOOLS.

BY

ROBERT POTTS, M.A.

TRINITY COLLEGE.

*CORRECTED AND IMPROVED.*

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183. a. 4.

INTERNATIONAL EXHIBITION,  
1862.

A Medal has been awarded to R. Potts,  
"For the excellence of his Works on Geometry."

*Jury Awards, Class XXIX, p. 313.*



## PREFACE TO THE THIRD EDITION.

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SOME time after the publication of an Octavo Edition of Euclid's Elements with Geometrical Exercises, &c., designed for the use of Academical Students; at the request of some schoolmasters of eminence, a duodecimo Edition of the Six Books was put forth on the same plan for the use of Schools. Soon after its appearance, Professor Christie, the Secretary of the Royal Society, in the Preface to his Treatise on Descriptive Geometry for the use of the Royal Military Academy, was pleased to notice these works in the following terms:— "When the greater Portion of this Part of the Course was printed, and had for some time been in use in the Academy, a new Edition of Euclid's Elements, by Mr. Robert Potts, M.A., of Trinity College, Cambridge, which is likely to supersede most others, to the extent, at least, of the Six Books, was published. From the manner of arranging the Demonstrations, this edition has the advantages of the symbolical form, and it is at the same time free from the manifold objections to which that form is open. The duodecimo edition of this Work, comprising only the first Six Books of Euclid, with Deductions from them, having been introduced at this Institution as a text-book, now renders any other Treatise on Plane Geometry unnecessary in our course of Mathematics."

For the very favourable reception which both Editions have met with, the Editor's grateful acknowledgements are due. It has been his desire in putting forth a revised Edition of the School Euclid, to render the work in some degree more worthy of the favour which the former editions have received. In the present Edition several errors and oversights have been corrected and some additions made to the notes: the questions on each book have been considerably augmented and a better arrangement of the Geometrical Exercises has been attempted: and lastly, some hints and remarks on them have been given to assist the learner. The additions made to the present Edition amount to more than fifty pages, and, it is hoped, that they will render the work more useful to the learner.

And here an occasion may be taken to quote the opinions of some able men respecting the use and importance of the Mathematical Sciences.

On the subject of Education in its most extensive sense, an ancient writer "directs the aspirant after excellence to commence with the Science of Moral Culture; to proceed next to Logic; next to Mathematics; next to Physics; and lastly, to Theology." Another writer on Education would place Mathematics before Logic, which (he remarks) "seems the preferable course: for by practising itself in the

former, the mind becomes stored with distinctions; the faculties of constancy and firmness are established; and its rule is always to distinguish between cavilling and investigation—between *close reasoning* and *cross reasoning*; for the contrary of all which habits, those are for the most part noted, who apply themselves to Logic without studying in some department of Mathematics; taking noise and wrangling for proficiency, and thinking refutation accomplished by the instancing of a doubt. This will explain the inscription placed by Plato over the door of his house: 'Whoso knows not Geometry, let him not enter here.' On the precedence of Moral Culture, however, to all the other Sciences, the acknowledgement is general, and the agreement entire." The same writer recommends the study of the Mathematics, for the cure of "compound ignorance." "Of this," he proceeds to say, "the essence is opinion not agreeable to fact; and it necessarily involves another opinion, namely, that we are already possessed of knowledge. So that besides not knowing, we know not that we know not; and hence its designation of compound ignorance. In like manner, as of many chronic complaints and established maladies, no cure can be effected by physicians of the body: of this, no cure can be effected by physicians of the mind: for with a pre-supposal of knowledge in our own regard, the pursuit and acquirement of further knowledge is not to be looked for. The approximate cure, and one from which in the main much benefit may be anticipated, is to engage the patient in the study of measures (Geometry, computation, &c.); for in such pursuits the true and the false are separated by the clearest interval, and no room is left for the intrusions of fancy. From these the mind may discover the delight of certainty; and when, on returning to his own opinions, it finds in them no such sort of repose and gratification, it may discover their erroneous character, its ignorance may become simple, and a capacity for the acquirement of truth and virtue be obtained."

Lord Bacon, the founder of Inductive Philosophy, was not insensible of the high importance of the Mathematical Sciences, as appears in the following passage from his work on "The Advancement of Learning."

"The Mathematics are either pure or mixed. To the pure Mathematics are those sciences belonging which handle quantity determinate, merely severed from any axioms of natural philosophy; and these are two, Geometry, and Arithmetic; the one handling quantity continued, and the other dissevered. Mixed hath for subject some axioms or parts of natural philosophy, and considereth quantity determined, as it is auxiliary and incident unto them. For many parts of nature can



neither be invented with sufficient subtlety, nor demonstrated with sufficient perspicuity, nor accommodated unto use with sufficient dexterity, without the aid and intervening of the Mathematics: of which sort are perspective, music, astronomy, cosmography, architecture, enginery, and divers others.

"In the Mathematics I can report no deficiency, except it be that men do not sufficiently understand the excellent use of the pure Mathematics, in that they do remedy and cure many defects in the wit and faculties intellectual. For, if the wit be dull, they sharpen it; if too wandering, they fix it; if too inherent in the sense, they abstract it. So that as tennis is a game of no use in itself, but of great use in respect that it maketh a quick eye, and a body ready to put itself into all postures; so in the Mathematics, that use which is collateral and intervenient, is no less worthy than that which is principal and intended. And as for the mixed Mathematics, I may only make this prediction, that there cannot fail to be more kinds of them, as nature grows further disclosed."

How truly has this prediction been fulfilled in the subsequent advancement of the Mixed Sciences, and in the applications of the pure Mathematics to Natural Philosophy!

Dr. Whewell, in his "Thoughts on the Study of Mathematics," has maintained, that mathematical studies judiciously pursued, form one of the most effective means of developing and cultivating the reason: and that "the object of a *liberal education* is to develope the whole mental system of man;—to make his speculative inferences coincide with his practical convictions;—to enable him to render a reason for the belief that is in him, and not to leave him in the condition of Solomon's sluggard, who is wiser in his own conceit than seven men that *can* render a reason." And in his more recent work entitled, "Of a Liberal Education, &c." he has more fully shewn the importance of Geometry as one of the most effectual instruments of intellectual education. In page 55 he thus proceeds:—"But besides the value of Mathematical Studies in Education, as a perfect example and complete exercise of demonstrative reasoning; Mathematical Truths have this additional recommendation, that they have always been referred to, by each successive generation of thoughtful and cultivated men, as examples of truth and of demonstration; and have thus become standard points of reference, among cultivated men, whenever they speak of truth, knowledge, or proof. Thus Mathematics has not only a disciplinary but an historical interest. This is peculiarly the case with those portions of Mathematics which we have mentioned. We find geometrical proof adduced in illustration of the

nature of reasoning, in the earliest speculations on this subject, the Dialogues of Plato; we find geometrical proof one of the main subjects of discussion in some of the most recent of such speculations, as those of Dugald Stewart and his contemporaries. The recollection of the truths of Elementary Geometry has, in all ages, given a meaning and a reality to the best attempts to explain man's power of arriving at truth. Other branches of Mathematics have, in like manner, become recognized examples, among educated men, of man's powers of attaining truth."

Dr. Pemberton, in the preface to his view of Sir Isaac Newton's Discoveries, makes mention of the circumstance, "that Newton used to speak with regret of his mistake, at the beginning of his Mathematical Studies, in having applied himself to the works of Descartes and other Algebraical writers, before he had considered the Elements of Euclid with the attention they deserve."

To these we may subjoin the opinion of Mr. John Stuart Mill, which he has recorded in his invaluable System of Logic, (Vol. II. p. 180) in the following terms. "The value of Mathematical instruction as a preparation for those more difficult investigations (physiology, society, government, &c.) consists in the applicability not of its doctrines, but of its method. Mathematics will ever remain the most perfect type of the Deductive Method in general; and the applications of Mathematics to the simpler branches of physics, furnish the only school in which philosophers can effectually learn the most difficult and important portion of their art, the employment of the laws of simpler phenomena for explaining and predicting those of the more complex. These grounds are quite sufficient for deeming mathematical training an indispensable basis of real scientific education, and regarding, with Plato, one who is *ἀγενεῖς*, as wanting in one of the most essential qualifications for the successful cultivation of the higher branches of philosophy."

In addition to these authorities it may be remarked, that the new Regulations which were confirmed by a Grace of the Senate on the 11th of May, 1846, assign to Geometry and to Geometrical methods, a more important place in the Examinations both for Honors and for the Ordinary Degree in this University.

TRINITY COLLEGE,  
March 1, 1850.

R. P.

The supplement to the School Euclid (about forty-eight pages) has been incorporated with this impression of the Fifth Edition.

TRINITY COLLEGE,  
October, 1863.

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