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INTRODUCTION
TO
ALGEBRA

FOR THE USE OF
SECONDARY SCHOOLS AND TECHNICAL
COLLEGES

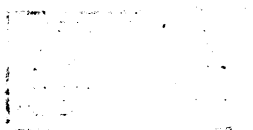
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THIS BOOK IS DEDICATED
BY THE AUTHOR
TO
DAVID RENNET, LL.D.
IN MEMORY OF
HAPPY HOURS SPENT IN HIS CLASS-ROOM
IN DAYS OF OLD

PREFACE

THERE are many signs that the departure of the old-fashioned English Elementary Algebra is at hand, not the least of them being the appearance of numerous competitors for the heirship. That I should have entered into a suit where there are already so many litigants is partly due to recent changes in the University system of Scotland, which cannot be discussed here, and partly to a long-standing promise to my publishers to provide an introduction to my larger text-book, which is suitable only for the highest classes in schools, and which contains too little of practical application, and not enough of graphical illustration for the purposes of a technical college.

It is somewhat surprising to me to find myself in the rôle of a reformer of the methods of elementary instruction—*non ita nutritus*. I began to teach in the old-fashioned way, and have been driven, simply by the stress of experience, until I find myself more or less at one in most of their positions with the reforming party of mathematical teachers, whether academic or (I suppose I must say) technical. The experience in question, extending now over more than twenty years, has been gained in laboratory work, in examining schoolboys and entrants to the universities, and (until 1893) in teaching the junior mathematical class in a Scottish University, which, like

the pass work in an English University, was essentially the work of a schoolmaster. I have therefore had a better opportunity than most of learning exactly where the old methods were defective.

The English text-books of Algebra in vogue during the latter part of this century have tended to degenerate into a mere farrago of rules and artifices, directed to the solution of examination puzzles of a somewhat stereotyped character having little visible relation to one another and still less bearing on practice. If general principles appeared at all, they were usually huddled apologetically into a chapter of "Miscellaneous Theorems,"—an arrangement which we might parallel by building a man of muscle and tendons, etc., and putting all his bones into his coat-tail pocket. It has been often and loudly complained that Algebra thus taught will not bear the superstructure of a university course, and is totally useless in practice. My own experience has convinced me that both complaints are in great measure just.

The present attempt to remedy these evils is a compromise, destined, I hope, to be superseded presently by something better. Nothing but a compromise is at present practicable, because *natura non agit per saltum*.

In the first place, I have kept the fundamental principles of the subject well to the front from the very beginning; I may instance the treatment of the derivation of equations in Chapter VI., a subject usually dealt with as if it were a separate science. At the same time I have not forgotten, what every mathematical (and other) teacher should have perpetually in mind, that a general proposition is a property of no value to one that has not mastered the particulars. The utmost rigour of accurate logical deduction has therefore been less my aim than a gradual