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THE ART OF THE INTELLIGIBLE

An Elementary Survey of Mathematics in its Conceptual Development

To my dear wife Mimi

The purpose of geometry is to draw us away from the sensible and the perishable to the intelligible and eternal.

Plutarch

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FOREWORD

My purpose in writing this book is to present an overview—at a fairly elementary level—of the conceptual evolution of mathematics. As will be seen from the Table of Contents, I have adhered in the main to the traditional tripartite division of the subject into Algebra (including the Theory of Numbers), Geometry, and Analysis. I have attempted to describe, in roughly chronological order, what are to me some of the most beautiful, and—if I am not entirely misguided—some of the most significant developments in each of these domains. In this spirit I have also included brief accounts of mathematical notation, ancient Greek mathematics, set theory, and the philosophy of mathematics. The Appendices contain short expositions of topics which are particularly dear to my heart and which I hope my readers (if any) will take to theirs. My approach here—a curious mix, admittedly, of the chronological and the expository—is the result, not entirely of my whim, but also of having spent a number of years of lecturing on these topics to undergraduates.

I should point out that the use of the word "intelligible" in the book's title is intended to convey a double meaning. First, of course, the usual one of "comprehensible" or "capable of being understood." But the word also has an older meaning, namely, "capable of being apprehended only by the intellect, not by the senses"; in this guise it serves as an antonym to "sensible". It is precisely with this signification that Plutarch uses the word in the epigraph I have chosen. While the potential intelligibility of mathematics in this older sense is hardly to be doubted, I can only hope that my book conveys something of that intelligibility in its more recent connotation.

ACKNOWLEDGEMENTS

It was Ken Binmore—my colleague for many years at the London School of Economics—who proposed in the 1970s that I develop a course of lectures under the catch-all title "Great Ideas of Mathematics". Twenty years or so later Rob Clifton—my erstwhile (now sadly deceased) colleague at the University of Western Ontario—suggested that I give the same course here, a stimulus which led to the expansion and polishing of the somewhat primitive notes I had prepared for the original course, and which also had the effect of emboldening me to turn them into the present book. In the last analysis it must be left to readers of the book to judge whether my two confrères are to be applauded for their encouragement of my efforts, but for my part I am happy to acknowledge my debt to them. I would also like to thank Elaine Landry for suggesting that I give the course of lectures on the philosophy of mathematics which ultimately led to the writing of Chapter 12 of the book. I am grateful to Alberto Peruzzi for his helpful comments on an early draft of the manuscript, and to Max Dickmann for his scrutiny of the hardback edition of the book, leading to the discovery of a number of errata (which are listed on a separate sheet in the present edition). To my wife Mimi I tender special thanks both for inscribing the Chinese numerals in Chapter 1 and for her heroic efforts in reading aloud to me the entire typescript (apart, of course, from the formulas). I must also acknowledge the authors of the many books—listed in the Bibliography—which I have used as my sources. Finally, I would like to record my gratitude to Rudolf Rijgersberg at Kluwer for the enthusiasm and efficiency he has brought to the project of publishing this book.