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# *Isaac Newton*

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ISAAC  
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IN THOUGHT  
—♦—  
A. RUPERT HALL



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# *General Editor's Preface*

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Our society depends upon science, and yet to many of us what scientists do is a mystery. The sciences are not just collections of facts, but are ordered by theory, and this is where Einstein's famous phrase about science being a free creation of the human mind comes in. Science is a fully human activity; the personalities of those who practise it are important in its progress and often interesting to us. Looking at the lives of scientists is a way of bringing science to life.

By the time of his death in 1727 Newton stood as the representative figure of modern science. His name was something to conjure with, evoking ideas of the absent-minded professor, the solitary genius, and the power of mathematical and experimental science to answer questions about the world. He became a key figure in the Enlightenment of the eighteenth century, and his work correspondingly aroused unease among Romantics who saw his science as inhuman and reductive.

A mythical Newton, a new Adam born on Christmas Day and nourished by an apple from the tree of knowledge, came to obscure the real man who had worked in dynamics, astronomy and optics, and less successfully in chemistry, to synthesize the work of great predecessors such as Kepler, Galileo, Descartes and Boyle. Rupert Hall comes to this biography after editing the correspondence of both Newton himself and also Henry Oldenburg, the first secretary of the

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## GENERAL EDITOR'S PREFACE

Royal Society and the editor of its journal. He has also edited some of Newton's unpublished papers. His interpretation of Newton thus has the authority brought by the easy familiarity with the documents which a lifetime's research can yield. Since many of Newton's papers were not accessible to scholars until the twentieth century, we can now perhaps meet Newton the man more easily than at any time since his death.

Newton was a secretive man, as Hall shows, easier to admire than to like, and lonely in his eminence at the end of his long life. But Hall is sceptical about seeing him as a psychological case, or as a magus whose real interests were in alchemy and in the interpretation of the more obscure biblical prophecies. The great virtue of this biography is that we feel that Newton is understandable. We see extraordinary ability and application in mathematics and experiment; we see Newton's mind gradually gaining upon the dark, but also making mistakes and sometimes from our perspective retreating from a better to a worse understanding. And yet Hall does not forget that Newton was a man of his time, involved in the political and religious issues of his day, making friends and allies and falling out with them.

As an introduction to an extraordinary man, and through him to that combination of experimental and mathematical reasoning which is modern science, this biography would be hard to beat. Readers will remember the formidable and reserved man who, for all sorts of reasons discussed by Hall, became that representative figure for his successors.

*David Knight*  
*University of Durham*

# Foreword

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I have endeavoured here to write an account of the greatest mind in British history. If any names of Englishmen survive into the remote future, those of Shakespeare and Newton will surely be among them. The latter was above all things a mathematician and a natural philosopher, but he also gave deep scholarship and profound thought to ancient history, especially to the early history of Christianity, the unravelling of sacred prophecy and even to monetary theory and practice. On all these topics he left vast accumulations of manuscript material.

In this book attention is chiefly directed to Newton the mathematician and philosopher. As such he worked his great transformation in human thought. Even so, a volume of modest size permits no very technical treatment of his researches in mathematics and mechanics, and in experimental optics. For such treatment the reader may turn to D. T. Whiteside's epoch-making edition of Newton's *Mathematical Papers*, the parallel volumes of *Optical Papers* (in progress) edited by Alan E. Shapiro, and very many specialist studies by these and other scholars. As for Newton's daily life and personal pursuits, for all the huge amount of material by and concerning Newton now accessible to us, these are shadowy at all periods of his life. I have not tried to emulate here Frank E. Manuel's psychological analysis of Newton in terms of theories whose validity

## FOREWORD

seems to be doubtful. In general, I believe it imprudent to try to interpret Newton's life and writings in terms of single factors, whether these be his infantile experiences, his reading of the strange books of the alchemists, his faith in God or even his confidence in number and measure. There is no single key to understanding Newton, no single source or stream of knowledge to which he applied his unique mental powers.

In less specialized formulae than those of Manuel, the student of Newton soon discovers that his temperament was volatile, sensitive and egocentric. He could also be steady, resolute and generous. His life shows little affection for people or places and no pretence of it. Outside his immediate family and possibly (for a year or two) his friend Nicolas Fatio de Duillier, Newton demonstrated attachment to no one; in later life he abandoned Lincolnshire and Cambridge without apparent regret. He was free from all sentimentality, some might say from warmth. He had little mercy for the human foibles of others, and held up no mirror to discern his own. Yet he gave away large sums and pushed the careers of young men of whose ability he was convinced. Geniality was not his obvious characteristic, but the few admitted to friendship found him a lively and hospitable companion. His ideas of principle and duty were deep-seated and inflexible; when these were at stake he was bold, intransigent, cunning. His threshold of anger and resentment was low. But to paint Newton as a psychopathic genius is to take as romantic a view of his life as painting him as a saintly genius. Such romance is the biographer's creation. Newton was a man; Robert Hooke, Gottfried Wilhelm Leibniz and John Flamsteed were not angels either.

To observe Newton's transcendence of the intellectual bounds of his age, while at the same time never questioning some of its entrenched certainties, is a fascinating exercise. Yet his thinking was consistent and all of a piece, just as he believed the universe of matter and spirit to be. To Newton an investigation of God's workmanship in the solar system by no means seemed as distant from an analysis of the language of biblical prophecy as it does to us. (The former we can understand, at the latter we only marvel.) Modern scholars like Manuel have rediscovered what the close successors of Newton knew: to Newton's mind his study of human experience was all one, whether it was experience of Nature, of human history or of the actions of divine mercy. In a sense, thinking man is as much the hero of the *Principia* as sinful man is of *Paradise Lost*. Newton was the last polymath, the last mind to believe that all knowledge was within its grasp. Only sensual and aesthetic experiences were denied to

## FOREWORD

Newton: food and drink meant nothing to him, verse was an antic game with words, music a tedious jumble of sounds. I think he never spoke of any picture.

The documented, analytical biography of Newton was begun by Sir David Brewster more than 150 years ago; his book, however dated his attitudes, is useful still. Since 1980 all who are fascinated by Newton have been indebted to its successor, the large, scholarly and immensely detailed account of his life and work by Richard S. Westfall. Not the least of the merits of *Never at Rest* is a bibliographical essay of almost eight pages, with which it would be pointless to compete; for reference, Peter and Ruth Wallis's *Newton and Newtoniana, 1672–1975* is an invaluable resource. Much useful information is compiled accessibly in Derek Gjertsen's *Newton Handbook*.

I should apologize to readers for the length of my notes, arising from a wish to simplify the text. They may also provide some guidance to the extensive corpus of Newtonian studies.

I beg to thank my wife for encouragement, criticism and forbearance. To Tom Whiteside goes my gratitude for his devoting his immense knowledge to the emendation of some chapters, and to the Librarians of the Royal Society and the Bodleian Library for facilitating my use of their collections. Mrs Sheila Edwards and her predecessors have cheerfully met my requests during more than forty-five years. Members of the Wellcome Institute for the History of Medicine have continued to be my friends, and to them also go my thanks.

Throughout this book I have restricted double quotation marks to Newton's words. As usual, square brackets denote editorial insertions. I have copied original spelling and punctuation, but make no apology for not perpetuating obsolete writing contractions such as  $y^e$  and  $y^n$ . In an Appendix I have outlined very briefly the history of Newton's manuscript legacy, and of his library.

A. Rupert Hall  
Tackley

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# Acknowledgement

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This new edition is issued without any change, except that I have corrected a mistake on p. 74. I owe this correction to Dr Alan E. Shapiro.

*A. Rupert Hall*