presence is a burden on the family budget. The departments that have the most divorces have the smallest number of children per family. Widespread unemployment has caused many foreign workers to return to their own country, particularly the Poles and the Czechoslovakians, who came to France after the war. These foreign peasant families have always been more prolific than the French. The unchanging nature of the birth rate shows no improvement in spite of the development of the prophylactic services, the dispensaries and the hospitals.—*The Journal of the American Medical Association.*

SCIENTIFIC BOOKS

LIFE OF NEWTON

Isaac Newton, a Biography. By LOUIS TRENCHARD MORE. Pp. xii, 675. Charles Scribner's Sons, New York. $4.50.

THIS is an important and valuable book. Most of us get all that we know about Newton from Brewster's Life, and Brewster was so impressed by Newton's intellectual greatness and so desirous to present his character as without a flaw that he suppressed all evidence that had not already been made public which tended to show that Newton also had his human weaknesses and errors. A critical biography, in which all that can now be discovered about Newton is given its place and weight, has long been needed. This book supplies the need.

Dean More is eminently qualified for the task which he has now completed. He is a physicist of distinction, a widely read scholar, an acute critic, and, further, he is thoroughly in sympathy with Newton's philosophical method, which begins with experiments, proceeds by induction and makes no hypotheses.

Apparently all the sources from which information can be gathered about Newton's life and work have been examined. Some new matter has been introduced, such as the account of his first note-book as a schoolboy and some unpublished extracts from letters and private papers. But most of the details have been published elsewhere, either in biographies or in monographs. The peculiar value of the book depends upon the care with which all the available information has been collected and arranged, and the candor and impartiality with which controversial questions have been presented.

The events of Newton's life are not many, and recorded by themselves would be of little interest. Dean More has enriched the simple record by descriptions of the conditions in which Newton's life was spent, by accounts of the men with whom he came in contact and by elaborate dissertations on his work. Thus the fact that Newton was an undergraduate and later a fellow of Trinity College, Cambridge, is made interesting by an account of the customary curriculum pursued by an undergraduate and by a description of Trinity College. Newton's invention of a reflecting telescope introduces an account of the invention and development of the refracting telescope. The account of Newton's first communication to the Royal Society, in which he presents his discovery of the composition of white light, is followed by a chapter on Newton's theory of light and his philosophical method. The account of Newton's chemical work is accompanied by a justification of his having entertained the hopes of the alchemist. The description of the "Principia" is preceded by a chapter on the mechanistic hypothesis as it appeared in the thoughts of Newton's predecessors.

After the "Principia" was published the course of Newton's life changed and he was thrust into the arena of politics by the attack of King James on the freedom of the universities. To explain the course which Newton followed a full account is given of the political situation, so far as it affected the universities. Newton's famous mental disturbance after the intense strain of many years is carefully studied, and the conclusion is reached that it was a simple case of nervous breakdown, which released Newton's naturally suspicious nature and made him doubt the conduct of his best friends, while it did not impair his intellectual powers and passed away completely in the course of a year. For two or three years following Newton was occupied with the lunar theory, with a view to a second edition of the "Principia." He was suddenly called away from his scholarly seclusion by being appointed Warden of the Mint. He removed from Cambridge to London and devoted himself to his new duties, which were exceptionally important because he took office shortly after the great reform in the coinage had been begun by his friend and patron Montague, and when the mint was strained to the utmost to provide the new money. A full account of the monetary situation and of the general political situation as well is given to introduce the story of Newton's work. Not to mention many other instances in which the bare narrative is elucidated with historical or critical additions, reference must be made to the chapters in which Newton's controversies with Flamsteed and with Leibnitz are presented. His earlier controversies with Hooke were given in the chapters on light and on the "Principia." These controversies are examined with scrupulous fairness, and the conclusions that are reached may be accepted as final.

In the difficulties with Hooke, Newton comes off fairly well. Hooke was so irascible and so given to

making exaggerated claims of achievement which he was not able to substantiate that it is easy to show that most of his claims are without foundation. He did do a great deal in the study of the diffraction and interference of light, and Newton should have made a more complimentary and extended reference to Hooke's work than he did. Hooke's suggestion of the law of gravitation amounts to nothing more than a guess, and he never proved that his law could account for the planetary motions.

Newton's difficulties with Flamsteed, the Astronomer Royal, began when Newton asked him to furnish observations of the moon's positions. It appears from the record that Flamsteed furnished them as soon as he could and withheld none; but Newton complained to his friends that Flamsteed refused or delayed to furnish them. There was certainly delay in the development of the lunar theory, but apparently it resulted from Newton's procrastination rather than from Flamsteed's slackness. When the time came to publish the results gathered by Flamsteed in thirty years of observation, Newton was president of the Royal Society and controlled the committee which had the publication in charge. The history details a series of conflicts, in which Flamsteed's claims to the right to determine the main features of the publications were persistently ignored or overridden, and in which, apparently, agreements made by the committee and even by Newton himself were violated. Flamsteed was pertinacious and must have been irritating, but he seems generally to have asked for no more than his due. Newton's conduct seems inexcusable. We have no statement from him in justification.

The famous controversy between the Newtonians and the Leibnitzians as to whether Newton or Leibnitz first invented the differential calculus is given at length and with entire impartiality. There is now no doubt that Newton invented his method of fluxions several years before Leibnitz published his calculus. The evidence seems good that Leibnitz's invention was not based upon any hint which he received from the slight intimation which Newton had given of his method in two or three letters. Perhaps if the two principals had been asked, early in the discussion, before passions were aroused, to state on their honor what they had done and when they had done it, and to outline the course of thought which led them to their inventions, the full truth might have been known, due credit given to each and all controversy avoided. But such a course was not followed. Newton at first recognized Leibnitz as an independent discoverer, and Leibnitz admitted Newton's priority. But one of Newton's friends, irritated perhaps by the boasts of the Leibnitzians, accused Leibnitz of getting hints from Newton's work which led him to his discovery, and Leibnitz retaliated by hinting that Newton owed most of the development of the fluxional calculus to the model which Leibnitz had given him in his differential method. The quarrel dragged on for years. It is hard to decide which of the two principals was more unfair in his suspicion of the other, or which descended to the more unworthy methods of attack. Neither of them comes out, after a fair examination, free from reproach.

Unlike most of the biographers, Dean More, in detailing these controversies, has kept free from partisanship. Perhaps his judicial attitude was made easier for him because he had no national hero to defend. And yet it is hard for any English-speaking person not to feel a bias in favor of Newton. He is the crowning intellectual glory of our branch of the human family, and it hurts our pride in him to learn that he was suspicious and irritable, often on slight provocation, and implacable in his resentment when he felt himself offended.

An important chapter of the book is devoted to a review of Newton's work in chronology and theology. It is customary to depreciate this work as unworthy of so great a genius and even, as Biot did, to look at it as a result of his nervous collapse. But Dean More shows that such studies had occupied him from his early days and that some of his most important work had been done before his illness. It is shown, that, though his chronology is hopelessly wrong, the system which he proposed exhibits immense reading and great ingenuity. From some hitherto unpublished material we learn that Newton, as has often been suspected, was an Arian, though he had no scruples in maintaining his connection with the Established Church.

In the preceding paragraphs have been cited a few of the topics which Dean More has introduced in his book to elucidate the history of Newton's life. They are only examples of his method and indications of the wealth of scientific and historical learning which his book contains. He has accomplished a great work, and it may well be that he has written the definitive biography of Isaac Newton.

W. F. MAGIE

THE KINETIC THEORY OF GASES

The Kinetic Theory of Gases. By LEONARD LOEB. xi + 687 pages. Published by the McGraw-Hill Book Company, Inc., New York City.

THIS is the second edition of the well-known book by this author. The general style of the first edition has been maintained. The aim is apparently to keep the student interested at all costs and to lead him by successive approximations to the theory from the simple to the more complex. The factor of safety which the author has employed to insure success in