Newton of promise

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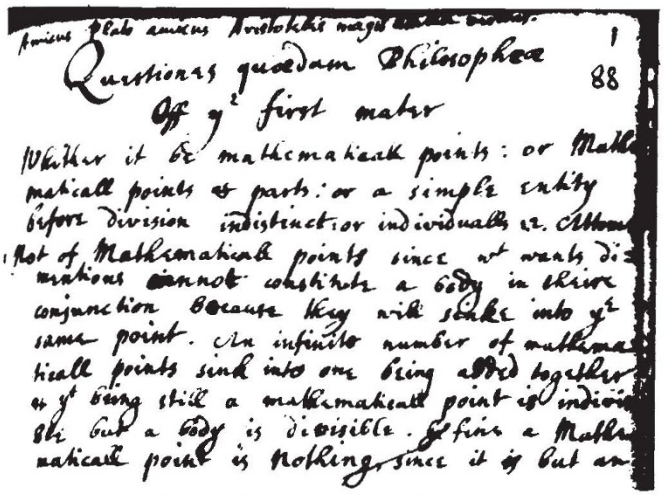
Certain Philosophical Questions: Newton's Trinity Notebook.
By J.E. McGuire and Martin Tamny.
Cambridge University Press: 1983.
Pp.519. £50, $84.50.

WE now know a great deal more about Newton than we did 30 years ago; this is mainly the result of Whiteside's magnificent edition of the papers, with the Halls' collection of the letters coming a close second*. As a result we can see the mistakes as well as the triumphs of a genius, and insights that, for one reason or another, never saw the light of day.

But are we any nearer to understanding this most astonishing of men? Perhaps a little, but because there is still so much left to understand one should hesitate long before relegating a work such as this to the "Newton's laundry book" category. And indeed such a judgement would be wholly unjust. In 1661, at the age of 18, Newton began to keep notes about his studies in Cambridge in a notebook which is in the University Library. But the *Questiones quaedam philosophicae* are (English) notes well on in the book and so almost certainly date from late March 1664 to late 1665. Since 1666 was to be, by his own confession, Newton's *annus mirabilis,* these notes on scientific matters could not fail to be of interest.


Questiones quaedam Philosophicæ
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Off y^e first mater

In his own hand — the title page of the "Questiones", consisting of Newton's notes on Walter Charleton's consideration of the nature of first matter in "Physiologia Epicuro-Gassendo-Charltoniana".

The book has been produced with all the care that American scholarship can provide, and the finished work is one of considerable beauty. Two-thirds of it is taken up by an essay describing the *Questiones* in the context of Newton's thought and of other thought of the time, and the remaining third presents, on facing pages, the transcription of the notebook and a modern English version (in which even Newton's sketches are carefully redrawn). So there is something for everyone. The historian and scholar have an important source presented in meticulous detail. The scientist can read the modern English and see Newton grappling with a variety of questions, some a consequence of the theoretical background with which he had been saddled by his university course, some of a much more modern kind.

He begins with a discussion of atomism and the "first matter", concluding that there must be atoms, finite in magnitude, and that as a consequence the "world" (i.e. the Universe) must be composed of a finite number of them, since "an infinite number of finite parts cannot be finite". This discussion partakes of an Aristotelian flavour in the arguments rejecting the possibilities of mathematical points serving as atoms. And Newton goes on to infer that, to discuss motion, there must be

> a least distance, a least progression in motion, and a least degree of time. Lay two globes together so close that they cannot come any nearer without touching — that is the least distance. Let them be moved together — that is the least degree of motion and it is performed in the least part of time.

So here was someone still far from understanding the use, let alone the nature, of fluxion or fluent, but at the same time preparing the ground for the seed. He returns to such problems later, evidently still worried, but without resolving them. This really summarizes the character of the whole book.

The next discussion is of the Sun, stars and planets: "Whether the Sun moves the vortex about (as Descartes's will) by his beams. . . . How it is that the Sun turns on his axis". Then a quotation "Hebrews, Chapter 1, Verse 2, God made the worlds by his son . . ." is followed shortly after by "On Saturday, December 10, 1664, by a subtle observation I found the distance of a comet from the centre of the Moon to be 9° 48′ . . .".

The properties of matter take Newton's attention next, including rarity, density, perspicuity, opacity, gravity and levity. He notes that "the matter causing gravity must pass through all the pores of a body". This is followed by a detailed discussion of the behaviour of this matter as it streams down to the Earth and back again. Then, quite soon, "you may observe in water that a thing moved in it does carry along with it the water behind it, as in a cone, or at least the water is moved from behind it with but a small force . . .".

There follows a varied selection of queries — on reflection of light, on atmospheric pressure, "What angle ought a windmill sail make with the wind", on water and salt, on magnetic attraction and electrical attraction, and so to much more on light, vision and colours. Even questions of memory, imagination and sympathy are touched on, succeeded almost at once by consideration of the character of oils, meteors, minerals and the tides. Here, as well as theoretical aspects of the vortex theory, there are notes about the reversing of the tides between Harris and Uist and about the alleged difference in speed of the Danube "as is perceived by the motion and noise of the clackers in mills" between six and midnight though "there is no ebb nor flow, the water keeping at a constant height".

Ever and again violent motion and motion itself return. Newton asks "Whether there can be motion in a vacuum" (since an earlier discussion interpreted the relative character of motion very strictly in terms of adjacent bodies). The argument concludes "If this going of c to d be not motion I ask what it is. But this is only to strive about terms, and if it pleases you not to call it motion call it what you will, but it is that which we aimed to prove". There are many astronomical observations and discussions, mostly of comets, before a return to motion yet again and then more optics. So it goes on, with notes on God and the soul, before various chemical queries come all together — genuine chemistry rather than alchemy, such as: "Alcalizate salts are wont to precipitate what acid salts dissolve".

So where does the notebook show us Newton standing? We see a man with at least part of one foot still in the Middle Ages, still needing to liberate himself from the weakening clutch of Aristotle; a man who has studied Descartes and is evidently not too happy about vortices. But above all we discern an enquiring mind, compulsively interested in everything around him or reported to him. In some ways a more human figure emerges. The authors tell us that "Newton's copy of Diogenes is extensively dog-eared . . . . As Newton used the technique of dog-earing, a dog-ear was used not only to mark a page but often to mark a place on a page". But the mystery is still there. The author of the notebook is the young man of promise. The Newton of 1666 still seems a different person. □

**The Mathematical Papers of Isaac Newton* (in 8 volumes). Edited by D.T. Whiteside. Cambridge University Press: 1967–1982. *The Correspondence of Isaac Newton* (in 7 volumes). Edited by A.R. and M.B. Hall. Cambridge University Press: 1959–1977.

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