LEIBNIZ, THE CAUSE OF GRAVITY AND PHYSICAL THEOLOGY

By Robin Attfield, Cardiff University

ABSTRACT

Der vierten Brief an Clarke von Leibniz behauptet, dass Newtons Glaube an Gewicht führt Okkultkräfte in die Physiek ein, was eine voreilige Zuflucht zu die Übernatürliche darstellt. Clarke verleugnete diese Behauptung und in seinem Fünften Antwort gab die officielle positivistische Newtonische Darstellung. Es ist jedoch wahrscheinlich, dass Newton und Clarke glaubten an eine Theorie die ähnelt der zu ihnen von Leibniz zugeschreiben – die Theorie das Gott durch Seine Allwesenheit die sonst mystseriöse Phänomen des Ferneinflusses verursacht. Erst im Jahre 1717, nach dem Tod Leibnizs, verurteilte Newton diese Betrachtungsweise. In diesem Aufsatz versuche ich, die Fäden dieser Kontroverse zu entwirren, die relevante Physik und Theologie zu abschätzen and die stillschweigende Andeutung von Leibniz (in dem Wörten von Austin Farrer) für 'physicalische Theologie' schuldig war, zu beurteilen.

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In the course of his correspondence with Clarke, and in particular of their dispute about miracles, Leibniz introduced the charge that Newton's belief in gravitation, and therefore in action at a distance, introduced occult powers into physics, and was yet another resort to the supernatural. Thus the concluding paragraph of Leibniz's Third Paper (of the Leibniz-Clarke Correspondence) claims that it is the nature of a planet not to revolve about a fixed centre, unless some other creature acts upon it, but to recede from such a curve at a tangent (implicitly in accordance with the law of inertia); hence to suppose that God makes it to be attracted towards its sun and thus to revolve around it is to invoke a power that exceeds all the powers of creatures, and accordingly to invoke supernatural power. And in his Fourth Paper, he asserts at paragraph 45 that the suggestion that bodies should attract one another at a distance, without any intermediate means, is also an appeal both to the supernatural and to the miraculous.

As Daniel Garber remarks, Leibniz did not reject the phenomenon of mutual attraction between separated bodies, but insisted on there being an underlying mechanistic explanation, such as that presented for the motions of the planets in his 1689 essay 'Tentamen de motuum coelestium causis'.[1] (In fact, as J.R. Lucas points out, John Locke, in Book II of his *Essay*, actually denied the conceptual possibility of action at a distance, until Newton convinced him that it was actual; and David Hume, in book I of his *Treatise*, reverted to the view that it was impossible, and required contiguity as an essential condition of causation.[2])

In part, the charge of Leibniz against Newton was unfair, since, as Newton frequently maintained, 'gravitation' was just the name of an observable phenomenon, the accurate description of which allowed the motions of bodies to be understood; besides, he did not deny the theoretical possibility of an underlying mechanical explanation, and (as Garber further remarks) would have been reluctant to grant that the mutual attraction of bodies exceeds their created nature. Yet Leibniz's suspicions were not altogether without foundation, for Clarke allowed in his reply that attraction must involve some means, and the means "may be invisible and intangible, and of a different nature from mechanism".[3]

In his Fifth (and final) Reply, Clarke returns to the more official (public) Newtonian line that the cause of gravity (whether mechanical or non-mechanical) is not known, but that the phenomenon of gravity is no hypothesis but an inductively established fact which a philosopher denies at his peril (or, we might add, at her own risk).[4] He is possibly on stronger ground when in his Fourth Reply he holds that there may be non-mechanical forces which are regular and constant, and thus natural.[5] This was certainly a possibility to be taken seriously, although Leibniz could hardly take it so not only because of his adherence to mechanism in physics but also because of his *a priori* belief in a plenum, and denial of the possibility of a vacuum across which such non-mechanical forces might be supposed to operate. (Leibniz explains to Queen Caroline, in a Postscript to his Fourth Paper, that a vacuum is impossible for two kinds of reason, one of them grounded in God's perfection, and the other in the Principles of Sufficient Reason and of the Best. It belongs to God's perfection to impart to every space every perfection which can be imparted without derogating from the other perfections of things, and since this imparting

of perfections could be done through placing matter in a space that might otherwise have been empty, this is what God will actually have done. Further, there is no reason for any one proportion of matter to void rather than any other. Since also matter 'deserves to have the preference' over void, and its perfection is to that of a vacuum 'as something to nothing', there must be no vacuum at all.) [6]

Nevertheless Clarke evidently held some view on the mode of operation of gravity; indeed the very terms ‘gravity’ and ‘attraction’ imply some kind of activity on the part of the participating objects. Hence the appropriateness of Leibniz’s well-targeted questions in his Fifth Paper.

“But then what does he mean, when he will have the sun to attract the globe of the earth through an empty space? Is it God himself that performs it? But this would be a miracle, if ever there was any. This would surely exceed the powers of creatures … That means of communication (says he) is invisible, intangible, not mechanical. He might as well have added, inexplicable, unintelligible, precarious, groundless, and unexampled.”[7]

Indeed the secret view of Newton was probably that God caused gravitation directly by his omnipresence. To this effect, Alexander quotes a letter of his of 1693 to Bentley. “It is inconceivable that inanimate brute matter should, without the mediation of anything else which is not material, operate upon and affect other matter without mutual contact.”[8] Alexander also quotes from Clarke’s Boyle Lectures; gravity is due to something “superior to matter *continually* exerting on it a certain force or power”, the world

therefore "depending every moment on some superior being, for the preservation of its frame".[9]

Alexandre Koyré adduces further evidence of this secret view of Newton in his *Newtonian Studies*. Thus in the Latin edition of the *Opticks*, after rejecting the Cartesian fluid medium as an explanation of planetary motion, Newton adds that for this rejection "we have the authority of those the oldest and most celebrated philosophers of Greece and Phoenicia, who made a Vacuum and Atoms the first principles of their philosophy; tacitly attributing gravity to some other causes than matter. Later philosophers banished the consideration of such a cause out of natural philosophy, feigning hypotheses for explaining all things mechanically and referring other causes to metaphysics."[10] Here the "later philosophers" would presumably be the Cartesians, while the atomists are represented as precluding mechanical explanations of gravity simply through making no provision for its explanation among their physical "first principles".

Koyré further argues, in his chapter 'Attraction, Newton and Cotes', that the only way to make sense of Newton's letter to Roger Cotes of early 1713, and of his remarks about attraction, is the view that Newton secretly believed that gravity is really a property of bodies, that the term 'attraction' is literally appropriate to that phenomenon, and that it operates by means of an immaterial medium.[11] If so, the full story would be one in which God, by his literal presence in the interstices of space, so acts upon bodies as to endow them with mutual attraction, or at least to bring it about that they behave as if mutually attracted. This endowment would appear to supplement their created nature, contrary to

Garber's defence of Newton (mentioned earlier) against Leibniz's charge of appeal to the supernatural.

It is, however, shown in R. H. Kargon's *Atomism in England from Hariot to Newton* that in 1717 Newton disowned the view of Bentley and of Clarke that God causes gravity, and reverted to a strict positivism on the subject.[12] For in the second English edition of his *Opticks* (1717), Newton reworded the Queries of 1706; the Greeks and the Phoenicians were, for example, attributing "Gravity to some other Cause than *dense* matter" (not just "matter"). Newton thus accepted the aether as a mechanical cause of gravitation, agreeing hereby with Clarke's correspondent Henry Dodwell, who had objected in the name of mechanical philosophy to the inclusion of efficient non-mechanical causes in nature. In keeping with his rejection of speculative "hypotheses", Newton therefore rejected the idea of an immaterial and potentially occult force within physics.

The eventual historical outcome was that the view of Cotes that gravity is a property of matter secured gradual acceptance, with the proviso that it is not an essential property (a proviso overtly accepted by Cotes in a letter to Samuel Clarke of June 1713. Cotes, who had toyed with the idea of gravity as an essential property, agreed to write of attractive power as a primordial property of body rather than an essential one).[13] Or rather, it secured gradual acceptance with this proviso according to the interpretation of Koyré. According to Karl Popper, however, Cotes and most Newtonians until at least 1880 took the view that gravity was precisely an essential property, and that this supplies its

ultimate explanation and thus averts the need for any further explanation. This view, however, Popper condemns as blocking the progress of science by preventing the asking of useful questions, and thus obscurantist. Indeed, whether or not these Newtonians regarded gravity as an essential property (and here Popper seems to have been exaggerating), acceptance that the laws of physics describe properties that are fundamental to matter (as Cotes undoubtedly did hold), or at least fundamental insofar as we can attain knowledge of matter at all (and it was on the basis of qualified scepticism about this that he was willing to discard claims about gravity being an essential property) could in any case have this kind of progress-blocking effect.

Hence, as Popper points out, it is highly significant that Newton rejected the essentialist view, probably on the Cartesian grounds that relational properties such as gravity cannot be essential properties, since essential properties must belong to whatever they characterise whether these things have relations with other things or not. In this regard, Popper quotes Newton's letter to Bentley of 25th February 1693: "That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance … is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it"[14]. But this letter (which is not the same one as the one cited above) was written at a stage when Newton probably regarded God as the direct cause of gravity, a belief with which its tone well coheres. It was also written long before Newton disavowed this belief. By refusing to adopt any hypotheses on the subject he effectively reopened it, or would have done had not Cotes' interpretation prevailed.

But it is no easy matter to decide to whom the honours belong on the issue of God and gravity between the stances of Bentley and Clarke on the one side and on the other that of Leibniz. Leibniz seems justified in rejecting any occult explanation of a particular phenomenon; and his related claim that non-mechanical explanations invoke the occult at any rate involves an appeal to a principle (the principle that occult explanations are inadmissible) put forward to make natural philosophy autonomous within its own realm, and to prevent any return to scholasticism and to explanations by substantial forms and the like. Yet the requirement that hypotheses in physics be mechanical is arbitrary, and Newton's success was only made possible by his willingness to waive it (at least at the stage of the original publication of the *Principia*) in face of observations apparently to the contrary. Thus Clarke and Bentley, in crediting non-mechanical explanations, were doing little more than making room for the preconditions of this success.

It might further be argued in defence of Bentley and Clarke that natural regularities like that of gravitation could be attributed directly to God, as examples of the universal order and of the cosmic regularities suggested by the doctrine of creation, and therefore assumed to be fundamental by virtually all scientists of the seventeenth and early eighteenth centuries. Leibniz did not of course object to belief in creation, and (like Clarke) was prepared to argue from the world to God. Even if we cannot argue to God from the contrivance or the symmetry of the eye, which are readily susceptible of natural explanations, why should people not argue to God from a regularity as strikingly all-pervasive as gravitation? So possibly Leibniz was objecting unnecessarily here, and the

question just raised is not to be answered as if it were a question about the methodology of physics.

However, this was not the point that Clarke was making. What he was puzzled about was in fact the operation of one natural phenomenon among others; indeed Newton was prepared to consider gravitation alongside and as on a par with fermentation or chemical change.[15] And Clarke concluded that it was not really a natural phenomenon at all. Certainly, he had qualms in the matter, and preferred in his Fifth Reply to take up a positivistic stance rather than to express his real view (as expressed in his Boyle Lectures). Yet in reality he believed much of what Leibniz charged him with believing. Gravity was really (in his view) inexplicable except by divine agency. Now certainly there comes a stage along the chain of explanations when we cease to ask why a particular description holds good of the world, and may instead ask why the world is susceptible of description by laws of a certain kind of universal form; and this is no longer to ask a scientific question. But Clarke had not reached this point. He admits in his Fifth Reply that the cohesion of particles in solids is just as puzzling as action at a distance; yet it was gravity alone that was selected as needing a special divine "concurrence". It is unsurprising that to Leibniz, who believed in divine concurrence in all events alike,[16] such a stance was unacceptable.

One conclusion, then, was that Leibniz was justified in refusing to bring in God to explain the phenomena of physics, and in excluding the First Cause from the realm of secondary causes. All things considered, the position of Clarke and Bentley and the

interim position of Newton comprised an instance of what Austin Farrer called "physical theology"[17] of the kind which invokes supernatural explanations of physical phenomena, just as was Newton's explanation of how the orbits of the planets are adjusted.[18]

Yet it was much less obviously a case of physical theology (a theme shortly to be further explored) compared with invoking God to explain the alignment of the orbits of the planets and to correct irregularities generated by the influence of comets. For one thing, it raised, almost as much as Newton's beliefs about space, the question of the limits of natural philosophy; for Clarke seemed to be appealing to belief in divine creation, even though this appearance may be misleading. For another, the need that Newton demonstrated to postulate action at a distance showed the unjustified narrowness of the requirement that all explanations in physics should be mechanical, an assumption which may have had its value when Boyle was attempting to construct a new approach to explanation in natural philosophy to replace that of the Aristotelians, but which had outlived its usefulness. Indeed it was only Newton's conviction that attraction was not a property of material particles (because of their inertness) which prevented him in this matter from anticipating the physics of the future and drove him to theology for an explanation of this particular phenomenon instead.

Again, the dispute over gravity makes clearer when a theory can be accused of occultness and when it cannot. It was generally agreed, according to Newton, that the invocation by the Aristotelians of those unobservable qualities which made up a thing's substantial form to explain the phenomena of its behaviour was an appeal to the occult.

But such appeals could not fairly be called occult simply because they involved non-mechanical explanations, or most modern physics is occult. A physical theory is occult rather, I suggest, when both it explains a phenomenon through what is unobservable and when this explanation allows of no observations of new phenomena either alone or in conjunction with well-attested phenomena or well-recognised theories. Unhappily for Clarke and for the pre-1717 Newton, explanations of particular physical phenomena by divine agency turn out to be occult on this definition.

There again, such explanations incur many of the liabilities both for science and for theology implicit in what Austin Farrer called 'physical theology'. According to Farrer, physical theology 'treats divine action as one factor among the factors which together constitute the working of the natural system'. But 'God's action cannot be a factor among factors'. Believers in creation hold that 'the Creator works through and in all creaturely action equally; we can never say 'This is the creature and that is God' of the distinguishable causalities in the natural world.'[19] And here Leibniz can be included among 'believers in creation'.

Farrer had in mind invocations of divine activity when human ingenuity can find no explanation of some particular natural phenomenon. Bringing in God in these circumstances involves despairing of explanations in terms of the world's natural powers and qualities. It also involves bad theology as well as bad scientific method. For from the perspective of theology, it is to diminish God, representing his (or her) overall creative workmanship as defective and in need of supplementation, and conceiving of God as on a

level with creaturely agencies. Further, it unnecessarily offers hostages to fortune, for with the passage of time better explanations are likely to become available, the introduction of divine agency is likely to be found redundant, and the inference may even be drawn that this is always the case, that the natural order is self-sufficient and self-explanatory, and that there is no need whatever for resort to divine agency.[20]

It is appropriate to note, without elaborating or evaluating the matter here, that Farrer introduced the notion of physical theology in criticism not of Newton's explanations, but of the Pre-Established Harmony doctrine of Leibniz; elsewhere, indeed, I have endorsed Farrer's verdict in this matter.[21] Farrer's charge is also arguably in place against Leibniz's argument for a plenum from God's perfections, although this is physical theology in the slightly different sense of deriving theories of physics from divine attributes. But this does not prevent Leibniz's criticisms of Newton being found to prefigure the very charge of physical theology that Farrer was later to direct against Leibniz himself. For such a charge against Newton and the Newtonians would, it turns out, be well targeted and well justified.

NOTES

1 G.W. Leibniz, Fourth Paper, para. 45; in: H.G. Alexander (ed.): *The Clarke-Leibniz Correspondence*, Manchester, Manchester University Press, 1956 (hereafter, Alexander), p. 43. See also Leibniz: Third Paper, para. 17; in: Alexander, pp. 29f. See further D. Garber: 'Leibniz: Physics and philosophy', in: N. Jolley (ed.): *The Cambridge Companion to Leibniz*, Cambridge, New York and Melbourne, Cambridge University Press, 1995, pp. 270-352, at pp. 282 and 333f. I am grateful to Graham Hallett for translating the Abstract into German.

2 J.R.Lucas: *A Treatise of Time and Space*, London, Methuen, 1973, pp. 193f.

3 S. Clarke: Fourth Reply, para. 45, in: Alexander, p. 53. See also Garber, op. cit., p. 335.

4 Clarke: Fifth Reply, paras 118-123, in: Alexander, pp. 118f.

5 Clarke: Fourth Reply, para. 45, in: Alexander, p. 53.

6 Leibniz: Fourth Paper, postscript, in: Alexander, pp. 44f.

7 Leibniz: Fifth Paper, paras 118-122, in: Alexander, p. 94.

8 Alexander (p. xx) assigns the passage to the third letter to Bentley; it is in fact from the fourth, that of 23 February 1693, as in: H.W. Turnbull (ed.): *The Correspondence of Sir Isaac Newton* (3 vols.), Cambridge, Cambridge University Press, 1959-1961, vol. III, 1961, pp. 253-4.

9 Alexander, p. xx.

10 Sir I. Newton: Opticks (1706), Query 28, quoted in A. Koyré: *Newtonian Studies*, London, Chapman & Hall, 1965, p. 108 (but Koyré adopts the wording of the fourth English edition of 1730).

11 Koyré: ibid., pp. 273-282.

12 R.H. Kargon: *Atomism in England from Hariot to Newton*, Oxford, Clarendon Press, 1966, pp. 136-139.

13 See Koyré: 'Attraction, Gravity and Cotes', in: *Newtonian Studies*, pp. 273-282. Cotes's letter to Clarke is cited at pp. 281f.

14 Newton: Letter to Richard Bentley, 25th February 1693, cited in: Karl Popper: *Conjectures and Refutations*, London, Routledge and Kegan Paul, 2nd edn, 1965, pp. 106f., the pages in which these comments are also made.

15 Newton: 'Opticks', Query 31; see S.H. Thayer: *Newton's Philosophy of Nature: Selections from his Writings*, New York: Hafner Press and London: Collier Macmillan, 1953, p. 176.

16 See E. Vailati: 'Leibniz on Divine Concurrence with Secondary Causes', *British Journal for the History of Philosophy*, 10, 2002, 209-230.

17 A.M. Farrer: 'Introduction' in: G.W. Leibniz, *Theodicy*, tr. E.M. Huggard, London, Routledge & Kegan Paul, 1952.

18 Newton: 'Opticks', Query 31, in: Thayer, p. 177.

19 Farrer: op. cit., p. 28.

20 See R. Attfield: *God and the Secular: A Philosophical Assessment of Seculaar Reasoning from Bacon to Kant*, Cardiff, University College Cardiff Press, 1978, and Aldershot, Gregg Revivals, 1993, pp. 68-70.

21 Attfield:*God and The Secular* (see note 20 above), pp. 87-88.