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Devoted to the Science of Religion,
the Religion of Science, and the Extension
of the Religious Parliament Idea

FOUNDED BY EDWARD C. HEGELER

FEBRUARY, 1930

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VOLUME XLIV NUMBER 885

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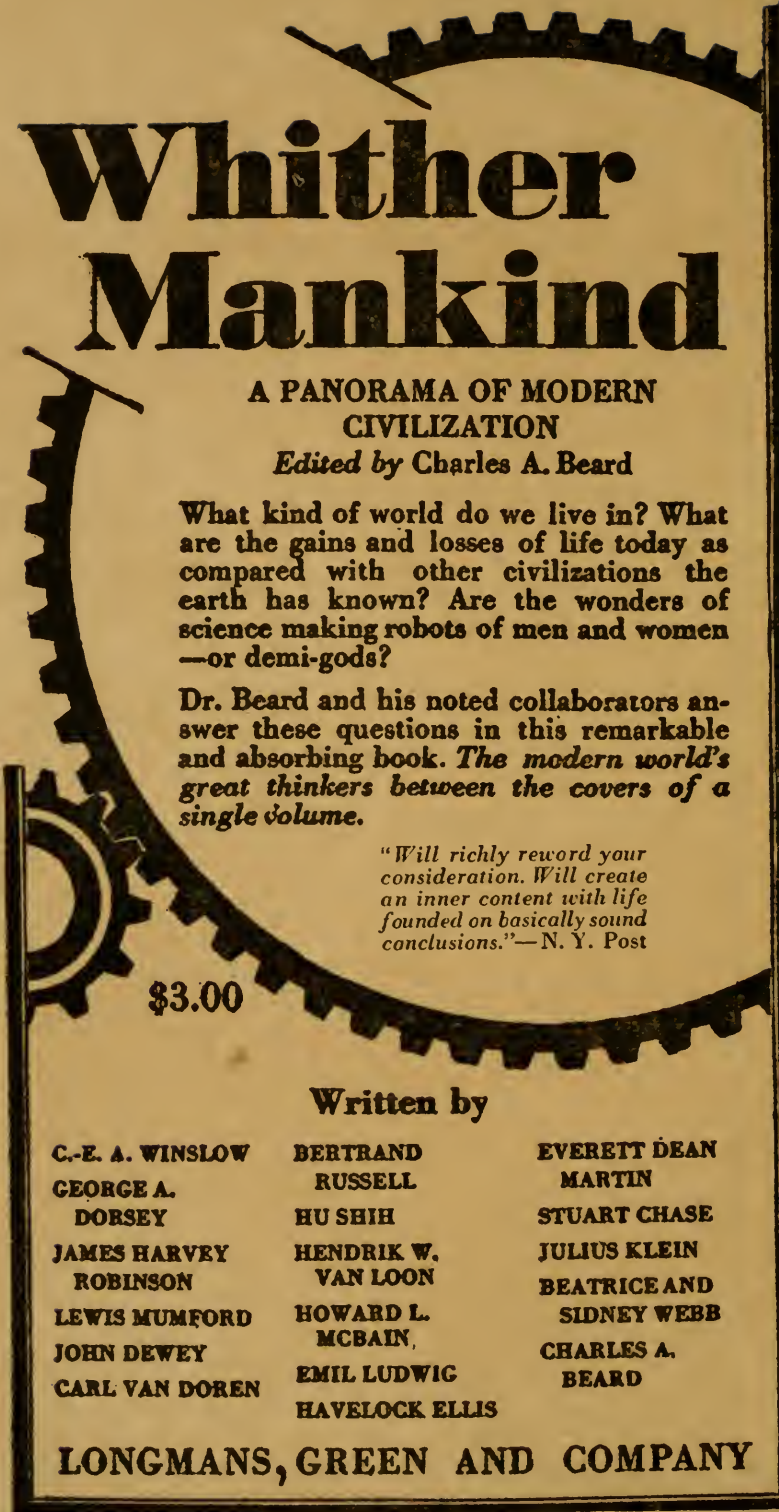
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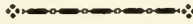
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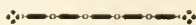
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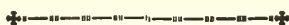
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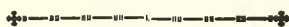
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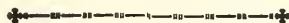


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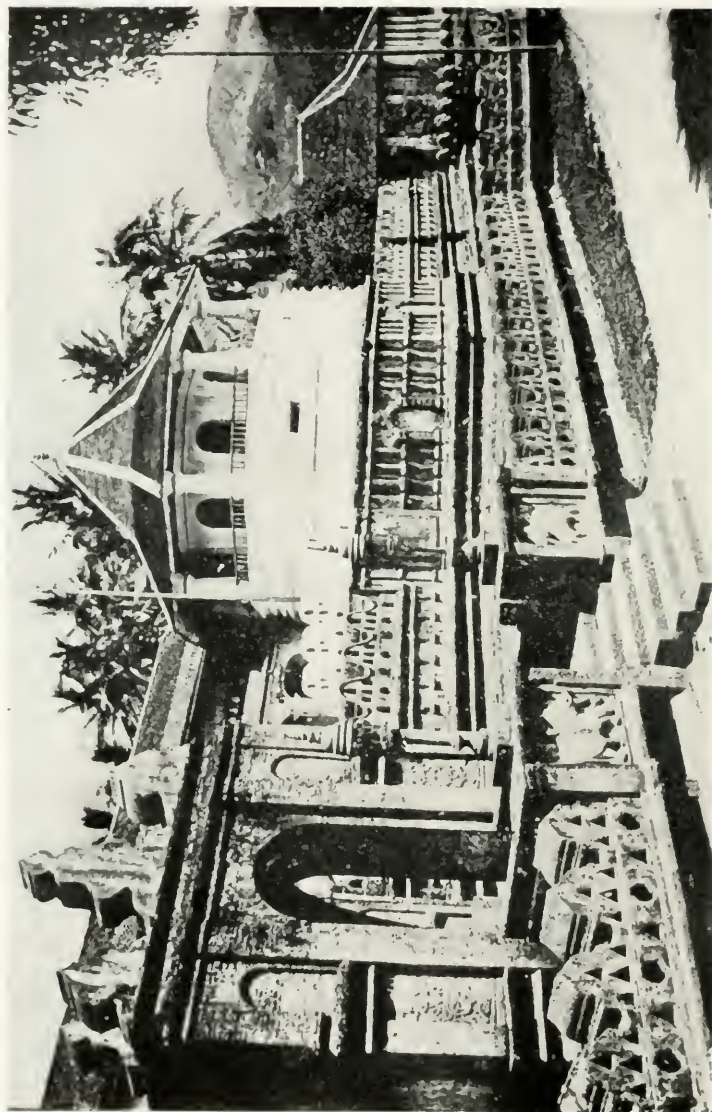
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NEWTON'S IDEA OF GOD AS FOUND IN THE DIFFERENT EDITIONS OF HIS PRINCIPIA

BY F. CAJORI

IN the first edition of Newton's *Principia* (1687) no statement is made on the nature of God. Nevertheless, criticism was passed upon the *Principia* on theological grounds, by two prominent thinkers—Bishop Berkeley who in 1710 published his *Principles of Human Knowledge*, and by G. W. Leibniz who on Feb. 10, 1711 wrote a letter to Hartsoeker, a Dutch physician at Düsseldorf, which was published on May 5, 1712, in the *Memoirs of Literature*, a weekly sold in London.¹

Berkeley attacks Newton's exposition, in the *Principia*, of the notion of absolute space, absolute time and absolute motion. "This celebrated author," says Berkeley, "holds there is an *absolute Space*, which, being unperceivable to sense, remains in itself similar and immovable." As to absolute motion, "I must confess it does not appear to me that there can be any motion other than *relative*; so that to conceive motion there must be at least conceived two bodies." "But the chief advantage arising from it [relative space as advocated by Berkeley] is that we are freed from that dangerous dilemma, . . . of thinking either that Real Space is God, or else that there is something beside God which is eternal, uncreated, infinite,

¹ This letter of Leibniz is found in Leibniz's *Opera omnia*, Vol. 2, Geneva, 1768, Part II, p. 60; *Philosophische Schriften von Leibniz* (ed. C. I. Gerhardt), Vol. 3, Berlin, 1887, p. 519.

See also D. Brewster's *Memoirs of Sir Isaac Newton*, Vol. 2, Edinburgh, 1860, chap. 22, p. 219-222; J. Edleston, *Correspondence of Sir Isaac Newton and Professor Cotes*, 1850, p. 153. Leibniz attacks the theory of gravity also in his *Essais de Théodicée sur la Bonté de Dieu*, 1710.

indivisible, unmutable. Both which may justly be thought pernicious and absurd motions."² Thus the absolute space, time and motion of Newton was attacked as an atheistic conception.

Leibniz, the second distinguished critic, does not mention Newton or the *Principia* in his letter to Hartsoeker, but the reference is obvious. Leibniz says:

"Thus the ancients and moderns who avow that gravity is an *occult quality*, are right, if they mean thereby that there is a certain mechanism unknown to them, by which bodies are impelled toward the center of the earth. But if their notion is that this transpires without any mechanism, by a simple *primitive property* (qualité primitive), or by a law of God which brings about this effect without using any intelligible means (moyens intelligibles), then it is a senseless, occult quality, which is so very occult that it can never be cleared up, even though a Spirit, not to say God himself, were endeavoring to explain it."

Neither Newton nor Cotes who edited the second edition (1713) of the *Principia*, make a direct reference to Berkeley. But Cotes, writing to Newton in March 18, 1713, refers to the letter of Leibniz to Hartsoeker, and says: "I think it will be proper [to] add some things by which your Book may be cleared from some prejudices which have been industriously laid against it. As that it deserts Mechanical causes, is built upon Miracles, and recurrts to Occult qualities. That You may not think unnecessary to answer such Objections You may be pleased to consult a Weekly Paper called *Memoires of Literature* and sold by Ann Baldwin in Warwick-Lane. . . . You will find a very extraordinary Letter of Mr. Leibnitz to Mr. Hartsoeker which will confirm what I have said. I do not propose to mention Mr. Leibnitz's name, twere better to neglect him, but the Objections I think may very well be answered and even retorted upon the maintainers of Vortices."³ Cotes made a spirited reply to Leibniz toward the end of his Preface to the second edition of the *Principia*.

That Newton was misinterpreted by Leibniz as regards the nature of gravity is quite evident. Newton did not believe in action at a distance without the aid of an intervening medium. That he was interested in theological questions even before he wrote the

² G. Berkeley, *Principles of Human Knowledge*, Part I, Paragraph 111, 117.

³ J. Edleston, *op. cit.*, p. 153.

Principia is evident from his annotations of Henry More's book, *On the Prophet Daniel and the Apocalypse*, found in a copy of this book which the University of California received as a gift from Julius Wangenheim. It was Newton's own copy, "ex dono Reverendi Authoris." These annotations have not yet received due attention in the study of Newton's theological and cosmological concepts at different periods of his career. As regards the *Principia*, Newton said in a letter to Richard Bentley (Dec. 10, 1692): "When I wrote my treatise about our system, I had an eye on such principles as might work with considering men for the belief of a Deity; and nothing can rejoice me more than to find it useful for that purpose."

And so, in 1713, twenty-six years after the first appearance of the *Principia*, Newton, then seventy-one years old, prepared the famous General Scholium, printed at the end of the second edition of his *Principia*. In the third edition (1726) certain parts of this Scholium were expanded. These new parts are printed below in italics. Omitting the early section on vortices, and the closing one on the forces of adhesion and cohesion, the General Scholium is as follows:

"This most beautiful System of the Sun, Planets and Comets, could only proceed from the counsel and dominion of an intelligent and powerful being. And if the fixed Stars are the centers of other like systems, these being formed by the like wise counsel, must be all subject to the dominion of One; especially, since the light of the fixed Stars is of the same nature with the light of the Sun, and from every system light passes into all the other systems. *And lest the systems of the fixed Stars should, by their gravity, fall on each other mutually, he hath placed those Systems at immense distances one from another.*

"This Being governs all things, not as the soul of the world, but as Lord over all: And on account of his dominion he is wont to be called 'Lord God παντοαράτωρ, or Universal Ruler.' For 'God' is a relative word, and has a respect to servants; and 'Deity' is the dominion of God, not over his own body, as those imagine who fancy God to be the soul of the world, but over servants. The supreme God is a Being eternal, infinite, absolutely perfect; but a being, however perfect, without dominion, cannot be said to be Lord God; for we say, my God, your God, the God of 'Israel,' *the God of Gods, and Lord of Lords;*

but we do not say, my Eternal, your Eternal, the Eternal of 'Israel,' *the Eternal of Gods; we do not say, my Infinite, or my Perfect:*⁴ These are titles which have no respect to servants. The word 'God' usually signifies 'Lord'; but every Lord is not a God. It is the dominion of a spiritual being which constitutes a God; a true supreme or imaginary dominion makes a true, supreme or imaginary God. And from his true dominion it follows, that the true God is a Living, Intelligent and Powerful Being; and from his other perfections, that he is supreme or most Perfect. He is Eternal and Infinite, Omnipotent and Omniscient; that is, his duration reaches from Eternity to Eternity; his presence from Infinity to Infinity; he governs all things, and knows all things that are or can be done. He is not Eternity or Infinity, but Eternal and Infinite; he is not Duration or Space, but he endures and is present. He endures for ever, and is every where present; and by existing always and every where, he constitutes Duration and Space. Since every particle of 'Space' is always, and every indivisible moment of Duration is 'every where,' certainly the Maker and Lord of all things cannot be 'never' and 'no where.' *Every soul that has perception is, though in different times and in different organs of sense and motion, still the same indivisible person. There are given successive parts in duration, co-existent parts in space, but neither the one nor the other in the person of a man, or his thinking principle; and much less can they be found in the thinking substance of God. Every man, so far as he is a thing that has perception, is one and the same man during his whole life, in all and each of his organs of sense. God is the same God, always and every where.* He is omnipresent, not 'virtually' only, but also 'substantially'; for virtue cannot subsist without substance. In him are all things contained and moved; yet neither affects the other: God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God. 'Tis allowed by all that the supreme God exists necessarily; and by the same necessity he exists 'always' and 'every where.' Whence also he is all similar, all eye, all ear, all brain, all arm, all power to perceive, to understand, and to act; but in a manner not at all human, in a manner not at all corporeal, in a manner utterly unknown to us. As a blind man has no idea of colours, so have we no idea of the manner by which the all-wise God perceives and understands all things. He is utterly void of all body and bodily figure, and can therefore neither be seen, nor heard, nor

⁴ The passage, "the Eternal of Gods; we do not say, my Infinite, or my Perfect." in the 1726 edition, takes the place of, "We do not say my Infinite, your Infinite, the Infinite of Israel; we do not say my Perfect, your Perfect, the Perfect of Israel," in the second edition, 1713.

touched; nor ought to be worshipped under the representation of any corporeal thing. We have ideas of his attributes, but what the real substance of anything is, we know not. In bodies we see only their figures and colours, we hear only the sounds, we touch only their outward surfaces, we smell only the smells, and taste the savours; but their inward substances are not to be known, either by our senses, or by any reflex act of our minds; much less then have we any idea of the substance of God. We know him only by his most wise and excellent contrivances of things, and final causes; we admire him for his perfections; but we reverence and adore him on account of his dominion. *For we adore him as his servants; and a God without dominion, providence, and final causes, is nothing else but Fate and Nature. Blind metaphysical necessity,⁵ which is certainly the same always and every where, could produce no variety of things. All that diversity of natural things which we find, suited to different times and places, could arise from nothing but the ideas and will of a Being necessarily existing. But by way of allegory, God is said to see, to speak, to laugh, to love, to hate, to desire, to give, to receive, to rejoice, to be angry, to fight, to frame, to work, to build. For all our notions of God are taken from the ways of mankind, by a certain similitude which, though not perfect, has some likeness however.* And thus much concerning God; to discourse of whom from the appearances of things, does certainly belong to Natural Philosophy.

“Hitherto we have explained the phaenomena of the heavens and of our sea, by the power of Gravity, but have not yet assigned the cause of this power. This is certain, that it must proceed from a cause that penetrates to the very centers of the Sun and Planets, without suffering the least diminution of its forces; that operates, not according to the quantity of the surfaces of the particles upon which it acts, (as mechanical causes use to do,) but according to the quantity of the solid matter which they contain, and propagates its virtue on all sides, to immense distances, decreasing always in the duplicate proportion of the distances. Gravitation towards the Sun, is made up out of the gravitations towards the several particles of which the body of the Sun is composed; and in receding from the Sun, decreases accurately in the duplicate proportion of the distances, as far as the orb of Saturn, as evidently appears from the quiescence of the aphelions of the Planets; nay, and even to the remotest aphelions of the Comets, if those aphelions

⁵ This part, though first published in 1726, was written six months after the appearance of the second edition of the *Principia* in 1713, and was inserted in a list of Corrections and Additions which Newton sent to Cotes. See J. Edleston, *op. cit.* p. 165.

are also quiescent. But hitherto I have not been able to discover the cause of those properties of gravity from phaenomena, and I frame no hypotheses. For whatever is not deduced from the phaenomena, is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferr'd from the phaenomena, and afterwards render'd general by induction. Thus it was that the impenetrability, the mobility, and the impulsive force of bodies, and the laws of motion and of gravitation, were discovered. And to us it is enough, that gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea.

“And now we might add something concerning a certain most subtle Spirit, which pervades and lies hid in all gross bodies; by the force and action of which Spirit, the particles of bodies mutually attract one another at near distances, and cohere, if contiguous; and electric bodies operate to greater distances, as well repelling as attracting the neighbouring corpuscles; and light is emitted, reflected, refracted, inflected, and heats bodies; and all sensation is excited, and the members of animal bodies move at the command of the will, namely, by the vibrations of this Spirit, mutually propagated along the solid filaments of the nerves, from the outward organs of sense to the brain, and from the brain into the muscles. But these are things that cannot be explain'd in a few words, nor are we furnish'd with that sufficiency of experiments which is required to an accurate determination and demonstration of the laws by which this electric and elastic spirit operates.”

The very last sentence is of interest for two reasons. First, it was not in the original draft of the General Scholium; Newton added it, as the second edition was going through the press.⁶ Secondly, Newton gives here his justification for treating of this subject in the *Principia*. To obtain an idea of God “from the appearances of things does certainly belong to natural philosophy.” That is to say, the earnest contemplation of the physical world, in its microcosm and macrocosm, affording ideas relating to the creator of that world, is a legitimate part of the study of physical science. This thought receives emphasis through the conviction expressed in his statement, that “we know him only by the most wise and excellent contrivances of things, and final causes.” “All that diversity

⁶ See Edleston, *op. cit.*, p. 155.

of natural things which we find suited to different times and places" could not arise from "blind metaphysical necessity," nor could it be due to a "God without dominion, providence and final causes"; such a God would be "nothing else but Fate and Nature."

Newton makes a striking attempt to prove that God exists in space and time "Since every particle of space is *always*, and every indivisible duration is *every where*, certainly the Maker and Lord of all things cannot be *never* and *nowhere*. The omnipresence of God, stressed by Newton, is in contrast to the old doctrine of the localization of God, remote from the world, and acting intermittently by suspending the operation of some natural law. Considerations involving the science of mechanics, which Newton helped to create, is seen in the following argument: "He is omnipresent, not *virtually* only, but also *substantially*, . . . God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God." Newton encountered the same question in the luminiferous ether which offers no perceptible resistance to the motion of the planets. What is meant by "substantially"? Newton does not know. "What the real substance of anything is we know not." Nor is our present day science much better informed. Newton sees an instance of design in the fact that the fixed stars are placed at "immense distances" from each other, so that they can not "fall on each other."

The omnipresence of God involves the geometrical idea of extension in space. This attribute of extension, the Cambridge Platonist, Henry More, applied to all spirits and to the human soul. More's spirits and souls were finite, but variable, in extension. He found it desirable also to postulate the existence of a fourth dimension of space, to afford a suitable abode for spirits. No such ultra-speculative notions are found in Newton's *Principia*, even though Newton was doubtless familiar with More's views. More and Newton had been under the same roof as boys at the school at Grantham, and, as already stated, Newton later read and annotated at least one of More's books.

That God is known only through his works was a tenet from which Newton departed in some of his statements, particularly in

the last interpolations printed in 1726, when he was 84 years old. There we read that "all our notions of God are taken from the ways of mankind"; "by way of allegory, God is said to see, to speak, to laugh, to love, to hate. . . ." Similar is the following thought: "Every man is one and the same man during his whole life in all and each of his organs of sense. God is the same God, always and every where." In a broad sense there is no conflict between the two views expounded by Newton, for man and mankind are a part of the "works" of God.