

# A BRIEF GUIDE TO INTERPRETING ISAAC NEWTON'S GENERAL SCHOLIUM TO THE *PRINCIPIA* (1713, 1726)

## The difficulty of the General Scholium

When Newton published the second edition of his *Principia* in 1713 (the first edition appeared in 1687), among other emendations and additions, he appended a General Scholium at the conclusion. The General Scholium acts something like an appendix and serves to highlight some of the natural philosophical, methodological, metaphysical and theological corollaries Newton believed were implicit in the *Principia* itself. A study of his recently-accessible private manuscripts also demonstrates that many of the ideas represented in an oblique fashion in the General Scholium relate to ideas detailed in much more explicit ways in papers not meant for the public. These manuscripts help fix the intended meaning of this document. The difficulty style of the General Scholium reflects two dynamics in particular: first, some of the ideas present in this document were considered controversial and even heretical; second, Newton believed that his readers could be divided into two camps, the vulgar (who are not able to understand higher truths) and the *cognoscenti* (who are). Newton was primarily interested in reaching those in the latter category. In order to deal with the first dynamic and to achieve the goal of the second, Newton deliberately constructed this document so that the uncontroversial and more broadly acceptable ideas appeared on the outer or “open” layers, while the specialised meanings for the *adepti* were concealed in the inner or “closed” layers, which are increasingly difficult to penetrate without specialised or privileged knowledge. For example, virtually all readers recognised and accepted Newton’s natural theological argument in the fourth paragraph, but only a select few recognised the attack on the doctrine of the Trinity in the fourth through sixth paragraphs (which was precisely Newton’s aim). The General Scholium is constructed much like a Russian doll and, accordingly, restricts access to its ultimate meaning. In using this strategy, Newton more closely resembles the ancient Pythagoreans, who hid higher theological and philosophical truths in similitudes and riddles, than a modern scientist (which Newton was not). When interpreting the General Scholium, it is important to take into account several backdrops: Newton’s attack on Descartes’ method and physics, Leibniz’s contention that Newton’s conception of an intervening God was weak, and the controversy surrounding the publication of Newton’s follower Samuel Clarke’s critique of the doctrine of the Trinity in 1712. In the General Scholium, Newton takes the dangerous step of supporting several arguments outlined in Clarke’s book. Denial of the Trinity was illegal in Britain until 1813, a full century after the General Scholium first appeared. Thus, the most revolutionary and important book in the history of science, championed by the orthodox British establishment throughout the eighteenth century and beyond, ends on a subversive note. The translation referred to here is that of Cohen and Whitman (1999).

## The first paragraph

- an attack on the Cartesian vortical theory of planetary motion is evident from the first line (“The hypothesis of vortices is beset with many difficulties”)
- Newton’s use of “hypothesis” here is important, and relates to his attack on Descartes’ method in the eighth paragraph
- Newton goes on to argue that the phenomenon of comets cannot be reconciled with fluid vortices (since they move east-west, west-east, north-south and south-north)

## The second paragraph

- Newton explains that planets and comets move freely in open space (a vacuum, or something very much like a vacuum), without the resistance of a substance like Descartes’ extremely subtle aether, according to “the laws of gravity”, which he has set out in paragraph one

## The third paragraph

- Newton believes the system of planets (which orbit in the same direction on a near plane) and the comets (which revolve in highly parabolic ellipses in every direction) must have some other explanation than a purely mechanical one; this helps to set up the natural theological apologetics of paragraph four
- Newton had by this time (1713) become disaffected with pure mechanical philosophy, which he believed had introduced a dangerously secular view of the physical world; he was eager to reintroduce active powers, spirit and God to physics
- unlike Descartes, Newton induced God from Nature rather than beginning with God as an axiom

## The fourth paragraph

- Newton asserts that the elegant and well-ordered solar system must have arisen through both the *design* and (on-going) *dominion* of God
- in this paragraph he begins to hint that the infinite dominion of the One God (in His omnipresence) can be linked to the universality of the phenomenon of gravity
- just as God is everywhere, so is gravity; the omnipresence of the One God upholds the *one* (universal) phenomenon of gravity
- Newton stresses both the divine design of Nature and God’s continuous sovereignty or dominion over Nature; both elements are important to him

## The fifth paragraph

- having introduced a designing God, Newton naturally turns to discuss his character and attributes; at this point he begins to diverge from then-common natural theological apologetics
- in describing his God, Newton is at pains to emphasise that his God is not the abstract God of the Greek philosophers, or the remote God of the contemporary Deists, but the personal, active and involved God of Hebraic and biblical thought; this is emphasised from the first line, where Newton calls the Creator the “lord of all”
- this God of dominion, who is personally involved in nature and human affairs on a continuous basis, is here implicitly contrasted with Leibniz’s non-intervening *Intelligentia Supramundana*, whose perfections allowed Him to create the world a “perpetual motion”; Newton finds this idea distasteful and tantamount to Deism
- Newton deploys a New Testament word for God (*παντοκράτωρ*; *Pantokratōr*), which Newton only used in his private manuscripts for the Father (and not Christ) and which he believed is used exclusively for the Father in the Bible
- Newton next runs a nominalist argument, contending that the word “God” is a not an absolute word but a relative term defined by relations and context; as this paragraph hints and as his private papers demonstrate, this is an antitrinitarian argument at its core: thus, the Son (Christ) can be called God (as he is a handful of times in the Bible) without this making the Son God in an absolute (Trinitarian) sense; Christ is God in a moral and official sense, not an ontological and substantial sense

- the expressions Newton uses for God (e.g., my God, God of Israel, God of Gods) are biblical and are only used by Newton in his private manuscripts of the Father
- Newton's linguistic argument for God as a relative term is also used to explain how the term "God" can be used (as it is in the Bible) for false gods as well as the true God; this is possible because the term is primarily relative in meaning
- in his footnote on God (added to the 1726 edition), Newton refers to two scriptural texts (one from the Old Testament and one from the New Testament) that use the term "God" of Hebrew magistrates; in his private papers, Newton argues that this is possible because the Hebrew magistrates are *representing* the One True God
- by using John 10:35, in which Christ appears to be claiming that he is "God" in a similar official or honorary sense, Newton is hinting at what is explicit in his private manuscripts: only the Father is God, Christ is the Son of God, but not ontologically God
- from the perspective of Trinitarian high orthodoxy, this is conclusion heretical; partly because it was illegal to deny the Trinity in his lifetime, Newton encodes this heresy in a philological and linguistic argument
- finally, Newton states that God fills both time (omnitemporality) and space infinitely, and in so doing, hints at an association between God's eternal duration and infinite presence and absolute time and space, the latter concepts outlined already in the first edition of 1687 in the Scholium on the Definitions (first three paragraphs)
- the connection between his characterisation of God's infinite temporal and spatial extensions and the Scholium on the Definitions is cemented by the common use of the biblically-influenced expression ("from infinity to infinity"; *ab infinito in infinitum*; cf. "everlasting to everlasting" in Psalms 41:13, 90:2, 93:2) in the General Scholium (paragraph five) and the Scholium on the Definitions (paragraph eleven); the use of this expression in the Scholium to the Definitions shows that the theological backdrop to absolute time and space was already latent in the first edition

#### The sixth paragraph

- by referring to indivisible persons in the first sentence and subtly adding a comment about God being the same always and everywhere, Newton appears to be deploying another antitrinitarian argument, as in the doctrine of the Trinity there are three persons not one (as in Judaism and early modern Unitarianism, Newton believed that God is unipersonal)
- the expression "God is one" (*Deus est unus*) is the standard Jewish and unitarian Christian affirmation of monotheism and God's unipersonality, deriving from several biblical texts (e.g., Deuteronomy 6:4, Mark 12:29, Galatians 3:20); while this dictum is accepted by Trinitarians, it is understood by Jews and unitarian Christians as expressing God's unipersonality and was used apologetically by unitarians in Newton's own day
- the phrase "in him all things are contained and move" is taken from Acts 17:28, which is in turn the Apostle Paul's quotation from the Stoic Aratus' *Phaenomena*; in the footnote attached to this quotation, Newton argues that this notion of God's omnipresence was held by both the ancient Jews and Christians, but also by some of the ancient Greeks, thus giving an example of Newton's commitments to the *prisca sapientia* and *prisca theologia*
- by arguing that God's omnipresence does not hinder the motions of bodies (such as the planets), Newton is again suggesting that universal gravitation is somehow underpinned by God's infinite extension in space

#### The seventh paragraph

- Newton contends that, as God cannot be observed or experienced directly, He must be described using allegories or similitudes
- by stating that we do not have any "idea of the substance of God", Newton is not only expressing a nescience of substance and a view of the weakness of human reason that is reminiscent of his contemporary and friend John Locke, but he is also slighting the Trinity, the theological articulation of which depends on precise discussions of God's substance and its communicability
- in the concluding line of this paragraph, Newton asserts that theology can and should be a part of natural philosophy; in this, Newton is consistent with the ideology of Medieval natural philosophy and is also taking a preemptive strike against the secularisation of natural philosophy—something that he apparently discerned emerging already in the early eighteenth century

#### The eighth paragraph

- Newton responds to criticisms that he was reintroducing occult forces into natural philosophy (as in ancient or Scholastic thought) by simply positing the empirical reality of the phenomenon of gravity, but without assigning a cause to it
- in asserting a phenomenalist view of the operations of nature, Newton helped to establish the descriptive and non-metaphysical natural of modern science
- as in his theology, so in his natural philosophy, Newton does not want to venture beyond description into incautious substance talk
- by stating "I feign no hypotheses" (*hypotheses non fingo*) Newton is not rejecting hypotheses out of hand, but the reckless and vain use of them; this statement is nothing short of a frontal assault on Descartes' hypothetico-deductive method
- Newton strengthens this point by stressing the method of inducing principles from phenomena; in this, we see Newton's empirico-deductive natural philosophical method that moves from empirically-based induction to physical and mathematical principles—a method second-nature to scientists today: "in this experimental philosophy, propositions are deduced from phenomena and are made general by induction"

#### The ninth paragraph

- in his final paragraph, Newton speaks about electricity, a phenomenon displayed at the Royal Society with the electro-static machine of Francis Hauksbee, Sr.
- Newton sees in electricity a productive future research programme, as well as a possible analogy for spirit
- electricity, Newton suggests, might help explain a wide range of phenomena, all the way from gravitation to the operation of the nervous system

#### Further reading on decoding the General Scholium

James E. Force, "Newton's God of dominion: the unity of Newton's theological, scientific, and political thought", in Force and Richard H. Popkin, *Essays on the context, nature, and influence of Isaac Newton's theology* (Dordrecht, 1990), pp. 75-102; R. De Smet and K. Verelst, "Newton's Scholium Generale: the Platonic and Stoic legacy—Philo, Justus Lipsius and the Cambridge Platonists", *History of Science* 39 (2001): 1-30; S. Snobelen, "'God of Gods, and Lord of Lords': the theology of Isaac Newton's General Scholium to the *Principia*", *Osiris* 16 (2001): 169-208; L. Stewart, "Seeing through the Scholium: religion and reading Newton in the eighteenth century", *History of Science* 34 (1996): 123-65.

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