MacIntyre, Alasdair. *After Virtue: A Study in Moral Theory*. 2nd ed. Notre Dame, IN: University of Notre Dame Press, 1984.

Söderqvist, Thomas. *Science as Autobiography: The Troubled Life of Niels Jerne*. New Haven, CT: Yale University Press, 2003.

Thomas Söderqvist

JOERGENSEN, AXEL CHRISTIAN KLIXBÜLL

SEE **Jørgensen, Axel Christian Klixbüll**.

JOHN OF ALEXANDRIA

SEE **John Philoponus**.

JOHN OF DUMBLETON

SEE **Dumbleton, John**.

JOHN PHILOPONUS (*b.* Ceaserea [?] c. 490; *d.* Alexandria, *c.* 570), *natural philosophy, theology*. For the original article on Philoponus see *DSB,* vol. 7.

Since the original publication of the *DSB* there have been large-scale changes in Philoponus's studies in particular and late antique philosophy generally. Thanks in great part to the work of Richard Sorabji, Philoponus and other late antique thinkers have been the subject of numerous monographs and articles. And Sorabji's large translation project of the *Commentaria in aristotelem graeca* and associated texts has led to the widespread availability of Philoponus's writings for English-language scholars.

Known also as John the Grammarian or John of Alexandria, John Philoponus was one of the most astute philosophical thinkers of the sixth century. A Christian Neoplatonist adhering to the Monophysite sect, he spent his career articulating a reformed Aristotelian physics that he hoped would both be amenable to Christians yet would retain the marked rationalism of pagan philosophy. He was educated at the Academy in Alexandria under Ammonius Hermeiou and probably taught there, although he likely did not hold the chair of philosophy. His earliest works were traditional commentaries on Aristotle and other elementary texts, such as a treatise on the astrolabe and an introduction to Nikomachus's *Arithmetic*. Philoponus's name is attached to five commentaries (on the *Categories*, the *Prior* and *Posterior Analytics*, *De anima*, and *De generatione et corruptione*), which in fact were lectures given by Ammonius that Philoponus edited and to which he added some of his own ideas. Few works can be dated with precision, but his commentary on the *Physics* (which includes the important *Corollary on Place* and *Corollary on Void*) was published in 517. An unfinished commentary on the *Meteorologica* was written shortly thereafter.

Beginning in the late 520s, Philoponus wrote a number of important treatises aimed at refuting arguments for the eternity of the world. The two most important of these are *Contra Proclum de aeternitate mundi* and the now-fragmentary *Contra Aristotelem de aeternitate mundi*. His final natural philosophical work, *De opificio mundi*—an exegesis of the opening book of Genesis in an attempt to reconcile Christianity with pagan natural philosophy—was most likely written in the 540s, although other evidence points to a date ranging from 557 to 560. The remainder of his career was dedicated primarily to specifically Christian theological issues, yet he retained a belief in the possibility of solving questions of the trinity and the nature of Christ with the same pagan rationality that he applied to natural philosophy. Indeed, by rigorously applying the Aristotelian definition of substance to the problem of the trinity, Philoponus developed a theology that his opponents would brand *Tritheism* (the Godhead contains three individual substances) for which he was anathematized from the church about a century after his death in 681. Although his anathema all but eliminated his influence in the Latin Christian thought, he had an impact on Islamic philosophy (particularly his arguments against eternity), which then later contributed to Latin Christian thought through the translation movement of the twelfth and thirteenth centuries.

Although scholars used to celebrate Philoponus for his apparent anticipation of many ideas developed during the scientific revolution of the seventeenth century (for example Galileo's impetus theory or Descartes's theory of matter as extension), later scholars placed him squarely in the intellectual context of the sixth century. It cannot be denied that Philoponus did in fact take some strikingly modern positions, but viewed as a whole he was a man of late antiquity, albeit with exceptional intellectual talent. Moreover, although often portrayed as a potent warrior in the battle to overcome Aristotle's towering influence on the history of Latin Christian thought, he nonetheless retained a deep admiration for and indebtedness to Aristotle and an even deeper admiration of the philosopher's commitment to rationality. That is, one should not be deceived by Philoponus's rejection of eternity or his attempt to unify heavenly and terrestrial physics, for example, into thereby believing that he rejected Aristotelianism altogether as would happen in the modern era. Basic Aristotelian

principles—the four causes, the role of potentiality and actuality, substance and accident—were not only retained by Philoponus but were his central resources for developing a new Christian natural philosophy.

Nonetheless, John Philoponus was a reformer. He was inspired primarily by the desire to bring natural philosophy into line with Christian dogma. And the most sweeping and decisive reform was the polemical and philosophical attack against pagan philosophers' arguments for eternity. The attacks were systematic and comprehensive, taking each of the many arguments for eternity and drawing out contradictions, absurdities, and philosophical difficulties. Some of the arguments Philoponus deployed were not original, but he also presented many novel and fascinating ones. Aristotle rejected actual infinites as a general rule (e.g. infinite extension). This is one of the major tenets which Philoponus exploited to show that eternity entails actual infinites (e.g. an infinite number of past generations) and thus violates Aristotle's own criteria. He asked how there could be different numbers of infinites: Different planets rotate around the earth at different rates and so there has been one actual infinite number of rotations for Jupiter and another for Mars, an early instance of cardinal numeration of infinites. Philoponus also challenged eternity from the opposite perspective, pointing out the unactualizable character of eternities. If the future is infinite, then its potential will never be exhausted and thus an eternal future violates the principle of plenitude: A potentiality which is never actualized is not a true potentiality at all. Philoponus also articulated another problem with the supposed eternity of the cosmos, namely, how could a finite body like the heavens continue eternally without an infinite force to keep it in motion? But a finite body cannot contain an infinite force, so its existence must be limited. These brief examples by no means represent the full extent of Philoponus's powerful anti-eternity polemics, but they do give particular insight into the way in which he turns the pagans' own philosophical resources against them.

Philoponus also rejected the existence of Aristotle's fifth element, the aether. As a Christian, he denied the heavens were divine or endowed with intelligence and argued that they were composed of the traditional terrestrial elements. The heavens manifestly have some terrestrial qualities—like the sun's heat—regardless of the protestations of pagans to the contrary. He dissented from Aristotle's problematic theory of forced motion, attempting instead to develop an impetus theory. Further he suggested that the heaven's circular motion was not the natural motion of the aether but a forced motion imparted to them by the Creator at the beginning of the world, just as the motion of the sphere of fire (directly below the Moon and in which meteorological phenomena occur) is forced, according to the pagans, because its circular motion is not natural but imparted to it by the celestial spheres. Consequently, because all forced motions eventually end, so too will the rotation of the heavens. He also defined place, again rejecting Aristotle, as the empty three-dimensional space which a body occupies. This theoretical void space never exists without body because of nature's *horror vacui*, but qua empty can be subjected to thought experiments about how it might behave if it were in fact void space.

Philoponus's reformed natural philosophy was deeply controversial. Simplicius, his pagan counterpart at the Athenian Neoplatonic Academy, was scathing in his response to Philoponus's *Contra Aristotelem*. Simplicius saw it not only as philosophically disingenuous (to be fair, some arguments are) but also as a betrayal of pagan religion and its sacred race. And some Christians, particularly those from the diphysite Nestorian sect such as Cosmas Indicopleutes, objected just as vociferously. Cosmas argued that Christians should reject paganism entirely, including the tradition of Greek philosophical rationalism. For him, Philoponus's main fault lay in his failure to refer to scripture as a guide to forming a Christian natural philosophy. Philoponus responded with his *De opificio mundi*, an exegesis of the narrative of creation and fierce pro-rationalist polemic against Cosmas' provincialism and ignorance. Despite his controversial role, he steadfastly considered himself a champion of reasonable Christianity (he entitled his proposed solution to the doctrinal controversies surrounding the Second Council of Constantinople [553] the *Arbiter*) and created a comprehensive and coherent, if ultimately unsuccessful, alternative to the dominant Aristotelian natural philosophy of Late Antiquity.

BIBLIOGRAPHY

WORKS BY JOHN PHILOPONUS

Ioannis Alexandrini cognomine Philoponi De usu astrolabii eiusque constructione libellus. Edited by Heinrich Hase. Bonnae: E. Weberi, 1839.

Ioannou Grammatikou Alexandreos (tou Philoponou) eis to proton tes Nikomachou Arithmetikes eisagoges. Edited by Richard Hoche. Lipsiae: Teubner,1864.

Carte archéologique de la Gaule. Vols. 13–17 (1887–1909).

De aeternitate mundi contra Proclum. Edited by H. Rabe. Lipsiae: Teubner, 1899.

Against Aristotle, on the Eternity of the World. Translated by Christian Wildberg. Ithaca, NY: Cornell University Press, 1987.

Ancient Commentators on Aristotle. Edited by Richard Sorabji. Ithaca, NY: Cornell University Press, and London: Duckworth, 1987.

De opificio mundi. Edited by Clemens Scholten. Frieburg, Germany: Herder, 1997.

John Philoponus and the Controversies over Chalcedon in the Sixth Century: A Study and Translation of the Arbiter. Translated by Uwe Michael Lang. Leuven: Peeters, 2001.

Against Proclus' "On the Eternity of the World." Translated by Michael Share. Ithaca, NY: Cornell University Press, 2005–2006.

OTHER SOURCES

De Haas, Frans. *John Philoponus' New Definition of Prime Matter*. Leiden, Germany: Brill, 1997.

"Ioannes Philoponus." In *Paul's Real-Encyclopadie der Classischen Altertumswissenschaft*, 9. Stuttgart: Drunckenmüller, 1764–1795.

McKenna, John. *The Setting in Life of the* Arbiter *of John Philoponus*. Eugene, OR: Wipf and Stock Publishers, 1998.

Pines, Shlomo. "An Arabic Summary of a Lost Work of John Philoponus." *Israel Oriental Studies* 2 (1979): 320–352.

Scholten, Clemens. *Antike Naturphilosophie und Christlich Kosmologie in der Schrift* De opificio mundi *des Johannes Philoponos*. Berlin: Gruyter, 1996.

Sorabji, Richard, ed. *Philoponus and the Rejection of Aristotelian Science*. London: Duckworth, 1987.

———. *Aristotle Transformed: The Ancient Commentators and Their Influence*. London: Duckworth, 1990.

Wildberg, Christian. *John Philoponus' Criticism of Aristotle's Theory of Aether*. Berlin: De Gruyter, 1998.

Carl Pearson

JOHN THE GRAMMARIAN

SEE **John Philoponus**.

JOHNSTON, JAMES FINLAY WEIR

(*b.* Paisley, Scotland, 13 September 1796; *d.* Durham, England, 18 September 1855), *chemistry, agriculture, teaching, and popularization.*

Johnston was a founder of the British Association for the Advancement of Science, compiling a report on isomerism and isomorphism for its 1837 meeting. He lectured at the newly founded Durham University, became an authority on applied chemistry, agriculture, and geology, and wrote very successful, widely translated popular works.

Johnston was the eldest son of James Johnston, a merchant of Kilmarnock. At Glasgow University, paying his way by tutoring, he won prizes and medals in both science and humanities. Graduating with an MA in 1826, he opened a school in Durham; in 1829 he married a Northumberland heiress, Susan Ridley, nineteen years older than him. That year he visited the Swedish chemist Jöns Jakob Berzelius, and Johnston convinced him that the solid substance paracyanogen (which Johnston had analyzed) had the same components in the same proportions as cyanogen. He went on to attend that year's annual meeting of German men of science. Much impressed by this open forum, he published an account of it; and with his friend and patron David Brewster he proclaimed the decline of science and the need to promote it, especially in the provinces. A founder of the British Association for the Advancement of Science (BAAS), which met first in York in 1831, he was never in its inner circle of "gentlemen of science."

In 1832 another visit to Berzelius's prestigious laboratory fueled his interest in the way atoms might be arranged in compounds. In 1837 he presented his commissioned report to the BAAS meeting at Newcastle-upon-Tyne, on the puzzling relationships between chemical composition, chemical and physical properties, and crystalline form. Some different substances, such as paracyanogen and cyanogen, had the same composition: they were called isomers. Some elements (like carbon or sulfur) or compounds existed in two different physical forms: they were dimorphic. Some compounds, like those of ammonium and potassium, formed exactly similar crystals: they were isomorphic, and often isodimorphic, each existing in two different forms. And yet ammonium (NH_4) is composed of five atoms, while potassium has a single atom in its corresponding compounds: so crystalline form and atomic constitution could not be connected in any simple way. Johnston's achievement was thus in clearly describing and classifying phenomena that still eluded satisfactory explanation.

In 1833 he was appointed reader in chemistry (at a salary of £50 a year, plus fees from students attending lectures; laboratory instruction was extra) at the newly founded and staunchly Anglican University of Durham, despite his belonging to the Church of Scotland. The little university, only the third to be chartered in England, was lucky to get a man with his reputation and connections. In the absence of a medical school in Durham, then the normal locus for chemistry, he strenuously promoted courses in engineering, involving practical work as well as advanced chemistry, geology, and mathematics. This pioneering venture, at first popular, did not ultimately succeed: engineering employers refused to recognize the new paper qualification as worth anything, making graduates begin on the shop floor and pay the full premium demanded of apprentices.

Holding forth at the Literary and Philosophical Society in Newcastle and at meetings of similar groups in the north of England, and in Mechanics' Institutes (which he