KALĀM ATOMISM AND ITS CRITICISM IN ARABIC PHILOSOPHY

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Abstract In this paper I examine the theories of the Mu'tazilite Abū l-Huḏail al-ʿAllāf (d. ca. 841) and Abū Isḥāq Ibrāhīm an-Naẓẓām (d. 845) with respect to the atomistic structure of reality. The former was one of the first promoters of an atomistic theory in Islamic lands, while the latter was an influent adversary of *kalām* atomism. I also describe the transfer of this debate into the domain of Arabic philosophy, by examining the anti-atomistic arguments of two Arabic philosophers, Abū Zakarīyā' Yaḥyā ibn ʿAdī (d. 974) and Abū-ʿAlī al-Ḥusayn ibn-ʿAbdallāh Ibn Sīnā/Avicenna (d. 1037), with a close focus on the popular argument of the sphere touching a plane. Finally, I argue that Avicenna's interpretation of said argument might have influenced the debates on the continuum in the Latin world.

Keywords *Kalām*, Arabic philosophy, Medieval atomism, Avicenna, Natural Philosophy.

Kalām is an intellectual movement born in the heartland of the Islamic dominion by the end of the second/eighth century that preceded and rivalled the introduction of Greek thought and its ensuing transformation into Arabic *falsafa*.[1] An all-too-common narrative, one which uses very

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[1] For an outline of the doctrinal tenets of *kalām*, see Abdelhamid I. Sabra, "Kalām Atomism as an Alternative Philosophy to Hellenizing Falsafa," in *Arabic Theology, Arabic Philosophy: From the Many to the One: Essays in Honor of Richard M. Frank*, ed. James E. Montgomery (Leuven-Dudley: Peeters, 2006), 199-272; Abdelhamid I. Sabra, "The Simple Ontology of Kalām Atomism: An Outline," *Early Science and Medicine* 14, no. 1/3 (2009): 68–78.; Also, see Jon McGinnis, "Arabic and Islamic Natural Philosophy and Natural Science", accessed May 3, 2022, https://plato.stanford.edu/entries/arabic-islamic-natural/.

large brush strokes, deeply antagonizes *falsafa* and *kalām*, labelling the first as the real heir to Greek philosophy (read 'rationality') and the latter as native, Islamic, theology. There is indeed an evident proclivity of the *mutakallimūn* towards matters of faith, yet it is equally obvious that issues of metaphysics, epistemology, and natural philosophy, pervade the major works of *kalām*.[2] Moreover, there was a need felt on the part of the *mutakallimūn* to construe their discipline as rigorous (methodologically and rationally) as their philosophical counterparts did in the case of *falsafa*. Al-Ğaḥiẓ, in *Kitāb al-Ḥayawāni*, expressed this demand accordingly: "The practitioner of *kalām* will not grasp the dimensions of *kalām*, and become a master and leader in his art, unless he brings what he knows well of the *kalām* of religion to the level of what he knows of the kalām of *falsafa*."[3]

Philosophers were also not blind to the challenges posed by *kalām*, and hostilities were sometimes dissolved for the sake of fruitful syntheses.[4] In this study, however, I am mostly concerned with the sole development of *kalām*, especially with regard to the endorsement by the *mutakallimūn* of atomistic theories. Therefore, after a broad description of the cultural context in which *kalām* emerged and evolved, I will look into the possible motives of the *mutakallimūn*'s adoption of atomism as explanative model, and I will also offer a description of the physical theories designed by the main religious thinkers of the period.

Given that the early practitioners of *kalām* were probably a heterogeneous group involved in the politics of the Islamic states by participating in religious debates with non-Muslims and Muslims alike, we need to delineate what function these debates played in the early Muslim society, and what was the doctrinal outlook of the contenders of *kalām*. An evaluation of major topics and ideas that entered into these polemics will partially clarify the point of contact by which the *mutakallimūn* (the Mu'tazilites especially) got acquainted with atomistic descriptions of the world.

It is important to note here that one crucial result of the Islamic conquest was to bridge contact between different religious denominations and cultural *foci*, as the territories that fell under Muslim rule were previously part of the Byzantine empire, where Orthodox Christians and

[2] As noted in Alnoor Dhanani, *The Physical Theory of Kalām* (Leiden: Brill), 1993, 2-3.

[3] The quote from al-Ğaḥiẓ is used as a motto in Sabra, "Kalām Atomism".

[4] See the discussion of a 'hybrid enterprise' in Robert Wisnowsky, "The Nature and Scope of Arabic Philosophical Commentary in Post-Classical (ca. 1100-1900 AD) Islamic Intellectual History. Some Preliminary Observations," in *Philosophy, Science and Exegesis in Greek, Arabic and Latin Commentaries*, vol. 2, ed. Peter Adamson, Han Baltussen and Martin W. F. Stone (Oxford: Oxford University Press, 2004), 140-191, at 154-156.

even Pagans lived, and the Sassanid empire, inhabited by Zoroastrians, Manicheans, heterodox Christians, Buddhist and followers of other religious traditions.[5]

If one would have to spell out a common feature for all these diverse cultures, the best candidate would be the process of Hellenisation which affected them and was accomplished to various degrees in both empires by the time Islam appeared.[6] For instance, with regard to scientific and philosophical activity produced in Syriac-speaking milieus there are the notable cases of Paul the Persian, Sergius of Reš'aina, and Prōbā, all active in the first decades of the sixth century.[7] Moreover, the conquered territories were filled with centres of learning and monastic teaching, among which we can name but a few: Caesarea, Antioch, Qenneshre (on the upper Euphrates), Edessa, Harran, Nisibis, Mar Mattai (near Mosul), Seleucia-Ctesiphon, and Gundishapur.[8]

In addition to the intellectual centres transmitting the Christian dogma infused with Hellenistic elements, there were also thriving communities of Bardaisanites, an offshoot of Syriac Christianity who followed the teachings of Bardaisan, a Christian priest who mixed traditional doctrines with Gnostic ideas into a compound that later influenced Manichaeism.[9] Bardaisan is important in our history of atomistic *kalām*, because he expounded a form of atomism which might had been further integrated in the cosmology of the Mu'tazilites.[10]

As for the Sassanid empire, which had a massive impact on the younger Islamic society, one can even talk about 'a culture of translation,' as Dimitri Gutas refers to it,[11] since

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[5] Dimitri Gutas, *Greek Thought, Arabic Culture. The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbāsid Society (2nd - 4th/8th-10th centuries)* (London/New-York: Routledge, 1998), 13-14.

[6] Ibid., 14.

[7] For a broad overview of their contributions to the dissemination of Aristotelian logic, see Ulrich Rudolph, "The Ancient Background," in *Philosophy in the Islamic World, Volume 1: 8th-10th Centuries*, eds. Rotraud Hansberger, Ulrich Rudolph, and Peter Adamson (Leiden/Boston: Brill, 2017), 29-73, at 54-60. Although Paul the Persian's works bear the mark of a Syriac language education, he was heavily implicated in scientific activities at the court of king Ḫusraw Anūšīrvān, and he even might had composed his works in Middle Persian; see Ibid., 59-60.

[8] This short list appears in Rudolph, Hansberger, and Adamson, *Philosophy in the Islamic World*, 60.

[9] See Prods Skjærvø, "Bardesanes," in *Encyclopædia Iranica*, Vol. III, Fasc. 7-8 (London, 1989), 780-785. Josef van Ess, *Theology and Society in the Second and Third Centuries of the Hijra. A History of Religious Thought in Early Islam* (Leiden/Boston: Brill, 2017), 502.

[10] See Dhanani, *The Physical Theory*, 170.

[11] Dimitri Gutas, "The Rebirth of Philosophy and the Translations into Arabic," in *Philosophy in the Islamic World*, *Volume 1: 8th and 10th Centuries*, eds. Ulrich Rudolph, Rotraud Hansberger, and Peter Adamson (Leiden-Boston: Brill, 2017), 98.

the imperial ideology construed by Ḫusraw Anūšīrvān commended the appropriation of Greek knowledge as part of the movement of glorifying the Sassanian past.[12] Here, of paramount importance to the process of Hellenisation was the propagation of a myth of *translatio imperii*, according to which the destruction of the Persian Empire by Alexander the Great brought the fragmentation of a whole corpus of knowledge that needed to be retranslated in Middle Persian starting from the pieces available in Greek.[13] This ideological narrative, then, provided the incentive for the translation of Greek philosophical works made in *pahlavi*. In this case, we already mentioned the role of Paul the Persian for disseminating Hellenistic knowledge in the capital of the empire.

Furthermore, a frequently overlooked aspect of the late Sassanid society is the relations the court of Ḫusraw bore with Greek-speaking exponents of Neoplatonic thought. I am referring to the so-called historiographic event of 'Closing of the Academy' in Athens as a result of Iustinian's anti-Pagan politics, and the later settlement of a group of Athenian philosophers (among them, Damascius and his pupil Simplicius) at the court of Ḫusraw I. The historical sources tell of the philosophers' hope in the patronage of a generous king interested in philosophy, but the affair quickly fell apart as the philosophers became displeased by Ḫusraw's tyrannical behaviour. However, it seems that the earliest sources are tainted with an anti-Sassanian sentiment that passed on unmodified to Edward Gibbon and the later historians, perhaps because of their biased Orientalism through which they were comparing a superior, rationalistic, culture (i. e., the Hellenistic world) with an allegedly brutish, unrefined, society (the Sassanid reign). It seems, however, that Ḫusraw was genuinely sympathetic towards philosophical activity, and initiated a climate of relative tolerance.[14]

This phenomenon of cultural transfer is connected to the project undertaken at a much larger scale, of the Arabic translations at the 'Abbāsid court, since the Sassanian ideology transpires in the political and cultural activities of caliph al-Manṣūr (*regnavit* 754-775).[15] But, although the translation movement played an important part in the development of Arabic thought, this historical process came into being later than the first complex developments of *kalām* thought.

[12] Gutas, *Greek Thought*.

[13] Mansour Shaki, "The Denkard Account of the History of the Zoroastrian Scriptures," *Archiv orientální* 49 (1981): 114-125.

[14] See Joel T. Walker, "The Limits of Late Antiquity: Philosophy between Rome and Iran," *Ancient World* 33 (2002): 45-69, esp. 56-64.

[15] Gutas, *Greek Thought*, 43 *sqq.*

Accordingly, in what follows I will investigate the early phases of *kalām*, with a special emphasis on the thought of the Mu'tazila branch of Islamic theology, given that the texts of the mu'tazilites are the main forum for discussions on cosmology, epistemology, and ontology.

Origins of the Mu'tazilite Physical Theories

The first known mention of the practitioners of *kalām*, in the plural form *mutakallimūn*, links their activity to political propaganda. Shlomo Pines investigated the early history of this term and found that in one Islamic chronicle the term is applied to a faction of agitators that were commissioned to aid Abū Muslim in winning the support of the inhabitants of Marw for the 'Abbāsid cause.[16]

The passage shows that the term was in use by 747 and was, according to Pines' interpretation, synonymous with *du'āt*, i. e. missionaries entrusted with religious propaganda on behalf of the 'Abbāsids. In this regard, their range of activities did not resume to polemical debates, since their role seemed to consist in convincing anyone, by any means necessary, to enrol in the Abbāsid cause.[17] The emphasis on the *mutakallimūn*'s engagement in apologetics, however, is not tantamount to repudiating that they were interested in a high measure in theoretical matters, since in the course of their ongoing polemics with religious opponents, as Pines highlights, "some of the early Mu'tazilites, who represented one of the varieties of *Mutakallimūn*, directed their attention to the technique of the debates in which they engaged with their Muslim and non-Muslim opponents, and in this way came to value both intuitive and discursive reason, not only as an instrument ensuring victory, but for its own sake."[18]

As Richard Frank has stated, the practitioners of *kalām* were driven by a desire of "discovering analytically and setting forth objectively in formal language the underlying structure of the created world as it manifested the *logos*, the divine Word, revealed in the *Koran*."[19] Thus, reducing *kalām* at the rank of mere apologetics diminishes its richness and complexity of thought.

[16] Shlomo Pines, "An Early Meaning of the Term Mutakallim," *Israel Oriental Studies* 1 (1971): 224-240.

[17] As Pines, "An Early Meaning," 225-228, suggests, the knowledge of the *mutakallimūn*'s initial role as defenders, frequently cunning or violent, of the Islamic religion determined al-Fārābī to portray the entire discipline of *kalām* as strictly filling the function of defending islam against non-believers. See al-Fārābī, *Iḥṣā'u l-'ulūmi* [Enumeration of the sciences], ed. Osman Amine, Cairo, 1949, 107-113.

[18] Pines, "An Early Meaning," 233.

[19] As reported by Dimitri Gutas, "Foreword," in Richard M. Frank, *Early Islamic Theology: The Mu'tazilites and al-Ash'arī* (Texts and Studies on the Development and History of Kalām, vol. II), ed. Dimitri Gutas (London/New-York: Routledge, 2007), vii.

As in the case of *falsafa*, *kalām* can be perceived as an umbrella term for a variety of movements and doctrines that were formed at the same time with the first attempts of religious self-reflection on the part of Muslim intellectuals, and which endured and developed even after its main intellectual contender, *falsafa*, came into the centre of Islamic cultural life. Therefore, we should be cognizant of the sensible differences between the various schools within *kalām*, and even of the contradictions between the members of the same school. For our investigation, we are primarily concerned with the school of the Mu'tazilites.[20] Since the latter historically derives from the former, we will first offer a broad sketch of the doctrinal core of the Mu'tazila.

The Mu'tazila emerged as a distinct movement by the middle of the second century (740-750). The name of the school is derived from the verb *'itazala* (to dissociate oneself of, to isolate oneself from),[21] yet this etymology does not clarify very much the circumstances of the movement's origin. It seems to denote a state of neutrality that the first members chose with regard to a certain political event or state of affairs.[22]

The founder of the Mu'tazila was a wealthy cloth merchant named Wāṣil b. 'Aṭā' (d. 748-9), who probably intended to initiate a reform movement within Islam, although the doxographical material is scant and dating from a later period.[23] According to the available information, Wāṣil was the author of a treatise on the *al-manzilatu bayna l-manzilatayni*, i.e., the intermediate state between faith and unbelief that characterises the mortal sinner.

One tradition places the origin of Wāṣil's distinct qualification of this state as *fāsiq* (evildoer) in a *munāẓaratun* (debate) between him and al-Ḥasan al-Baṣrī (d. 728), after which Wāṣil, articulating his position on the matter, withdrew *('itazala*) from al-Baṣrī's circle. The anecdote is most likely untrue.[24] Regardless of whether Wāṣil concerned himself with

[20] They are not, however, to be considered the first systematic expositors of islamic theology; the Mu'tazila started as a minority group among other, more influent, strands of religious thought. See Josef van Ess, *Theology and Society in the Second and Third Centuries of the Hijra. A History of Religious Thought in Early Islam*, vol. 2 (Leiden/Boston: Brill, 2017), 268.

[21] Hans Wehr, *A Dictionary of Modern Written Arabic*, ed. J. Milton Cowan (London: MacDonald & Evans Ltd, 1990), 714.

[22] Josef van Ess, "Mu'tazilah," in *Encyclopaedia of Religion*, ed. Mircea Eliade (New York: Macmillan, 1987), 220-229, at 221, stresses that the term was already used in the seventh century CE to indicate those companions of Muḥammad who refused to take a side in the first civil war, meaning that the connotation of political neutrality was already present in the name by the second century AH.

[23] Ibid., 221; Van Ess, *Theology and Society*, vol. 2, 269.

[24] Ibid., 292-294.

metaphysical and epistemological issues, such as the problem of God's attributes, for a systematic account of Mu'tazilite thought, we need to look somewhere else.

Mu'tazilite Atomism: Abū l-Huḏayl al-'Allāf

Abū l-Huḏayl al-'Allāf (d. c. 841) founded the Baṣran branch of the Mu'tazila and contributed, alongside other figures, to "initiating the *mutakallimūn*'s dialogue with Hellenistic cosmology."[25] As such, Abū l-Huḏayl endorsed atoms as the fundamental constituents of the physical world. However, his atoms are dimensionless, and dimension is only an effect of their aggregation. Furthermore, along atoms, Abū l-Huḏayl accepted the existence of accidents.[26] In his system, there are accidents that belong to some substances, but there are also other kinds of accidents (time, for instance), which are apart from any particular substance.[27]

In the intellectual context of its age, Abū l-Huḏayl also distanced himself from the consensus by claiming that some atoms and their accidents have more than a momentary duration.[28] For a large part of the *mutakallimūn*, at every instant God creates the atoms that compose the beings anew. This doctrine of temporal instantiation developed into a theory of spatial atomism.[29]

According to van Ess, Abū l-Huḏayl "handled atomism in a reductionist way, explaining not the physical coming-into-being of things, but their ontological structure."[30] For instance, he argues that if bodies were infinitely divisible, then a mustard seed, divided at each point, would be as great as a mountain, or could be spread on the entire surface of the earth.[31]

[25] Dhanani, *The Physical Theory*, 7.

[26] Ibid., 8.

[27] Ibid., 39. See also Ibid., 41: "Abū l-Hudhayl was probably the first mutakallim to conceive of accidents which do not inhere in any substrate." For a general discussion about accidents in Mu'tazili thought, see Ibid., 38-54.

[28] Ibid., 45.

[29] Cristoph Lüthy, John E. Murdoch, William R. Newman, "Introduction: Corpuscles, Atoms, Particles, and Minima," in *Late Medieval and Early Modern Corpuscular Matter Theories*, eds. Cristoph Lüthy, John E. Murdoch, William R. Newman (Leiden/Boston/Köln: Brill, 2001), 1-38, at 8. For an account of islamic occasionalism, see Majid Fakhry, *Islamic Occasionalism and its Critique by Averroes and Aquinas* (London: George Allen & Unwin Ltd.), 1958.

[30] Josef van Ess, *Kleine Schriften*, ed. Hinrich Biesterfeldt (Leiden/Boston: Brill, 2018), 247.

[31] Ibid., 247. For the probable Indian source of this argument, see Schlomo Pines, *Beiträge zur islamischen Atomenlehre* (Berlin: Heine), 1936; and Josef van Ess, *Theology and Society in the Second and Third Centuries of the Hijra. A History of Religious Thought in Early Islam*, vol. 4 (Leiden/Boston: Brill), 523.

Despite being equivocal, one of the terms used by Muslim theologians for atoms was *ǧawhar*, a term of Persian origin (*gohr*), which means 'substance'.[32] Thus, both Abū l-Huḏayl and his fellow Mu'tazilite al-Mu'ammar believed that *ǧawāhir*, that is substances or atoms are not bodies, but the constituents of bodies.[33] For example, al-Mu'ammar spoke of *al-ǧawharu l-wāḥidu allaḏī lā yanqasimu*, "the single substance which does not break [into smaller parts]."[34]

Other terms used to refer to atoms were *ǧuz'* (part) or al-*ǧuz'u l-laḏī lā yataǧazza'u* (the part which does not divide), or even the term of Quranic origin *ḏarra,* which originally meant a mote or a tiny particle.[35] According to van Ess, "Islamic atomism thus does not explain the world; it explains God's omnipotence. What matters is not so much the atoms as the accident of *ta'līf* [composition], which was developed into a symbol of God's power […] Only one thing remained which was not subject to God's omnipotence: human will, for Abū l-Huḏail was a Mu'tazilite. But will belonged to the realm of action, and actions were accidental."[36]

However, the atomistic theory of the *mutakallimūn* is deemed problematic by the fact that, although atoms are taken to be dimensionless entities, they are, however, described as *mutaḥayyiz ("occupying place"). But, if it is said of atoms that they lack dimensions, how could they be occupying place? One explanation, provided by Alnoor Dhanani,* is that *kalām* atoms have some sort of extension without being full-fledged bodies. In this manner, according to Dhanani, the *mutakallimūn* conceptualized a non-Euclidean type of space in which atoms move as within a grid. Furthermore, Dhanani associates this kind of discrete geometry with the

[32] Soheil M. Afnan, *Philosophical Terminology in Arabic and Persian* (Leiden: Brill, 1964), 99. Dhanani, *The Physical Theory*, 59: "In my view, it is this concept of the atom as the material substrate of change, which underlies the kalām use of jawhar to denote the atom. The differing views of jawhar which are reported by al-Ash'arī reflect this, for, apart from the Christian view of substance, the three other views which he reports attempt to define jawhar as the substrate in which accidents, whose role it is to explicate change, inhere in it. This concern betrays the primacy of the role of jawhar as the substrate in which change occurs. The kalām use of the term jawhar, then, denotes the atom insofar as the atom is the material substrate for inherent accidents which are responsible for change. More succinctly, jawhar represents the smallest unit of matter, so long as by matter we mean the substrate in which accidents inhere."

[33] Ibid., 57, n. 10.

[34] Carmela Baffioni, M. Nasti de Vincentis, *Atomismo E Antiatomismo Nel Pensiero Islamico* (Napoli: Istituto Universitario Orientale, 1982), 92.

[35] Van Ess, *Kleine Schriften*, 1128: "By introducing the Quranic word *dharra* into an atomistic context, Abū l-Hudhail prepared the ground for it to become a *terminus technicus*, but he himself left it on the level of ordinary language and referred to the atom by a different term, al-juzʾ alladhī lā yatajazzaʾ, which seems to be a calque from the Greek."

[36] Ibid., 1132.

Epicureans' attempts to propose an alternative geometry, and suggests possible ways of transmission from Epicurean atomism to *kalām* physical theories.[37]

Kalām Criticism of Atomism: an-Naẓẓām

Furthermore, there were also critiques of atomism issued even from the *kalām* camp. Abū l-Huḏayl's nephew, an-Naẓẓām (d. 845), was a fierce adversary of *kalām* atomistic theories. He answered the atomist position by enumerating its potential absurdities: an atom having sides, as the *mutakallimūn* believed, must be divisible; the way the defenders of atomism describe the atoms suggest that atoms already possess tridimensional features.[38]

An-Naẓẓām is better known for his theory of leaps which he devised as an argument against the doctrine of atomistic division of continua. The problem an-Naẓẓām faced was that endorsing infinite divisibility confronted one with answering Zeno's old paradoxes about the impossibility of traversing all the infinite subsections of a distance.

The atomists found a solution by rejecting the reality of infinite divisibility and postulating a limited number of possible divisions. However, an-Naẓẓām was not content with that solution and suggested a different explanation. According to an-Naẓẓām, it is possible to travel any finite distance by performing leaps from one point to the next one. However, an-Naẓẓām's theory is strange, since it claims that the mover simply disappears during the leap, only to reappear at the next position.

In an-Naẓẓām's example, an ant need not traverse all the subsections of a given distance, since that task would be infinite, but it can traverse some while skipping others through leaps (in Arabic, 'leap' is called *ṭafra*).[39] In this manner, an-Naẓẓām accepts infinite divisibility as a natural feature, but does not accept the consequences spelled out by the mustard seed argument – that the parts of a seed would be equal to the parts of a mountain.[40]

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[37] Dhanani, *The Physical Theory*, 133-141.

[38] See Josef van Ess, *Theology and Society in the Second and Third Centuries of the Hijra. A History of Religious Thought in Early Islam*, vol. 3 (Leiden/Boston: Brill, 2019), 335, who notices the similarity with pseudo-Aristotle's *De lineis insecabilibus*.

[39] Richard Sorabji, *Time, Creation, and the Continuum: Theories in Antiquity and the Early Middle Ages* (London: Duckworth, 1983), 385: "Naẓẓām's idea […] will have been that any journey involves, not an infinite number of sub-journeys, but only a finite number of variably short leaps. The sub-distances may be infinite in number, but the leaps are not;" See van Ess, *Theology and Society*, vol. 3, 339.

[40] Ibid., 349.

An-Naẓẓām's theory was very controversial in *kalām* circles.[41] For instance, his adversary, Abū l-Huḏayl, replied that if the ant is covered in ink, its movement on the surface will leave a continuous trace, which means that an-Naẓẓām's theory is empirically refuted.[42] However, van Ess cautions us against the distortions which the original argument may have suffered during its textual transmission.[43]

According to Richard Sorabji, an-Naẓẓām had Greek sources at his disposal in constructing this theory. Sorabji compares arguments transmitted by Sextus Empiricus and Damascius with an-Naẓẓām's theory, and particularly hints to Aristotle's *De sensu* as a stock of examples for an-Naẓẓām.[44]

The Philosophical Criticism of *Kalām* Atomism: Yaḥyā ibn ʿAdī

However, a large lot of criticism towards *kalām* atomism came not from the theologians, but from the philosophers of practitioners of *falsafa*. Therefore, we now turn to the philosophical criticism of the physical theories of the *mutakallimūn*. One of the most prominent critics of *kalām* atomism was Abū Zakarīyā' Yaḥyā ibn ʿAdī, a Syriac theologian, philosopher, and translator who lived in the ninth century.[45] As a member of the Baghdad school, ibn ʿAdī was a disciple of Mattā b. Yūnus and al-Fārābī, and seems to have shared with the latter interesting doctrinal similarities.[46]

There is an argument that was developed in the Arabic milieu, which afterwards was transmitted to the Latin scholastics. Its beginnings are somewhat surprising, since its first context could be Aristotle's treatise *On the soul*, more exactly the first book of that treatise (403a12-14). That particular passage is concerned with a problem very distant from atomism, mainly it is a critique of the Platonic view according to which the soul is an entity separable from the body. The single criterion by which such a thing would be possible is, for Aristotle, the existence of an affection that is proper only to the soul, not to the soul and body altogether.

However, as a geometrical line entails all kinds of accidents, such as being tangent with a sphere in a certain point, yet it does not have these properties when it is not a concrete,

[41] Ibid., 336.

[42] Ibid., 341.

[43] Ibid., 337.

[44] Sorabji, *Time, Creation, and the Continuum*, 385. See also van Ess, *Theology and Society*, vol. 3, 338.

[45] For a portrait of Yaḥyā ibn ʿAdī, see Joel L. Kraemer, *Humanism in the Renaissance of Islam: The CulturalRevival During the Buyid Age* (Leiden: Brill, 1986), 104-109.

[46] Ibid., 107.

material, line, so it is the case with the soul: there is no property of the soul by which it is separable from the body. One can discern a stream of incoherence on Aristotle's part, since in other places of his work, he denies that points have any kind of corporal existence.

This example was afterwards transformed by the atomists in an argument in favour of their thesis, but it also stood for one of the weak points of the atomist doctrine, by which the divisibilists refute the atomists. In its simplest form, the arguments start from the premise that a sphere can touch a plane: a) wholly or b) only partially, by one of its extremities. The aim of the atomists is to show how these possibilities fail, and how only the indivisibilist solution makes sense.

Gerhard Endress had studied Yaḥyā ibn ʿAdī's anti-atomism in three treatises which he critically edited.[47] A fourth treatise was discovered by David Bennett and Robert Wisnovsky, who also edited it and provided an English translation.[48] From these treatises, it appears that Yaḥyā ibn ʿAdī knew the mustard seed argument.

However, in the fourth treatise ibn ʿAdī focuses on another argument as is subject matter, the argument involving a sphere moving on a plane surface. The authors of the article that studies this treatise emphasize its importance by observing that the "sphere-touching-the-plane argument was analyzed by Avicenna (d. 428/1037) in his *Kitāb al-Shifāʾ* as well as by post-classical Islamic philosopher-theologians such as Fakhr al-Dīn al-Rāzī (d. 606/1210), who responded to Avicenna's discussions. It was popular in the Latin tradition as well, for example in the work of Henry of Harclay (d. ca. 1317 CE)."[49]

Yaḥyā ibn ʿAdī first presents the atomist's argument. Experience reveals that a sphere can touch a surface. In ibn ʿAdī's rendition of the argument, the underlying principle of this possibility is the fact that, like the surface of a flat body, the sphere is a body. Ibn ʿAdī does not explain why this detail is important, but it might work for the atomist as a condition for the plausibility of the argument: if both the sphere and the flat body are bodies, then they have to react in the same way with regard to the other bodies they come in contact with. If it were be possible for the sphere to behave differently than other bodies when touching surface, then the argument would lose its strength.

[47] Gerhard Endress, "Yaḥyā ibn ʿAdī's Critique of Atomism: Three Treatises on the Indivisible Part, Edited with an Introduction and Notes," *Zeitschrift für Geschichte der arabisch -islamischen Wissenschaften* 1 (1984): 155-179.

[48] David Bennet, Robert Wisnovsky, "A Newly Discovered Yaḥyā ibn ʿAdī' Treatise against Atomism," in *Ideas in Motion in Baghdad and Beyond*, ed. Damien Janos (Leiden: Brill, 2015).

[49] Ibid., 299.

Having accepted the first premise, the opponent of atomism is faced with two alternatives. The sphere touches the surface of the body either through its "corporeality, in all of its dimensions (*ab'ād*), or by its extremity."[50] The first alternative is logically and physically impossible. Logically, because a case of a sphere touching another body in all its width, length, and depth is no longer a case of contact, but of penetration (*mudāḫala*), as ibn ʿAdī calls it. Physically, because "it would entail the body (*jirm*) of the celestial sphere could enter the body (*jism*) of a mustard seed."[51]

The other horn of the dilemma is equally absurd. The extremities or surfaces of the sphere and the flat body are different, since the sphere has a curved surface and the flat body has a flat surface. But it is impossible for these two kinds of surfaces to coincide. Therefore, the sphere can touch the flat body only at a point, which is not further divisible.

Furthermore, the sphere moves continuously on the body, a fact that is admitted by the atomist's adversary. This motion does not take place in leaps, as an-Naẓẓām would have it, since according to ibn ʿAdī, "our senses reject this."[52] However, ibn ʿAdī does not explain how, according to the atomist, the senses are able to discern that the motion of the sphere is indeed continuous. For it might be that our eyes are not well equipped to observe the very small transitions the point makes on the surface.

Therefore, perhaps our senses cannot decide whether the motion is continuous or takes place by leaps. Perhaps what ibn ʿAdī or his atomist have in mind here is the popular counter-argument against an-Naẓẓām's theory that imagines the ant soaked in ink living a continuous line of ink on the traversed surface. In this case, the trace of ink aids the senses in discerning the continuity of motion. Hence, since the sphere touches the flat body at one point once, the line it makes is composed of finite indivisible points.[53]

Yaḥyā ibn ʿAdī retorts with a series of arguments. First, the thesis that there are indivisible parts destroys the possibility of a sphere since, according to ibn ʿAdī, indivisible parts could only be ordered into a straight line, but not a circular shape.[54] Second, the fact that the sphere touches only one point at a time does not imply that there are no other points on the line which the sphere traverses that are not touched by it.[55]

[50] Ibid., 306.
[51] Ibid., 306.
[52] Ibid., 307.
[53] Ibid., 307.
[54] Ibid., 308.
[55] Ibid., 308.

Furthermore, between the first point that the sphere touches and the second, there is either some distance to be traversed or there is none. If the first alternative is correct, then the sphere cannot actually move between the first and the second point, because "it has been demonstrated that every motion can only be along a span – you should know that in this discussion we mean by the term 'motion' only a local motion along a straight line."[56]

By mentioning a demonstration, ibn ʿAdī is perhaps alluding to the argument that atomistic motion is not possible, since motion is a kind of process of transition from one point to another, and not a case of instantaneous transportation, as the atomist perceives it. The classical argument against atomistic motion was set forth in Aristotle's *Physics*, Book 6, 231b20-232a10, and probably ibn ʿAdī is referring to that version of the demonstration.

If the second alternative is right, then there are distances or spans between any purportedly indivisible point along the trajectory of the sphere's movement. Therefore, motion is not atomistic, since motion of the sphere takes place on ever further divisible parts of the flat surface.

Yaḥyā ibn ʿAdī's reasons against atomism are stock arguments. However, he played an important role in the dissemination of these arguments and probably influenced more elaborate strategies of defending divisibilism, such as Avicenna's.

The Philosophical Criticism of *Kalām* Atomism: Avicenna

Abū-ʿAlī al-Ḥusayn ibn-ʿAbdallāh Ibn Sīnā (ca. 970-1037), known to the Western world as Avicenna, was one of the greatest Islamic philosophers, and also one of the greatest systematisers of Aristotelian thought in all periods of time. Dimitri Gutas commends Avicenna's achievement as a breaking off with the Aristotelian tradition and the bringing forth of an "Encyclopaedia of Unified Science", which stands in relation to the Aristotelian corpus as the blueprint stands to the complete edifice.[57]

[56] Ibid., 309.

[57] Dimitri Gutas, *Avicenna and the Aristotelian Tradition. Introduction to Reading Avicenna's Philosophical Works*, Second, Revised and Enlarged Edition, Including an Inventory of Avicenna's Authentic Works (Leiden: Brill, 2014), 228. In this comparison, Gutas borrows his vocabulary from Jonathan Barnes.

In this enduring task of reshaping the Aristotelian philosophical corpus, Avicenna rethought and refined almost all of the tenets of Aristotelian natural philosophy.[58] So, Avicenna could not have overlooked the importance of *Physics*, 6. However, Avicenna is concerned with a refutation of atomism not only due to the desire to avoid carelessness in interpreting Aristotle's works, but also because, as we saw above, the problem of the compositions of bodies (*aǧsām*) is one of the most important topics in the *kalām* literature, and it had preoccupied practitioners of *falsafa* even before Avicenna, as in the case of Yaḥyā ibn ʿAdī.

Avicenna provided refutations of atomism in various places of his *oeuvre*. The most articulate critique, however, is found in his monumental *al-Shifāʾ* (*The Cure*), in the section dedicated to the *Physics*, Book 3.3-5. In this regard, the importance of Book 3 for the history of atomism cannot be overestimated.[59] Nevertheless, as McGinnis highlights, Avicenna admits the existence of *minima naturalia*, i.e. "magnitudes below which an element cannot retain its species-form. In effect, Avicenna is allowing that there are bodies that cannot physically be divided further and so are physical *a-toms* (literally, "something that cannot be cut"), even if they are conceptually divisible *ad infinitum*."[60]

For Avicenna, atomists are those who "compose bodies out of non-bodies" – *al-muʾallifīn li-al-ajsām min ghayr al-ajsām* (*Shifāʾ*, 3. 4). There follows a series of arguments designed to refute the tenets of atomism. Avicenna denies, one by one, the possibility of composing bodies out of succession, contiguity, interpenetration, or continuity.

Let us first present the version of the sphere argument in Avicenna's rendition, and after provide a brief commentary on its most salient features and of Avicenna's rebuttal:

[58] According to Peter Adamson, *Philosophy in the Islamic World* (Oxford: Oxford University Press, 2016), 116: "Avicenna went out of his way to be innovative, deliberately overthrowing centuries of philosophical tradition to forge a new and distinctive philosophy."

[59] Jon McGinnis, "Translator's Introduction," in Avicenna, *The Physics of The Healing*, ed. and transl. J. McGinnis, 2 volumes (Provo: Brigham Young University Press, 2009), xxi-xxxi, at xxv: "Equally of interest to the historian of science is Avicenna's impressive knowledge of *kalām* Atomism, discussions of which permeate the first half of book 3. Indeed, not only does Avicenna rehearse many of the *kalām* arguments found in the notable studies of this topic by Shlomo Pines (1936; 1997), Alnoor Dhanani (1994), and more recently, A. I. Sabra (2006), but he also presents arguments not catalogued by these scholars. In the same vein, Avicenna is conversant with the thought of the anti-Atomist *mutakallim*, Ibrāhīm al-Naẓẓām, and quite likely had read the latter's *Book of the Atom (Kitāb al-juzʾ)*, now no longer extant. All in all, then, Avicenna's Physics, and especially Book 3, makes an excellent additional source for the study of Islamic Atomism."

[60] Ibid., xxix.

> Likewise they asked: what do they say about a sphere's rolling over a smooth surface? Isn't it contiguous with one point after another such that the line that the sphere maps out is composed of points?[61]

Avicenna responds a couple of chapters below:

> As for what was related about the surface and the sphere, one does not know whether a sphere could exist on a surface having this description in reality or only in the activity of the estimative faculty, in the way that mathematical objects do. Nor is it known (if it exists in reality) whether [the sphere] is, in fact, rolling over [the surface] or not, for perhaps it is impossible for it to roll over it. Aside from all this, it is not necessary, in any case, that the sphere touch the surface and the line at only a point; rather, it may be like that [only] when it is stationary and at rest. In that case, when it is moved, it would touch [the sphere] at the line during the time of the motion, and there simply would be no actual moment at which it touches at the point, save in the estimative faculty. [That] is because the estimative faculty images that [contact at a point] only when it imagines the instant, whereas the instant has no existence in actuality. In summary, this problem does not turn out to be truly admissible, because what is admitted is that the sphere does not meet the surface at a single instant save at a point, from which it does not necessarily follow that the motion involves a locomotion from one point to another point immediately adjacent to it and from one instant to another, immediately adjacent one.[62]

In both Yaḥyā ibn ʿAdī's and Avicenna's version, the atomists claim that the contact the sphere makes with the flat body is *punctual*, meaning that the sphere can only touch one point of the body at a time, and *successive*, that is, during its motion on the flat surface, after the first contact with the first point, the sphere will continue to touch just one other point, which is not separated by the first through an interval, and so on, to the effect that the line the sphere is moving on is composed of a finite number of points.

[61] Avicenna, *The Physics of The Healing*, ed. and trans. J. McGinnis, 2 volumes (Provo: Brigham Young University Press, 2009), 277.
[62] Ibid., 308.

After that, follows the rejection of the argument by Avicenna, who first emphasizes that what the argument describes is pertinent rather to the field of geometry, since the image of the sphere touching a surface under the conditions prescribed by the argument might be only a construct of the imagination. Therefore, Avicenna acknowledges that the experiment of the argument is a mental construct of our imagination and criticizes the confusion the atomists make between the mathematic domain and the physical domain of reality. This particular criticism will have numerous echoes in the Latin debates regarding this subject.

Furthermore, Avicenna points at what was only implicit in the argument, the fact that a sphere moving on a line composed of a finite number of indivisible points must partake in this motion in a time which is already segmented in a similar way. But trying to prove that a quantity is composed out of atoms while believing that time is also composed of indivisible units is, Avicenna stresses, a form of circular argument. Therefore, Avicenna also rejects, along the thesis of an atomistic space, the thesis of a time composed of indivisible instants.

I now want to turn my attention from this argument rejected by Yaḥyā ibn ʿAdī and Avicenna, among other Arabic philosophers, to its career in the Latin West, since the argument appears in similar forms in the writings of the medieval scholars after the introduction of Aristotle and the Arabic philosophers in the universities. For instance, one of the versions of the argument in the Latin tradition reads as follows:

> "Again a sphere moved over a plane touches the plane only at a point." For [whether] in a plane or a straight [line], a circle or a sphere, "there is nothing common but a point, and contact is in virtue of some common thing. But a sphere" touching a plane in that manner can "move continuously over a plane, therefore it can touch the plane continuously, point after point." Consequently such a line as it describes with its motion is composed of points.[63]

[63] *Adam de Wodeham: Tractatus de Indivisibilibus. A Critical Edition with Introduction, Translation, and Textual Notes*, ed. Rega Wood (Synthese Historical Library, 31), Springer, 1988, 95. The latin version is on p. 94: Item, sphaera mota super planum tangit planum solum in puncto. quia recto aut plano, circulo seu sphaerico, "nihil est commune nisi punctus, et contactus est secundum aliquod commune. Sed sphaera" sic tangens planum potest "continum moveri super planum, ergo potest continue tangere punctum post punctum." Et per consequens talis linea quam describit per motum suum componitur ex punctis.

The argument is attributed to Henry of Harclay, but is actually transmitted by William of Alnwick, from whom Adam Wodeham copied it.[64] Henry of Harclay was chancellor of the University of Oxford between 1312 and 1317 and one of the first to reply to Scotus's anti-atomistic arguments. The argument is formally identical to what we have seen in the Arabic tradition.

Moreover, we encounter similar expressions used to describe the sphere's contact with the surface in both traditions, point after point: *binuqṭatin baʿda nuqṭatin* in Arabic, *punctum post punctum* in Latin. Avicenna's treatise was translated in Latin. It might therefore be a source for the Latin debates, although it has been argued that the probable source would be Averroes.[65]

Concluding Remarks

In this paper I examined the historical origins of *kalām* atomism, which competed with the explanations of natural phenomena introduced in the Islamic world by the translators and practitioners of *falsafa*. First, I tracked the events that led to the appearance of a refined tradition of thought in the Islamic world: the Hellenisation of the Middle East, the 'Abbāsid revolution, the translation culture, and the origins of the Mu'tazilite movement. After describing the main tenets of Mu'tazilite atomistic theories and counter-theories developed by *kalām* authors, such as Abū l-Huḏail al-ʿAllāf and an-Naẓẓām, I addressed the arguments of the practitioners of *falsafa*, namely Yaḥyā ibn ʿAdī and Ibn Sīnā (Avicenna). I focused on one particular argument and its refutations, namely the sphere touching the plane argument, since it originated in Arabic philosophical literature and was later transmitted to the Latin world.

[64] For a commentary of this argument, see Cristophe Grellard, "Thought Experiments in Late Medieval Debates on Atomism," in *Thought Experiments in Methodological and Historical Contexts*, eds. Katerina Ierodiakonou and Sophie Roux (Leiden: Brill, 2011), 65-82, at 66-67.

[65] Jack Zupko, "Nominalism Meets Indivisibilism," *Medieval Philosophy and Theology* 3 (1993): 158-185, at 160, n. 5.