Title: Concepts of Time

Author: Nader El-Bizri

Source: *Medieval Islamic Civilization: An Encyclopaedia*, Vol. 2, pp. 810-812, ed. Josef W. Meri, Routledge (New York-London, 2006).

Concepts of Time

Nader El-Bizri

Classical concepts of time confronted philosophers with perplexing paradoxes. Some wondered whether time altogether was nonexistent, whereas others doubted the reality of its divisibility into parts by arguing that the past ceased to be, the future does not yet exist, and the present as a moment/now that is without magnitude (i.e., like a mathematical point is not part of time). In addition, it was unclear whether time progressed smoothly or proceeded by way of discontinuous and divisible leaps.

Although inquiries about the nature of time were integrated within physical theories of motion, their broad cosmological and metaphysical bearings had an impact on speculations about creation and causation. In Plato's *Timaeus* (37d; 38a) time (*kronos*) was pictured as a moving image (*eikona*) that imitated (*mimoumenon*) eternity (*aiona*) by circling around according to number (*arithmos*) and came into existence with the generation of the heavens. In the earliest systemic investigation of the essence and existence of time, which was contained in Aristotle's *Physics* (219b3-4; 220a25-b20; 222b20-23), *kronos* was defined as the number (*metron*) of a continuous (*sunekhes*) motion (*kinesis*) with respect to the anterior (*proteron*) and the posterior (*husteron*). Rejecting the claim that time was the movement of the whole (*holos*), Aristotle argued that the circular, uniform, and continuous motion of the celestial sphere (*sphaira*) acts as the measure (*metron*) of time (*Physics*, 223b21). His theory subsequently received numerous responses by Neoplatonist and Hellenist exegetes; these are grouped in a monumental edition titled *Commentaria* in *Aristotelem Graeca.* Damascius argued that time was a simultaneous whole, Plotinus grasped it as the changing life of the soul (*Enneads*, 3. 7. 11-13), and Simplicius defended the thesis of the eternity of the world against doubts raised by the grammarian Philoponus, who adopted a Christian doctrine of *creatio ex nihilo.* As for the author of the *Confessions,* Augustine of Hippo, he noted that *tempus* (time) was created when the world came to be while affirming that the existential reality of time is grounded in the present (*praesens*), which in itself is what tends not to be (*tendit non esse*), *g*iven that only eternity was stable (*semper stans*).

On the basis of a belief in the linear directionality of time, from Genesis to Judgment, Augustine argued that the present of things past was preserved in memory, the presence of present things was confirmed by visual perception, and the presence of things future was secured through expectation. Accordingly, the reality of time depended on an *anima* who remembers, perceives, and expects events; this is similar to Aristotle's claim in the *Physics* (218b29-219a1-6, 223a25) that *kronos* required *psukhe* to compute its numbering (*arithmein*). Ishaq ibn Hunayn's translation of Aristotle's *Physics* (*al-Tabi'a*) secured the transmission of the Aristotelian conception of *kronos* into Arabic, which subsequently inspired variegated philosophical interpretations of time among Muslims. Al-Kindi held that *al-zaman* (time) had a beginning and an end and that it measured motion according to number (*Tempus ergo est numerus numerans motum*), whereas al-Farabi and Ikhwan al-Safa' affirmed that time resulted from the movement of the created celestial sphere (*al-falak*). Abu Bakr al-Razi claimed that the *dahr* (perpetuity) was absolute (*mutlaq*), while taking *al-zaman* (time) to be a flowing substance (*jawhar yajri*) that is

bound (*mahsur*) as well as being associated with the motion of *al-falak* (the celestial sphere).

In *Kitab al-Hudud,* Ibn Sina defined *al-zaman* (time) as that which resembles the created being (*yudahi al-masn*) and acts as the measure of motion (*miqdar al-haraka*) in terms of the anterior and the posterior (*mutaqaddim wa muta'akhkhir*). He also noted that *al-dahr* (supra-temporal duration) resembled the Creator (*yudahi al-san'i*) insofar that it was stable throughout the entirety of time. In the *Isharat wa'l-Tanbihat,* he linked time to physical inquiries about motion; in *'Uyun al-Hikma,* he construed it as a quantity (*kamiyyat*) of motion that measures change (*yuqaddir*) and whose perpetuity (*dahr al-haraka*) generated temporality. Time also played a notable role in *Kitab al-Manazir* (*Optics;* II. 3, II. 7, III. 7) by the polymath Ibn al-Haytham, who argued that the propagation of light rays was subject to time and consequently inferred that the velocity of light (*al-daw'*) was finite despite being immense in magnitude. Moreover, he held that acts of visual discernment and comparative measure (*al-tamyyiz wa'l-qiyas*) were subject to the passage of time even if not felt by the beholder, and he cautioned that if the temporal duration of contemplative or immediate visual perception fell outside of a moderate range, it resulted in optical errors. In addition he listed *al-zaman* as one of the known entities (*ma'lumat*), while taking duration (*mudda*) to be its essence (*mahiyya*) and the scale (*miqyas*) of its magnitude (*miqdar*) and quantity (*kamiyya*) that become knowable in reference to the motion of the celestial sphere (*al-falak*).

Opposing the views of the peripatetic Muslim philosophers, the exponents of *kalam* (dialectical theology) articulated alternative conceptions of time that rested on physical theories inspired by Greek atomism. Time was grasped by the *mutakallimun* (dialectical theologians) as being a virtual (*mawhum*) phenomenon of changing appearances and renewed atomic events (*mutajaddidat*), whereby a discrete moment (*waqt*) replaced the concept of a continuous *zaman*. Motivated by this theory - although resisting its thrust - al-Nazzam believed in the divisibility of particles *ad infinitum,* which entailed that a spatial distance with infinitely divisible parts requires an infinite time to be crossed unless its traversal proceeded by way of leaps (*tafarat*)*;* this echoes the Stoic views regarding the Greek notion of *halma* (leap). When doubting the doctrine of the eternity of the world in *Tahafut al-Falasifa,* al-Ghazali attempted to show that duration (*mudda*) and time (*zaman*) were both created, and he argued that the connection between what is habitually taken to be a cause and an effect was not necessary, given that observation only shows that they were concomitant. Consequently, he proclaimed that the ordering relation of an antecedent cause with a consequent effect does not necessarily rest on an irreversible directionality in time.

In defense of causation, Ibn Rushd argued in *Tahafut al-Tahafut* that the refutation of the causal principle entailed an outright rejection of reason while asserting that the eternal (*al-qadim*) was timeless and that the world was subject to the workings of a continuous *zaman.* Affirming the truth of Genesis, Maimonides asserted in *Dalalat al-Ha'irin* the belief that time was created, given that the celestial sphere and the motion on which it depended were both generated. Although speculations about time continued with scholars of the calibre of Nasir al-din Tusi, Fakhr al-din al-Razi, Mir Damad, Mulla Sadra, Abu'l-Barakat al-Baghdadi, al-Iji, and al-Jurjani, the elucidation of its uncanny reality remained inconclusive.

Primary Sources

Aristotle. *Physics,* ed. W. David Ross. Oxford, UK: Oxford University Press, 1998.
Augustine. *Confessions,* ed. James O'Donnell. Oxford, UK: Clarendon Press, 1992.
Ghazali. *Tahafut al-Falasifa,* transl. Michael Marmura. Provo, Utah: Brigham Young University Press, 1997.
Ibn al-Haytham. *Kitab al-Manazir,* ed. Abdelhamid I. Sabra. Kuwait: National Council for Culture, Arts and Letters, 1983.
_ _ *T he Optics of Ibn al-Haytham,* transl. A. I. Sabra. London: Warburg Institute, 1989.
Ibn Rushd. *Tahafut al-Tahafut,* ed. Muhammad ʻAbid al-Jabiri. Beirut: Markaz Dirasat al-Wihda al-ʻArabiyya, 1998.
Ibn Sina. *Kitab al-Hudud.* ed. A. M. Goichon. Cairo: Institut Francais d'Archeologie Orientale du Caire, 1963.
_ _ *al-Isharat wa'l-Tanbihat,* 3 vols., ed. Sulayman Dunya. Cairo: Dar al-Maʻarif bi-Misr, 1957-1960.
Ikhwan al-Safa'. *Rasa'il Ikhwan al-Safa' wa Khullan al Wafa',* vol. II, ed. Butrus Bustani. Beirut: Dar Sadir, 1957.
Maimonides. *Dalalat al-Ha'irin, The Guide for the Perplexed,* transl. M. Friedlander. New York: Dover, 1956.
Philoponus. *Corollaries on Place and Void;* Simplicius. *Against Philoponus on the Eternity of the World,* transl. David Furley and Christian Wildberg. London: Duckworth, 1991.
Plato. *Timaeus,* transl. R. G. Bury. Cambridge, Mass: Harvard University Press, 1999.
Simplicius. *Corollaries on Place and Time,* transl. J. O. Urmson. London: Duckworth, 1992.

Further Reading

Dhanani, Alnoor. *The Physical Theory of Kalam.* Leiden: Brill, 1994.
Mallet, D. "Zaman", In *Encyclopaedia of Islam,* vol. XI. Leiden: Brill, 2001.
Massignon, Louis. "Le Temps dans la Pensee Islamique". In *Opera Minora,* vol. II, ed. Y. Moubarak. Beirut: Dar al-Maʻarif, 1963.
Rashed, Roshdi. *Les Mathematiques Infinitesimales du IX au XI siecle,* vol. IV. London: al-Furqan Islamic Heritage Foundation, 2002.
Sorabji, Richard. *Time, Creation and the Continuum.* Ithaca, NY: Cornell University Press, 1983.
Walzer, Richard. *Greek into Arabic: Essays in Islamic Philosophy.* Columbia, South Carolina: University of South Carolina Press, 1962.