ARISTOTLE ON RELATIONAL TIME

In the wake of the recent re-evaluation of Aristotle's physics by Monica Ugaglia (2004) and Carlo Rovelli (2015), this work aims to contribute to this "Aristotle renaissance" by restoring Aristotle's concept of time. In doing so, it seeks to engage with contemporary philosophical and physical debates on the ontology of time. Aristotle's notions of time and space are characterized by an intrinsic relationality that resonates with modern physical theories, notably Einstein's Special and General Relativity and quantum physics, especially Rovelli's theory of Loop Quantum Gravity. By re-examining Aristotelian physics, this study contributes to the ongoing dispute between substantivalist and relationalist approaches to time and spacetime.

The analysis begins with Aristotle's unresolved aporias concerning the reality of time. In *Physics* IV, Aristotle asks whether time belongs to what is or to what is not, and what its nature is (217b32), suggesting that time exists only "scarcely and dimly" (217b30–31). This hesitation has often been interpreted as an anti-realist stance. Aristotle does not directly resolve this aporia, but proceeds by examining the relation between time and change, defining time as "the number of change in respect of the before and after" (219b1). Time is not a substance but a number; it is continuous like motion and indefinitely divisible. Although Aristotle places time under the category of quantity, its status as a number and its dependence on change and enumeration invite an analysis in light of the category of relatives. This approach also requires addressing the aporia concerning the role of the soul that counts change.

In *Categories* 7, Aristotle defines relatives as entities that are what they are only in relation to something else (6a36–37). The philosophical difficulty lies in determining their ontological status, since Aristotle defines substance as that which is neither said of nor in a subject (2a12–13), seemingly excluding relatives from substantial being. Aristotle resolves this tension by redefining relatives as those entities whose being consists in being related to something else (8a32–34). Relatives are not substances but accidents, whose actuality depends on the actuality of their relata. They exist in a derivative and dependent way, as relations between existing entities.

By comparing the ontological status of relatives with that of time, this work proposes a solution to Aristotle's aporias. Time exists because change exists and because there is a soul capable of counting it. Like relatives, time possesses a local and relational mode of existence. Aristotle's theory of act and potency helps clarify how accidents and relations exist as actualizations in or between substances.

The relational structure at the core of Aristotle's concept of time allows for a meaningful dialogue with contemporary relational theories of time and spacetime. In Aristotle, General Relativity, and Loop Quantum Gravity alike, time is not a flowing substance but a relational structure: of change, of the geometric field, and of quantum interactions, respectively. Despite its limits, Aristotle's local and relational ontology of time offers valuable conceptual tools for understanding the nature of spacetime today and the structure of reality.

REFERENCES

Aristotle, *Categories*, trad. eng. J.L. Ackrill, Oxford: Clarendon Press, 1963.

Aristotle, *Metaphysica*, trad. eng. W.D. Ross, Oxford: Clarendon Press, 1908.

Aristotle, *Physics*, trad. eng. E. Hussey, Oxford: Clarendon Press, 1983.

Castelli, Laura M., (introduction, translation and comment), *Aristotele: Fisica, Libro IV*, Roma: Carocci, 2012.

Pooley, Oliver, *Substantivalist and Relationalist Approaches to Spacetime*, Oxford: Oriel College, 2012.

Rovelli, Carlo, "Aristotle's Physics: a Physicist's Look" in *Journal of the American Philosophical Association*, 1 (2015), pp. 23-40.

Sedley, David, "Relatività aristoteliche (Parte I)623-", in *Dianoia* 2, 1997, pp. 11-25.

Sedley, David, "Aristotelian Relatives" in *Le style de la pensée*, edited by M. Canto-Sperber and P. Pellegrin, Paris, Les Belles Letres, 2002.

Ugaglia, Monica, *Modelli idrostatici del moto da Aristotele a Galileo*, Roma: Lateranio University Press, 2004.

Ugaglia, Monica, (introduction, translation and comment), *Aristotele: Fisica, Libro III*, Roma: Carocci, 2014.

Wieland, Wolfgang, *La fisica di Aristotele*, trad. it. di C. Gentili, Torino: Rosenberg&Sellier, 2018.