Materialist Theories of Time

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Historically, materialist thought on time has divided into two opposing trends: those following Democritus, including the Stoics and Gassendi, who see time as that in which matter exists, a kind of precondition for material existence; and those following Aristotle and Epicurus, who see time as an accident of motion or change. Arthur argues that the latter type of theory is to be preferred, being in accordance with the kind of nominalism which he sees as the distinctive characteristic of materialist thought: entities mistakenly thought to exist independently of us and our "temporal" activity -whether souls (la Mettrie), religion-based moral law (d'Holbach), fixed biological species (Diderot, Darwin), gods (Feuerbach), or commodities (Marx)- are revealed to be artifacts resulting from interactions among material things, organisms, or people. Against this background Arthur considers in the third part of the paper the new initiatives in understanding time that have been launched by researchers of quantum gravity, where Barbour and Rovelli argue for the "elimination of time", while identifying Leibniz (together with Mach) as their chief inspiration.

Tempus item per se non est, sed rebus ab ipsis consequitur sensus

Titus Lucretius Carus

Historical Views

What would constitute a materialist theory of time? A first thought might be that, if matter is what exists in space and time, then time should be an existing something within which matter can undergo its changes. According to Aristotle, some of his predecessors thought of time as a container in a quite concrete sense, and others identified it with the motion of the heavens. 1 Thus Pherecydes of Syrus (a contemporary of Anaximander), whom Aristotle regarded as a “hybrid” thinker who wrote only partly in a mythica(l vein, began his book: “Zas [i.e. Zeus] and Chronos [Time] always existed, and so did Chthonie; and Chthonie acquired the name Earth when Zas gave her the Earth as a bridal gift.” 2 (Over)interpreting, perhaps, matter existed even before Zas/Zeus gave it form, and it existed in time, which thus also existed. Of course, it is difficult to know just how to interpret such early texts written in a quasi-mythical vein, and one cannot simply take the personifications to signal literal belief in them as entities. Anaximander, who was one of the originators of prose writing in philosophy, nevertheless regarded time as a

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kind of arbitrator adjudicating the claims of competing tendencies, whereas Pythagoras is reputed to have called it the soul or procreative element in the universe. Presumably, neither of these personifications of time are supposed to be taken literally, but they are consistent with a worldview in which time (Chronos), being an uncreated principle, was regarded as divine.

Nevertheless, there are other indications that these early thinkers thought of time as something quite concrete. Ancient commentators described Pherecydes' Chronos, for instance, as a kind of receptacle: it is that in which the things that Zas (the creative element) has created out of Chthonie (the matter) exist. Again, one surviving line of Empedocles appears to refer to time as the revolving heavenly sphere: “In turn they come to power as time revolves”. Similarly, Plato (like Empedocles, much influenced by Pythagorean thought) explicitly identified each planetary orbit as a time, and called time itself a “moving image of eternity”. According to these latter formulations, then, time seems to be a concrete thing or motion: either the revolving heaven containing all, or the revolutions of the planets: the month, the year, and the annual cycle of the various planets.

Antiphon was perhaps the first to emancipate himself from this conception of time as a concretum. In one of the surviving fragments of his thought, he says: “Time is a thought or measure, not a substance.” This notion is in keeping with the general tendency of the thinkers Plato dismissed as “Sophists”, to see things which their predecessors had thought of as “by nature” to be in reality “by convention”. By the latter half of the fifth century, when Antiphon was active, the conventional element of time measures would in any case have been made more obvious by the various problems with the calendar: Meton had introduced his calendar reform in 432 B.C. At any rate, the idea of time as a measure is taken up by Aristotle, who followed Antiphon in making time measurable, and dependent on a soul to count its measures: “Time is that feature of change which makes number applicable to

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3 Anaximander: “It is necessary that things should pass away into that out of which they came into being. For things must pay one another penalty and compensation for their injustice according to the ordinance of Time.” From: Simplicius, Commentary on the Physics, §24. from Barnes, Early Greek Philosophy, op cit, p. 75.
6 Empedocles [B 17.39], Simplicius, Commentary on the Physics 1183-4; in Barnes, Early Greek Philosophy, op cit, p. 177. Also perhaps suggesting time as a container is “As they [Love and Hate] were formerly, so also will they be, and never, I think, shall boundless Time be emptied of these two.” (DK 16) in Freeman, op cit, p. 53.
7 In Plato’s Timaeus, quoted in Whitrow, op cit, p. 19.
8 (DK 9) in Freeman op cit, p.145.
9 Whitrow, op cit, p. 32, 45, 189.