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RESEARCH GROUP (D-II-1) THE ONTOLOGY OF SPACE

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## THE ONTOLOGY OF SPACE

Research results of the period from

01.04.2008 – 01.04.2012

## Members of the research project

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## Description of research question, approach and results

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### Research question

How does Aristotle understand the ontology of space, spatial relations and spatial entities?

### Research methodology and approach

We approached the research questions through *close reading* of relevant texts, reconsideration of their *philological basis* in the manuscript tradition (when called for), *systematic reconstruction and assessment* of the arguments, guided always by sensitivity to their place in the ancient *history of science*. The work on this project benefited from close ties with the Junior Research Group, “Place, Space and Motion,” particularly the post-Aristotelian perspective.

### Results

This group’s main achievement has been to bring into focus a cluster of issues concerning the relationship of space and body. This relationship is intimately connected with the status of knowledge of space and its relationship to knowledge of body. These issues surface in a variety of diverse but related philosophical contexts from the pre-Socratics, through Plato and Aristotle, to the Hellenistic schools and the commentary literature of Late Antiquity.

Gábor Betegh solved a problem that arises within Plato’s *Timaeus* about what two bodies cannot be in the same place at the same time. Because his answer makes no use of the concept of impenetrability, it is both philosophically interesting (since one would have expected impenetrability to play a role) and textually justifiable (since the text says nothing about impenetrability). Betegh’s answer has two parts. The first concerns any two bodies of different kinds, for instance a particle of fire and a particle of water. Any two bodies of different kinds will necessarily have opposite properties (for instance hot and cold), and opposite properties cannot be present at the same time at the same place. This account does not, however, apply to two bodies of the same kind, and a second answer must be

sought to cover such cases. The proposed, and more tentative, answer relies on the stricture, explicit in the text, that these crafted bodies be as beautiful as possible – where »beautiful« means »geometrically regular.« If two particles of the same kind were to interpenetrate, an ugly body would result.

Beere has also done substantial work on the *Timaeus*. His work has focused on the relationship between the so-called Receptacle and the bodies that are “in” the receptacle. He argues that the Receptacle is the bearer of certain fundamental perceptible properties (viz., the properties of the traditional elements), but that it is nevertheless not a part of any perceptible body. Thus, in the *Timaeus*, being a part and being a subject of a property do not come together in the way that we would normally expect. This is a philosophically challenging and interesting position, and a new way of interpreting the text.

Our working group has arrived at four results regarding Aristotelian themes related to body and to space. (1) The first concerns the reasons why Aristotle espouses the doctrine that two bodies cannot be in the same place at the same time, but he does not explain its basis. Christian Pfeiffer has worked out a very interesting idea, which, like Betegh’s reading of the *Timaeus*, explains this principle about bodies in much more »metaphysical« terms than one might have expected. In particular, Pfeiffer thinks that Aristotle specifies necessary and sufficient conditions for the individuation of bodies in terms of their boundaries. Two bodies cannot be in the same place because this would entail that they have the same boundaries at the same time, which is for Aristotle impossible.

(2) In his dissertation “The Metaphysics of Bodies in Aristotle” (written in English, submitted March 2012), Christian Pfeiffer investigated the role the notion of body has for Aristotle’s conception of physical science. He argued that an analysis of the notion of body should be part of the conceptual investigation of basic notions of physical science we find in *Physics* III and IV. Although Aristotle did not devote a series of chapters to the notion of body as in the case of place, time and void, the notion of body is of equal importance for his project in the *Physics* and it is possible to reconstruct a unified and comprehensive theory of body. Pfeiffer thereby shows (1) why the study of bodies is a genuinely physical study and how it differs from a mathematical analysis of body. (This further develops ideas from the paper he wrote together with Betegh and Pedriali for *Rhizai*.) (2) He further shows how the general thesis about the place of Aristotle’s arguments sets the context for Aristotle’s specific views on bodies. More specifically, Pfeiffer investigates (among others) how (2a) the priority of bodies over lower-dimensional magnitudes, (2b) the difference between continuity and contact, and (2c) the claim that the parts of a body exist potentially are all grounded in the metaphysical constitution of physical bodies.

(3) Beere focused in his book, *Doing & Being*, on the conceptual and metaphysical foundations of Aristotelian metaphysics, namely the concepts of *energeia* and *dunamis*. He argued that the traditional understanding of these concepts has to be revised. *Energeia* has to be conceived in such a way as to cover, without ambiguity, both activities and states. *Dunamis* is to be understood as a capacity. These concepts play an integral role in Aristotle's thought about space: e.g., some places exist in capacity; some bodies have parts in capacity; some geometrical objects are divided in capacity; the void may or may not have being in capacity (Aristotle seems to contradict himself on this). In one chapter of his dissertation, Pfeiffer builds directly on this work, showing it bears on the metaphysics of bodies and their parts.

(4) Anagnostopoulos has been attempting to clarify what change, including in particular locomotion, amounts to for Aristotle. He has found that several of Aristotle's most fundamental discussions of change in his *Physics* are motivated not by convictions about the ontology of change, but by the need for change to be subject to explanation. Anagnostopoulos's bold view is that Aristotle's conception of change does not commit him to the problematic claim that change is an »actuality«, but rather to change being a species of activity or event (*energeia*) (Andreas Anagnostopoulos, „Change in Aristotle's *Physics* III“, in: James Allen, Eyólfur Emilsson, Ben Morison und Wolfgang-Rainer Mann [Hrsg.], *Oxford Studies in Ancient Philosophy. Essays in Memory of Michael Frede*, Oxford - New York: Oxford University Press, 2011, 33–79). This raises several difficult questions about how to distinguish genuine changes from other activities. One of the most interesting such cases concerns the boundary between natural science and psychology. Anagnostopoulos argues that the crucial factor that distinguishes perception from genuine change can be traced back to Aristotle's definition of change in *Physics* III, as »the activity of a potential being, as such.« According to Anagnostopoulos, Aristotle has in mind a restricted notion of potentiality that does not apply to perceivers, as such. Anagnostopoulos's collaboration with the group, »Mapping Body and Soul« (D-III-E-II-2) has been especially fruitful in supporting his research on the relations between Aristotle's natural science and psychology.

Body returns to center stage in Betegh's work on Sextus Empiricus. In *Against the Physicists*, Sextus argues against physics by arguing against the coherence of the very concept of body. Oddly, however, Sextus's arguments are drawn, often word for word, from another work, *Against the Mathematicians*. But the physics Sextus' targeted distinguished sharply between physical and mathematical bodies, so that it is unclear how a criticism of the one concept can be applied to the other. Betegh draws two related conclusions. First, he suggests that Sextus may in fact have borrowed from earlier physicists' arguments against the geometrical concept of body. But while the physicists used these arguments either to show the internal incoherence of geometry or to show its irrelevance to a description of physical bodies, Sextus turns these arguments against the physicists themselves. Is this

reasonable and justified, or is it sophistry? This brings us to Betegh's second conclusion. Sextus seems to work on the reasonable (although certainly defeasible) assumption that the coherence of any physical concept of body presupposes the coherence of the geometrical concept of body. After all, all the relevant parties agree that both physical bodies and geometrical bodies are three-dimensionally extended figures. It is thus reasonable to think that if the concept of a three-dimensionally extended figure is incoherent, then *a fortiori* the concept of physical body, like the concept of geometrical body, is incoherent.

### **Discussion of the results in the light of current research**

Beere's work on *energeia* and capacity has rejected wide-spread conceptions of these concepts (especially the understanding of *energeia* as actuality). The ramifications of this for Aristotle's other views have yet to be worked out. His (unpublished) work on the *Timaeus* constitutes a new interpretation of a much-discussed text. Previous interpretations have treated the Receptacle as matter or space or both; Beere treats it as neither.

Pfeiffer's dissertation is a major contribution to the literature on Aristotle's physics and metaphysics. It fills an acknowledged lacuna. The project is surprisingly large for a dissertation, but it executed impressively. Previous interpretations of body (and other magnitudes) in Aristotle's works have typically assumed that the arguments are mathematical in character. Pfeiffer thereby shows both that the context of many passages has been wrongly conceived and why this has led to erroneous interpretations. Moreover, his work is the most comprehensive discussion of Aristotle's views on bodies. It will force a rethinking of Aristotle's views about bodies, physics and mathematics.

Anagnostopoulos's paper on the definition of change (2010) rejects, with compelling arguments, the interpretation of that definition that has been dominant since the 1960's. This is a major shift in how we view the definition of change and its role in Aristotle's thought.

Betegh's work on the *Timaeus* shows a new way of thinking about the impossibility of interpenetration (viz., not by way of impenetrability) and a new way of understanding Sextus's arguments against the coherence of the concept of body.