

Minimal Aristotelian Ontology

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Keywords: Barry Smith, formal ontology, applied ontology, Aristotelian Ontological Square, SNAP, SPAN, Rudolf Carnap, Peter Frederick Strawson, ontological minimalism, descriptive metaphysics, substances, *entia minora*, universals, time

INTRODUCTION

Barry Smith is a man of such strong views that his greatest impact on other researchers, especially if these are equally opinionated, may be the often forceful resistance his ideas are met with. Occasionally, however, after having interacted with him, with hindsight one realizes that he changed one's mind after all, even though one's first reaction may have been one of loathing. Thus, it is to Barry that I owe my having become an Aristotelian, but before anything else, he may have prevented me from abandoning philosophy for computing science. It was in 2001, during my stay as research associate at the Italian National Research Council in picturesque Padua, and while I was involved in the development of the foundational ontology DOLCE,¹ that I became aware of the work of the Mancunian brothers-in-arms Barry Smith, Kevin Mulligan and Peter Simons, as exemplified in particular by the volume *Parts and Moments* edited by Barry in 1982. I was immediately charmed and won over by their staunch and apt defense of a rich Aristotelian metaphysics which not only allows for universals and particulars alike, but recognizes substances as well as dependent *entia minora* or *moments*. The contrast with the Quine-Davidson tradition in which I had been previously raised as a philosophy student was truly mind-blowing, and when Barry founded the Institute for Formal Ontology and Medical Information Science at the University of Leipzig, I gladly seized the opportunity to join him there as a Humboldt fellow in 2002. This decision marked a turning point in my life, even though I was definitively converted to a rich Aristotelian ontol-

ogy only later, while writing my Ph.D. under the joint supervision of Barry and Kevin Mulligan at the University of Geneva between 2003 and 2007.

If there is one paper among the whole body of Smith's work I would have to cite as having had the most lasting influence on the orientation of my research, it is his 1997 article "On Substances, Accidents and Universals: In Defence of a Constituent Ontology." Indeed, with this essay Barry revived an ancient conceptual framework that Ignacio Angelelli (1967, p. 11ff; 1991, p. 12) has named the "Ontological Square,"² a four-fold division of entities suggested³ in Aristotle's *Categories* 1a20–1b10 which is based on two orthogonal distinctions, namely:

- 1 being in a subject vs. not being in a subject, i.e. *attributes* vs. *substances*, and
- 2 being said of a subject vs. not being said of a subject, i.e. *universals* vs. *particulars*.

The cross-wise combination of these dichotomies results in a categorial scheme which comprises universal and particular substances, i.e. *kinds* and *objects*, as well as universal and particular attributes, i.e. *characters* and *moments*:

	Substances	Attributes
Universals	Kinds e.g. Man	Characters e.g. Wisdom
Particulars	Objects e.g. Socrates	Moments e.g. Socrates' wisdom

Universal substances or kinds (e.g. Man) are instantiated by particular substances or objects (e.g. Socrates). Particular attributes or moments (e.g. Socrates' wisdom) are cases or tokens of universal attributes or characters (e.g. Wisdom). Moments are said to inhere in objects, e.g. Socrates' wisdom inheres in Socrates.

The Aristotelian Ontological Square has been later on advocated as a foundation for natural science by the late E. J. Lowe, notably in his "The Four Category Ontology" (2006). Though this book greatly inspired me, it is Smith's 1997 essay which has started my own obsession with the subject. And if I have developed a Logic of the Ontological Square (Schneider 2009; 2010), this is also due to Barry's consistent attacks against fantology (Smith, 2005), the idea that ontology can be simply read off the logical form of standard predicate calculus.

Meanwhile, Barry himself, however, has moved on to a Six Category Ontology consisting of objects, moments and processes as well as their respective universals (Smith 2005; Arp, Smith, and Spear 2015). I believe that the most appropriate way to acknowledge my deep indebtedness to Barry's work and encouragement is to revisit some issues that have always troubled me and with respect to which I respectfully beg to differ with Barry as his loyal, if slightly dissident, student.

The topics related to the Ontological Square I will discuss in this contribution are the following:

1. How can the choice of such a rich ontological scheme be motivated beyond mere considerations as to its applicability within information science?
2. How can the Ontological Square be formally reconstructed?
3. How can we do justice to time and change within the Ontological Square?

The first question is intimately tied to the issue of realism dear to Barry, and my heretical answer will be a combination of Carnapian deflationism and Strawsonian descriptivism. It is also in the spirit of ontological deflationism or minimalism that the second question will be tackled, i.e. by providing a set of uncontroversial introduction and elimination rules for the various ontological categories. Thus, *pace* Barry, the completeness of the Aristotelian Ontological Square can be shown in a purely formal manner. Finally, my response to the third problem will commit me to a form of fragmentalism (cf. Fine 2005, 281–284), for the general framework of the Ontological Square has to be instantiated in infinitely many temporal ontologies which merely differ in the reference of

the uniquely designating expression "the present moment." To use Barry's terminology, I declare my latish conversion to SNAP (Grenon and Smith 2004), without however adopting SPAN (*ibid.*). In fact I will argue that, *pace* Barry Smith, the passage or flow of time cannot be captured, but shows itself exclusively in the succession of presentist ontologies.

2. JUSTIFYING THE ARISTOTELIAN ONTOLOGICAL SQUARE

2.1 The question of realism and ontological minimalism

The most immediate way of arguing for the choice of a given theory, respectively ontology, is to maintain (putting one's foot down) that it corresponds to reality, that it describes how reality is. Barry has tirelessly defended this position throughout his career, and even argued that realism is a methodological *sine qua non* for building good scientific ontologies (see Smith and Ceusters 2010). However, the realist notion of a correspondence to the world is open to anti-realist challenges.⁴ Unfortunately it does not do to reply to these attacks by providing an ontological account of truth as correspondence, since this essay is immediately questioned by anti-realists as "yet another theory," the correspondence of which to reality is an open question in turn. It is easy to see that these moves initiate a potentially endless argumentation game of challenges and parries (cf. Smart 1995) in which it remains ultimately undecided whether it is the realist or the anti-realist who ends up bearing the burden of proof, let alone who eventually wins the argument.

A popular escape from potentially endless debates is to deflate them, and I plead guilty of having ended up sitting with the deflators on the question of realism. Indeed, according to ontological deflationists or minimalists such as Rudolf Carnap (1950/1956) and Amie Thomasson (2015), existence questions fall into two sorts:

- they are either answerable by trivial inferences from uncontroversial empirical or conceptual premisses (such as the inference from "there are tables" to "there are material objects"), *or*
- they are really questions about the appropriateness to adopt a certain linguistic framework in which such existence claims can be stated.

This strategy has the advantage that objections to certain existence claims can be countered in two ways: either they can be rejected as plainly conflicting with the rules of use

that authorize the introduction of the contested entities, or they can be charitably re-interpreted as actually questioning the linguistic framework itself of which these meaning-constitutive rules are part. Therefore, the problem of justifying ontological commitments is ultimately to be settled by pragmatic considerations regarding the advantages and disadvantages of choosing a particular language which allows to state the existence of disputed entities.

Thus, ontological minimalism does not so much consist in deflating existence questions than in defusing ontological debates about existence claims regarding contested entities inasmuch as these claims are the conclusions of uncontroversial inferences within a given linguistic framework. In essence, the contestator is being faced with the inconsistency of wanting to have the cake and eat it: one cannot dispute the existence of entities of a certain class while using a language the rules of which allow referring to or quantifying over these entities.

Ontological minimalism goes hand in hand with a modest view of the role of philosophy in general and of ontology in particular that was dominant before the second half of the last century both within phenomenology and within analytic philosophy (Thomasson 2015, pp. 4–13). Briefly stated, the division of work between philosophy and science was perceived as follows: while the former uses conceptual methods, i.e. recurs to linguistic and/or conceptual analysis in order to clarify the meaning of notions that are central to scientific inquiry and everyday practice, the latter applies empirical methods to the investigation of matters of fact.

According to Thomasson, this modest view of ontology is best illustrated by Carnap's (1950/1956) approach to existence questions. Carnap distinguished *internal questions* from *external questions*, a distinction that echoes the dichotomy of *using* vs. *mentioning* terms. Indeed, while *using* terms referring to certain entities according to the rules of a given language, existence questions can be uncontroversially answered either by conceptual analysis or by empirical methods. So the question of whether a certain biological species exists can be tackled by empirical observations, while the problem whether there is a prime number between 17 and 23 can be figured out by mathematical calculation. Furthermore, from the statements "there are platypus" or "there is a prime number between 17 and 23" one can trivially infer "there are organisms" respectively "there are numbers." Now, within a language the rules of which license the inference to existence claims regarding certain entities such as numbers or properties, one cannot sensibly question the existence of the very same entities while using the terms that

are supposed to refer to them. However, the contestator may be charitably interpreted as *mentioning* these terms and as questioning the rationale of choosing a linguistic framework that permits the statement of those existence claims (Thomasson 2015, pp. 12, 39–44).

Hence Carnap's treatment of existence claims implies a simple realism about any entities the existence of which can be established according to the rules of the language that is respectively used (Thomasson 2015, p. 145f). Concurrently it also leads to a form of deflationism about philosophical debates concerning the existence of certain sorts of entities, since any such debate is spurious, not because the discussants are talking past each other, but because existence questions can be so easily and straightforwardly answered (Thomasson 2015, pp. 158–160).

It should be emphasized that Carnapian minimalism does not lead to relativism about existence and truth: that the meaning of terms like *planet* is dependent on the linguistic rules that govern the use of these terms does not imply that the truth of the statements "there is a planet between Mercury and Earth" or "there are planets" is a matter of linguistic convention (Thomasson 2015, p. 60). Furthermore, Carnap's approach does not presuppose a clear-cut distinction between analytic and synthetic propositions, but is compatible with there being a spectrum of intermediary cases (Thomasson 2015, p. 53 fn. 18). Finally, Carnapian minimalism is not committed to quantifier variance, but embraces the idea of existence as a univocal, formal notion governed by a fixed set of rules (Thomasson 2015, pp. 63–80).

2.2 Descriptive metaphysics to the rescue of ontological minimalism

The most serious objection to ontological minimalism is that it involves an element of arbitrariness as to the linguistic or conceptual framework in which existence questions are couched. But if it is a matter of arbitrary choice which language we adopt, then so is also the range of existence questions we may ask (Thomasson 2015, pp. 41–42).

Of course, Carnap and Thomasson do argue that this arbitrariness is only apparent, since it is a practical issue which language we choose in a certain context (Thomasson 2015, p. 42). The choice of linguistic or conceptual framework is thus determined by our purposes (e.g. to account for biological phenomena), but is also informed by theoretical considerations (e.g. as to the simplicity or fruitfulness to use a certain language in describing a given range of empirical phenomena). Nonetheless, though the decision to use a linguistic framework that allows for stating and answering certain

existence questions may not be totally arbitrary, there are doubtlessly many sorts of purposes one may want to achieve, and also a multitude of theoretical considerations that one may consider relevant. Hence, ontological minimalism does seem to imply ontological pluralism after all.

This may be a welcome consequence to some—certainly to me—since it allows for an equable attitude towards the maze of drawn-out debates about minutiae that lately seem to obstruct real progress in analytic ontology. Nonetheless, there undoubtedly remains the impression of an embarrassment of metaphysical choice. This feeling might be mitigated if one could identify a linguistic framework that is fundamental in some sense to every discourse. Now, it can be argued that ordinary language discourse underpins human practice in all its forms, and thus is prior to the specialist idioms of arts and sciences, which can be regarded as outgrowths of everyday speech. Therefore, while ontological pluralism seems to be an unavoidable consequence of ontological minimalism, it is possible to single out ordinary language as a linguistic framework presupposed by every kind of specialized talk, be it formal or informal. To put it in Austin's words: Ordinary language may not be the last word, but it should be the first (Austin 1979, p. 185).

It has to be pointed out, though, that the purpose cannot be to simply read off ontology from ordinary language use. It is more fruitful to focus on the underlying conceptual structures that constitute the preconditions of speech acts, in particular acts of referring and asserting. The task of identifying and analyzing these conceptual structures is incumbent upon descriptive metaphysics (Strawson 1959, pp. 9–10), which perfectly complements ontological minimalism.

Indeed, ontological minimalism and descriptive metaphysics agree on the view that the task of philosophy is to elucidate the structure of our thought, to trace the connections between our concepts in order to clarify the latter's function (Strawson 1992, 19), and to uncover the fundamental features of our conceptual and linguistic framework (ibid., 24). Now, this view starkly contrasts with the stance defended also by Barry that formal ontology uncovers the structure of the world; according to him, conceptual analysis as described above is a form of Kantianism. What is meant as an insult would only constitute an objection against descriptivism if the focus on our concepts implied an adoption of anti-realism. However, as already pointed out above, Carnapian minimalism does not imply relativism as to existence and truth. Moreover, conceptual analysis as defended by Strawson (and most recently by P. M. S. Hacker 2010) is compatible with the tenable core of the correspondence con-

ception of truth, i.e. what Paul Horwich (1998, p. 104f) has called “the correspondence intuition”, namely that our beliefs, including our ontological presuppositions, are the causal result of our exposure to or interaction with the world, be it through observation or through instruction by our peers (Strawson 1992, p. 95). Properly understood, Kantianism does not conflict with realism.

2.3 Descriptive metaphysics as Aristotelian ontology

As it has already been pointed out by MacMahon (1977), Strawson's descriptive metaphysics naturally provides the tools for reconstructing the Aristotelian Ontological Square. In fact, the distinctions within the Ontological Square can be motivated by considerations on the nature of acts of assertion (Strawson 1959, pp. 167–170). Asserting a proposition is tantamount to asserting a non-relational tie between terms, thus grounding the unity of the proposition.⁵

A term can be said to “collect” the entities of which it can be assertively tied to (Strawson 1959, p. 167). Each entity referred to by a term can thus be regarded as a principle of collecting other entities. Therefore, basic classes of entities can be distinguished in terms of the ways in which they collect other entities. For the purposes of the argument, we only need to take into account non-relational ties (1) between universals and particulars and (2) between particulars.

Let us first consider the case of universals collecting particulars and vice versa. A universal (e.g. Man, Wisdom) may collect an unlimited number of particulars (e.g. Socrates, Plato, Aristotle), but a particular (Plato) may equally collect innumerable many universals (Wisdom, Man, Philosopher, etc.) (Strawson 1959, p. 169). The difference between universals and particulars consists in the fact that particulars collect universals in virtue of their continuous identity (ibid.), while universals collect particulars in virtue of conferring them a resemblance (Strawson 1959, pp. 169, 170). In other words, a particular collects a set of universals simply by being the very same subject that the latter can be said of, while a universal collects a set of particulars, namely its extension, by being a resemblance maker for these particulars.

Amongst particulars we can differentiate between *objects* and *moments*: objects (e.g. Socrates) can collect an unlimited number of other particulars, especially moments (Socrates' wisdom, Socrates' baldness), while moments can be assertively tied to one particular, namely an object, only. Moments are *non-transferable* in the sense that they are specific to one object (or, in the relational case, to one series of objects) only.

Amongst universals we may distinguish between sortal universals or *kinds* and characterising universals or *charac-*

ters. A kind (e.g. Man) provides a principle of distinguishing, counting, and grouping together *objects* which does not presuppose the latter being already distinguished, counted or grouped together by another principle. A character (e.g. Wisdom), by contrast, may only provide a principle of counting and grouping together *objects* in virtue of them being already grouped together by another principle, i.e. ultimately by a kind (Strawson 1959, p. 168).

Particulars, whether objects or moments, are akin to characters inasmuch as they may only collect other particulars provided these are already distinguished or distinguishable by (other) universals.

Finally, characters not only collect objects, but also moments: indeed, whenever a character is assertively tied to an object, a moment that is collected by the character is also assertively tied to that object. Thus, that Socrates died implies there having been a moment, namely a particular death, that inhered in Socrates (Strawson 1959, p. 168). To sum up, then, we can distinguish between four non-relational ties that articulate the Ontological Square (cf. Fig. 1):

1. *instantiation*: an object *instantiates* or is an *instance of* a kind;
2. *tokenization*: a moment is a *case* or a *token of* some character;
3. *exemplification*: an object *exemplifies* a character;
4. *inherence*: a moment *inheres in* an object.

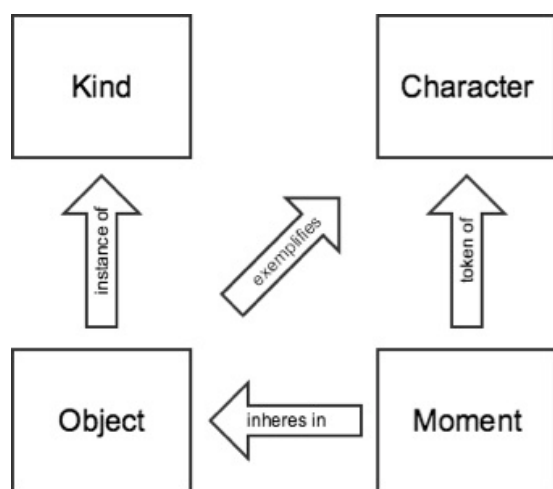


Fig. 1: The Ontological Square

The preceding reflections only constitute an *informal motivation* of the distinctions that make up the Ontological Square. A *formal justification* shall be provided in the shape

of introduction and elimination rules of respective existence claims within a formalisation of the fragment of ordinary language discussed above.

3. RECONSTRUCTING THE ARISTOTELIAN ONTOLOGICAL SQUARE

3.1 From features to objects

The deflationist approach to ontology sketched above is spelled out in a series of languages, each member of which, with the exception of the starting point, is a conservative extension of its predecessor in virtue of two operations:

1. the addition of *individual terms of a new category* to the alphabet of the predecessor,
2. the addition of *introduction/elimination rules* for statements involving these new terms, supplemented by further *auxiliary rules* governing the predicates that occur in these statements as well as by *definitions*.

The introduction/elimination rules play the same role in our version of neo-Carnapian deflationism as the instances of Thomasson’s (2015, p. 86) core rule for the term “exists,” according to which Ks exist if, and only if, the application conditions actually associated with the term “K” hold. These rules are certainly at the heart of ontological deflationism, but I agree with Evnine (2016) that they are not sufficient for providing a complete basis for the use of the terms that are introduced. In order to be able to infer properties of the admitted entities beyond those explicitly stated on the right-hand side of the introduction/elimination rules, one needs to adopt further rules and definitions. Here one may draw an analogy to the fact that deflationism about truth needs recursive rules in addition to the instances of the T-schema “<p> is true if and only if p” in order to offer a satisfactory framework for semantics.

The logical starting point for this successive enlargement is a language L^F in which no individual terms occur altogether. This would be a *feature-placing* language the well-formed formulae of which correspond to statements of a “naming game” such as:

- Rain(ing) here now!
- Water here now!
- Coal here now!
- Rabbit here now!

- Scent of roses here now!
- Red here now!

that simply protocol the apparition of subjectless features within the sphere of conscious experience (Strawson 1959, pp. 202–203). These features may be that of homogeneous stuffs, as in the case of “water” or “coal,” of heterogeneous patterns of spatial or temporal occupation, as in the case of “rabbit,” or of qualia such as “scent of roses” or “red.”

It should be emphasized that features are not properties of space-time points, since the spatial and temporal adverbs appearing in the statements of a feature-placing language are to be regarded as sentential, namely modal operators. I shall return to the issue of temporal modality further below. So let us consider the atomic well-formed formulae of L^F as corresponding to single-word phrases in natural language. More precisely, the predicates of L^F are all anadic, and thus by themselves constitute the atomic sentences of L^F .

The feature-placing language L^F can be extended to an object-centered language L^O , which in addition to anadic predicates or single-word sentences comprises predicates of any adicity, with argument places for variables ranging over the domain of *objects* (x^o, x_1^o, x_2^o , etc., y^o, y_1^o, y_2^o , etc., z^o, z_1^o, z_2^o , etc.).

A mapping μ associates to each L^F -predicate a set of L^O -predicates of non-zero adicity. Indeed, some features, e.g. those corresponding to homogeneous stuffs such as “coal,” may be associated to more than one predicate of objects, e.g. “lump of coal,” “grain of coal,” or “veins of coal,” since they may be subject to arbitrary (de-)compositions. Other features, in particular those that are tantamount to patterns of spatial and temporal distribution, may generally be associated with single predicates of objects only, since they may not undergo arbitrary fusions.

Given the mapping μ , one can, for each pair of predicates ϕ of L^F and ψ of L^O , such that $\psi \in \mu(\phi)$, propose an introduction/elimination rule, which has ϕ as its single premiss and a full existential quantification of the open formula $\psi(x_1^o, \dots, x_n^o)$ as its conclusion:

$$\mathbf{IE1} \quad [\psi \in \mu(\phi):] \quad \phi \vdash \exists x_1^o \dots \exists x_n^o \psi(x_1^o, \dots, x_n^o)$$

Those L^O -predicates, for which holds

$$\vdash \exists x_1^o \dots \exists x_n^o \psi(x_1^o, \dots, x_n^o)$$

are referred to as *satisfiable* predicates. There is a subset S of monadic predicates of L^O such that identity statements about objects presuppose that these objects jointly satisfy at least

one member of S : these predicates are called *sortals*.⁶ I write “ ψ^{+s} ” for “is a sortal” and “ ψ^{-s} ” for “is a non-sortal.”

Note that by no means the passage from a feature-placing language to an object-centered language sketched here is claimed to be cognitively plausible in any way. Far from presupposing that each speaker of English or any other natural language ever consciously goes through the stage of feature-placing, this step merely serves as a starting point for a *logical* construction.

3.2 Universals: kinds and characters

The language L^O can be extended to the language L^U by introducing individual variables ranging over *universals*, i.e. *kinds* (marked by the superscript “ k ”) or *characters* (marked by the superscript “ c, i ”), where i is a number indicating the adicity of the character):

- $X^k, Y^k, Z^k, X_1^k, Y_1^k, Z_1^k, X_2^k, Y_2^k, Z_2^k, \dots$
- $X^{c,i}, Y^{c,i}, Z^{c,i}, X_1^{c,i}, Y_1^{c,i}, Z_1^{c,i}, X_2^{c,i}, Y_2^{c,i}, Z_2^{c,i}, \dots$

Furthermore, I adopt a dyadic predicate “ $X^{k/c,i}; \psi^{+/-s}$ ” (reading: “ $X^{k/c,i}$ is the abstraction of $\psi^{+/-s}$ ”), which holds between universal variables and *satisfiable* predicates of L^O , such that sortal predicates are always associated with kind variables and n -place non-sortal predicates always with character variables of (non-zero) adicity n . Thus one can stipulate introduction and elimination rules for existential claims about kinds and characters:

$$\mathbf{IE2} \quad \psi^{+s}(x^o) \vdash \exists X^k (X^k; \psi^{+s} \wedge x^o \iota X^k)$$

$$\mathbf{IE3} \quad \psi^{-s}(x_1^o, \dots, x_n^o) \vdash \exists X^{c,n} (X^{c,n}; \psi^{-s} \wedge x_1^o, \dots, x_n^o \in X^{c,n})$$

where “ $x^o \iota X^k$ ” means that the object x^o *instantiates* or is an *instance* of the kind X^k , and “ $x_1^o, \dots, x_n^o \in X^{c,n}$ ” means that the objects *exemplify* the (n -adic) character $X^{c,n}$.

3.3 Moments

The language of universals L^U can be expanded into the language of moments L^M by introducing variables ranging over moments of any (non-zero) adicity i , i.e.

$$x^{m,i}, y^{m,i}, z^{m,i}, x_1^{m,i}, y_1^{m,i}, z_1^{m,i}, x_2^{m,i}, y_2^{m,i}, z_2^{m,i}, \dots$$

and by adopting the introduction/elimination rule

$$\mathbf{IE4} \quad x_1^o, \dots, x_n^o \in X^{c,n} \vdash \exists x^{m,n} (x^{m,n} \tau X^{c,n} \wedge x^{m,n} \langle x_1^o, \dots, x_n^o \rangle)$$

where

1. “ $x^{m,n} \tau X^{c,n}$ ” means that the moment $x^{m,n}$ is a token of the character , and
2. “ $x^{m,n} \langle x_1^o, \dots, x_n^o \rangle$ ” means that the moment $x^{m,n}$ inheres in the objects x_1^o, \dots, x_n^o .

It is commonly assumed that moments are not transferable from one object to another. In other words, no moment may inhere in more than one object or tuple of objects:

$$\mathbf{R1} \quad x^m \langle x_1^o, \dots, x_n^o \rangle, x^m \langle y_1^o, \dots, y_n^o \rangle \vdash x_1^o = y_1^o \wedge \dots \wedge x_n^o = y_n^o$$

In the process of introducing terms for entities of the various categories within the Aristotelian Ontological Square, we have also added predicates for instantiation, exemplification, inherence and tokenization. These predicates may aptly be called “transcendentals” inasmuch as they cross the categorial borders between kinds, characters, objects and moments. For this reason, it is only a matter of caution not to augment the Language of the Ontological Square with introduction rules that would allow the reification of those predicates, a choice which amounts to a form of nominalism about purported higher-order universals.

3.3 Grounding and the ontological priority of objects

Using the introduction and elimination rules stated above, a partial order of grounding relations between ontological categories can be defined and a class of entities can be identified as ontologically basic in the sense of being the least element in that partial order.

Now, the reader should be reminded that according to ontological deflationism all existence statements are equally deep or shallow. This means that an ontological deflationist cannot, on pain of incoherence, both maintain that items of certain categories exist *and* that they are “nothing over and above” whatever category of entities that may be considered ontologically basic. In ontological minimalism, as pretty much elsewhere, there ain’t such a thing as a free lunch. However, while “free lunch” double-talk is not permissible within ontological minimalism, the ontological commitment to entities of a basic category may be considered to be more fundamental than the ontological commitment to classes of entities that are higher up in the grounding hierarchy.

Let the notions of “immediate grounding” and “grounding” be defined as follows. A class of entities C1 immediately grounds a class of entities C2 if, and only if C1 appears in the introduction and elimination rule for C2. A class of entities

C1 grounds another class of entities C2 if, and only if there is a third class of entities C3 such that C1 grounds C3 and C3 immediately grounds C2.

By this definition, and in consideration of the succession of introduction and elimination rules described in the previous section, one can say that objects immediately ground kinds as well as characters, and thus also ground moments. Characters immediately ground moments, but neither kinds nor moments ground any other class of entities (cf. Fig. 2).

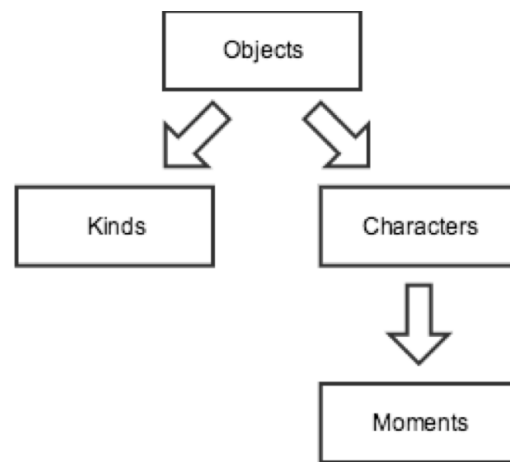


Fig. 2: Grounding between the elements of the Ontological Square

The fact that objects ground all other classes of entities within the Ontological Square represents a “victory of substantial particularity,” inasmuch as both universals and moments are grounded on objects. However, the present view also supports realism in the sense that the introduction rules ensure the existence of all classes of entities that belong to the Ontological Square. So the present approach emphasizes the primacy of objects without denying the existence of kinds, characters and moments, which is certainly Aristotelian in spirit if not in letter.

4. TAKING TIME SERIOUSLY WITHIN THE ONTOLOGICAL SQUARE

4.1 Times as substantial universals

According to Strawson (1959, p. 38f), objects, more specifically material bodies, are also ontologically prior to other particulars in terms of particular-identification. The members of a category *A* are (generically) ontologically prior to those of a category *B* if, and only if the *Bs* are *identifiability-dependent* on the *As*, i.e. if, and only if the *Bs* can only be identified provided the *As* have already been singled out (Strawson 1959, p. 17). Objects, being three-dimensional particulars with some endurance through time, are identifiability-independent because they alone are suitable for being nodes within a single spatiotemporal framework of reference on which particular-identification ultimately rests (Strawson 1959, p. 39).

However, someone could object to this thesis on the ground that objects are not fine-grained enough in terms of their duration in order to constitute sufficiently many temporal reference points within a spatiotemporal framework of reference. This may be one of the main reasons why Barry, following Moravcsik (1976), has adopted the view that the Aristotelian Ontological Square must be completed by adding two categories, namely processes and processual universals (see Smith 2005). Nonetheless, I maintain that since objects gradually come into and go out of being while their durations overlap, there should be enough of classes of contemporaneous objects to stand in for times. Let us assume that these classes are a special subcategory of kinds: these kinds could be regarded as the bearers of temporal relations. In other words, I propose to regard times as a special sort of substantial universals. So, substances are ontologically prior in terms of particular-identification after all, if among substances one includes universal substances, i.e. kinds, as well as particular substances, i.e. objects.

Objects are in time inasmuch as they instantiate times; since they *endure* in time, they may instantiate more than one time. But objects are not the only temporal entities. Indeed, in order to account for accidental change, one may assume moments, including the spatial locations of objects, to be temporally located, too. Thus, an object's having incompatible properties at different times amounts to moments with different temporal locations inhering in the very same object. There are some significant differences between moments and objects with respect to being in time, though. On the one hand, temporal location of moments cannot not

be analyzed in terms of instantiation as in the case of objects. On the other hand, it is arguable that, contrary to objects, moments may be instantaneous, i.e. temporally unilocalized.

4.2 Elements of a basic theory of time

Assuming that times can be associated with universal substances or kinds, our task is to find introduction and elimination rules for existence claims specifically about times, kinds having already been introduced at an earlier stage of the construction of the Language of the Ontological Square.

In a Priorian fashion, we may assume that ordinary modal idioms are primitive and that modal statements constitute the entry ticket for commitments to times (cf. Prior 1959/1976). Let us assume a simple, if not simplistic modal language for temporal reasoning, namely $K4_t$: The modal operators *F* ("sometimes in the future") and *P* ("sometimes in the past") are assumed to be primitive, while the operators *G* ("it is always going to be the case that") and *H* ("it has always been the case that") are defined in a straightforward manner:

$$D1 \quad G\phi \equiv \sim F \sim \phi$$

$$D2 \quad H\phi \equiv \sim P \sim \phi$$

Assuming that each syntactically independent or top-level sentence is to be evaluated at the present time, we can formulate two introduction and elimination rules, one for future times and another for past times, a commitment to the present time being concurrent in both rules. So the sentence "sometimes in the future it will be the case that ϕ " is the antecedent for the statement that there is at least one time *T* that is preceded by the present time such that ϕ holds at *T*.⁷

$$IE6a \quad F\phi \dashv\vdash \exists T (T^@ < T \wedge [\phi]^T)$$

Correspondingly, the sentence "sometimes in the past it is the case that ϕ " is the antecedent for the statement that there is at least one time *T* that precedes the present time such that ϕ holds at *T*.

$$IE6b \quad P\phi \dashv\vdash \exists T (T^@ < T \wedge [\phi]^T)$$

In order to guarantee that all theorems of $K4_t$ turn out to be true, the relation of temporal precedence has to be transitive at least.

$$R2 \quad T < T', T' < T'' \vdash T < T''$$

The definition of the expression “ ϕ holds at T ” ($[\phi]^T$) is obvious for molecular statements; I focus on atomic statements. Now, I suppose, but will not argue for the stance that instantiation of kinds by objects and tokenization of characters by moments are temporally invariant, that is, an object is an instance of its kinds *simpliciter* or *atemporally* and a moment is a case or token of its characters *simpliciter* or *atemporally*.⁸ This invariance is ensured by stipulating that “ $[x^o \iota X^k]^T$ ” is equivalent to “ $x^o \iota X^k$ ” and “ $[x^{m,n} \tau X^{c,n}]^T$ ” is equivalent to “ $x^{m,n} \tau X^{c,n}$.” Therefore, the only atomic statements affected by tense are exemplification claims and inheritance claims.

Thus, the statement that a moment inheres in a (sequence of) object(s) *at a certain time* is tantamount to the statement that the moment inheres in this sequence/object *and* that it is located at or a case of that time.

$$D3 \quad [x^{m,n} \langle x_1^o \dots x_n^o \rangle^T] \equiv x^{m,n} \langle x_1^o \dots x_n^o \rangle \wedge x^{m,n} \lambda T$$

The statement that a character is exemplified by a (sequence of) object(s) *at a certain time* is tantamount to the statement that the character has a case or token that inheres in this sequence/object at that time.

$$D4 \quad [x_1^o \dots x_n^o \in X^{c,n}]^T \equiv \exists x^m (x^{m,n} \tau X^{c,n} \wedge [x^{m,n} \langle x_1^o \dots x_n^o \rangle^T])$$

4.3 Fragmentalism and the ineffability of the passage of time

Presentism is the combination of two views:

1. the ordinary tense idioms are primitive;
2. only present entities exist.⁹

As far as (2) is concerned, both descriptivism and ontological minimalism do not seem to be very accommodating. On the one hand, the transcendental account of the conditions of possibility for particular-identification posits past and future entities within a four-dimensional framework of reference. On the other hand, within ontological minimalism, any reduction turns out to be a straightforward introduction of the reduced entities into discourse, not their elimination from it. This means that in a deflationist context, any attempt to eliminate references to past and future entities by reducing them to references to presently existing things actually ends up providing grounds for existence statements about non-present entities, these grounds being exactly those statements that are supposed to provide the analyses of existence claims about past and future things.

The situation is slightly different with respect to (1). I have shown above how in a minimalist descriptivist setting modal idioms may be used as entry tickets or grounds for existence claims about times.¹⁰ What is more, the existence statements that are introduced into the language already contain one ultimately irreducible modal idiom, namely that of the uniquely designating expression of “the present moment.”

If the flow of time is real, it is obvious that the reference of “the present time” is by no means rigid. This implies that the extensions of the predicates “past time” and “future time” are not rigid, either. Now, while Aristotelian Four-Category Ontology is incomplete without these notions, it seems to be under the threat of incoherence if it contains them: as time flees, what is future becomes present and what is present becomes past. The only way to preserve coherence is to distinguish between an untensed (or eternalist) and thus incomplete trunk ontology and an infinite sequence of tensed (or presentist) ontologies into which the former is successively instantiated and which only differ in the reference of the notion of “the present time” and the extension of the predicates “past time” and “future time.” The view that taking the passage of time seriously enforces a fragmentation of ontology and the abandonment of the idea of the unity of reality has been christened “fragmentalism” by Fine (2005, pp. 281–284),¹¹ but has been anticipated by Barry (see Grenon and Smith 2004) under the name of SNAP.¹²

Now, the passage of time enforces fragmentalism, but strictly speaking is invisible in each single presentist ontology. *Pace* Smith (ibid.), *a fortiori* this gap cannot be closed by adjoining an ontology of processes (which he calls SPAN) since this ontology is untensed. Hence neither a presentist ontology nor the eternalist trunk ontology can represent the passage of time: in this sense it is ineffable. Instead it shows itself in the succession of presentist ontologies: the flow of time is not ontological, nor meta-ontological, but literally dia-ontological.

What holds for the passage of time is even more so true for (human) action or activity (in the sense of *energeia*) as contrasted with the act (in the sense of *ergon*) that is its result. The diaontological character of action could be at the root of the puzzling problem of free will: the escape route between the Scylla of determinism and the Charybdis of indeterminism may be neither within, nor above, but in between ontologies.

CONCLUSION

To sum up, then, I basically agree with Barry on two views:

1. Aristotelian ontology remains a viable option both in philosophy and in applied ontology.
2. The nature of time, namely that time *passes*, suggests that there is no overall unitary account of temporal reality, but that its description is fragmented into a succession of infinitely many presentist ontologies.

Nonetheless, I disagree with him on four issues:

1. The commitment to a methodology that emphasises the role of conceptual analysis does not conflict with the fundamental assumption of realism.
2. The Aristotelian Ontological Square can be defended as a categorial framework of descriptive metaphysics using a minimalist methodology.
3. The Aristotelian Ontological Square as a Four Category Ontology is complete insofar as it:
 - a) accounts for the varieties of ordinary language attribution,
 - b) can be validated in a formally rigorous manner, by showing how, starting from a feature-placing language as a fictional “degree zero” of ontology, a series of languages can be constructed, each resulting from its predecessor by the addition of terms referring to or ranging over a new category of entities, as well as of introduction/elimination-rules for existence claims regarding members of this category.

Provided the reality of the flow of time is granted, even the totality of presentist ontologies or views on reality is incomplete in the sense that it cannot capture the passage of time. But the ineffable shows itself precisely where, *pace* Smith, ontology fails.

Let me close on a personal note: at the beginning of this paper I have described Barry as a man of strongly held opinions. I may add that he defends this views in an uncompromising, sometimes formidable manner, especially if he fundamentally disagrees with his opponent(s)—in this respect he is only equaled or maybe even surpassed by Kevin

Mulligan, my other “Doktorvater.” However, I have to acknowledge his immense generosity and even tolerance for diverging views if their holder is capable of standing his or her ground. In this respect I sincerely recognize my personal debt to Barry, since without his support and opposition, I would not be the philosopher I am, however minor this status may be.

NOTES

- 1 My only minute claim to fame in the applied ontology community is the fact that I am the last-mentioned co-author of the famous (2002) paper “Sweetening ontologies with DOLCE.”
- 2 So called because of its iconographic representation which can already be found in Carolingian manuscripts of Boethius’ commentary on Aristotle’s *Categories*; cf. Dufour 2014.
- 3 At least according to Porphyry’s Commentary (Busse 1887, pp. 22–79); cf. also Evangelidou 1996, pp. 51–53.
- 4 In applied ontology, this view has been defended e.g. by Gary Merrill (2010).
- 5 By calling the nexus between the terms a “non-relational tie,” one wishes to convey that it should not be reified as a relational universal.
- 6 In a sense I turn Wiggins’ principle of sortal dependence (cf. his 2001, p. 56) upside down in order to single out the class of sortals.
- 7 For variables over times, I shall ignore the complication of category superscripts.
- 8 I shall ignore the complication of so-called “phase-sortals”.
- 9 These views are classically put forward in Prior’s works (cf. Fine 2005, p. 133).
- 10 Note, however, that while this may be a reduction, it is not, by the very nature of the deflationist approach, an elimination.
- 11 It should be pointed out that I beg to differ with Fine concerning the ontological commitment to times.
- 12 It may be an irony that I have ended up admitting a position with which I used to differ viscerally while staying in Leipzig at Barry Smith’s IFOMIS.

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