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SNAP/SPAN IN BASIC FORMAL ONTOLOGY: AN ARISTOTELIAN SUGGESTION

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Abstrakt:

Basic Formal Ontology (Základní formální ontologie, zkr. BFO) vyvíjená Barry Smithem a jeho spolupracovníky je fundamentální ontologie užívaná v informační vědě k popisu entit na nejvyšší úrovni obecnosti. Jedním z nápadných rysů BFO je rozdělení entit na ty, které trvají (continuants) a jsou součástí ontologie SNAP (snap = snímek), a na ty, které se dějí (occurents) a jsou součástí ontologie SPAN (span = rozpětí). Toto dělení je motivováno kontroverzí mezi endurantismem a perdurantismem v současné analytické metafyzice. V tomto článku, v návaznosti na Aristotela, navrhuji v zájmu realismu určitou modifikaci Smithova přístupu.

Klíčová slova*: endurantismus vs. perdurantismus, Basic Formal Ontology (Základní formální ontologie), Aristotelés, Barry Smith*

Abstract:

Basic Formal Ontology (BFO), developed by Barry Smith and his colleagues, is a foundational ontology used in information science for the description of entities at the highest level of generality. One of the salient features of BFO is the division of entities into continuants of so-called SNAP (or snapshot) ontology and occurents of so-called SPAN (or spanning time) ontology. The division is motivated by an apparent impasse in the endurantist/perdurantist controversy in recent analytical metaphysics. In this paper, drawing on Aristotle, I suggest a realism-supporting modification of Smith's approach.

Keywords*: endurantism vs. perdurantism, realist perspectivalism, Basic Formal Ontology, Aristotle, Barry Smith*

Introduction

Basic Formal Ontology (BFO), developed by Barry Smith and his colleagues since 2002, is a foundational or upper-level ontology used in information science for the description of entities at the highest level of generality.[1] Though BFO is geared towards use in practical application rather than in philosophical speculation, due to its explicit realist orientation it directly concerns philosophy too.[2] Moreover, one of the salient features of BFO is the division of entities into continuants of so-called SNAP (or snapshot) ontology and occurents of so-called SPAN (or spanning-time) ontology and this division is at least partially motivated by an apparent impasse in the endurantist/perdurantist controversy in recent analytical metaphysics. The controversy has to do with the traditional philosophical problem of identity of material entities across time. BFO attempts to bypass the controversy by taking endurantism and perdurantism to be two distinct and irreducible, nevertheless true and transparent ontological perspectives of one reality (= realist perspectivalism). The former (SNAP) is intended to capture *static* aspects of reality, while the latter (SPAN) *dynamic* ones.[3] I briefly describe the controversy and BFO's attempt to evade it in section 1 of this paper.

In section 2 I turn my attention to focus on the Ancient Greek philosopher Aristotle who seems to me to have anticipated BFO's approach. Aristotle contended that 'being' is non-univocal and that there are two fundamental modes of being, namely categorial (static) and potential/actual (dynamic). I further discuss the extent to which Aristotle's approach resembles BFO: I argue that Aristotle's doctrine of the non-univocity of being amounts to BFO's realist perspectivalism and that Aristole's categorial and potential/actual distinction resembles SNAP and SPAN ontology. Among other things, however, I point out that by acknowledging other "modes" of being besides the actual one, Aristotle's dynamic ontology (i.e. potential/actual being) is more transparent to reality than Smith's SPAN. In the conclusion I make a suggestion, inspired by Aristotle and Ingarden, as to how to make BFO a more robust form of common sense realism.

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[1]   For up-to-date information on BFO, see URL=<http://www.ifomis.org/bfo>, see also references in the next two footnotes. The main competing ontologies in the public domain are: DOLCE (a Descriptive Ontology for Linguistic and Cognitive Engineering), SUMO (The Suggested Upper Merged Ontology) and OpenCyc (from "enCYClopedia"). For a general introduction into the interdisciplinary field of applied ontology, see e.g. SOWA, John F. *Knowledge Representation: Logical, Philosophical, and Computational Foundations*. Boston, MA: Course Technology, 2000. ISBN 0-534-94965-7; MUNN, Katherine – SMITH, Barry, eds. *Applied Ontology: An Introduction.* Frankfurt: Ontos Verlag, 2009. ISBN 978-3-938793-98-5.

[2] See SMITH, Barry – CEUSTERS, Werner. Ontological Realism as a Methodology for Coordinated Evolution of Scientific Ontologies. *Applied Ontology*, 2010, vol. 5, pp. 139–188. ISSN 1570-5838.

[3]There are several papers explaining the philosophical background of SNAP/SPAN. See e.g. GRENON, Pierre – SMITH, Barry. SNAP and SPAN: Towards Dynamic Spatial Ontology. *Spatial Cognition and Computation*, 2004, vol. 4, no. 1, pp. 69–103. ISSN 1387-5868; SMITH, Barry – GRENON, Pierre. The Cornucopia of Formal-Ontological Relations. *Dialectica*, 2004, vol. 58, no. 3, pp. 279–296. ISSN 0012-2017; GRENON, Pierre – SMITH, Barry. Persistence and Ontological Pluralism. In *Persistence*. Ed. Christian Kanzian, Frankfurt: Ontos Verlag, 2008, pp. 33–48. ISBN 978-3-938793-74-9.

1. *Diachronic Identity and SNAP/SPAN*[4]

It is an undisputable part of our common sense view of the world that material things, with which we are all well acquainted, preserve their identity or sameness through various changes in time.[5] Since this "sort" of identity has to do with what is going on *in* or *through* or *across* time, it has been called 'dia-chronic' (henceforth DI).[6] Thus, for instance, Daniel Novotny ten years ago is believed to be diachronically identical with Daniel Novotny today. But how is this possible? Ten years ago he was much different from what he is today – he was younger, smaller, less educated, lived in a different place, etc. Biochemists will also tell us that there is likely not a single atom of him that he would have both then and today.

Now, an easy way out of this problem is to give up our common sense belief and to accept that material entities (persons) do not preserve DI. So, at best, Daniel Novotny is "identical" throughout all those years just in a loose sense – he thinks that way, there is still some resemblance between how he is now and how he was ten years ago,[7] etc. Strictly speaking, however, Novotny during all those years is *not* identical.

Still, there are philosophers who do not want to give up our belief in DI so easily. These philosophers *have* to account for how there can be entities which apparently *both* change *and* remain identical. Two basic strategies seem to be available. The first originates in Aristotle and recently has been called 'endurantism'.[8] According to this view, material things have two types of properties: essential and non-essential. As long as a thing preserves its essential properties it remains DI, i.e. change concerns only non-essential properties. The second strategy is propounded especially to David Lewis and has been called 'perdurantism'. According to this view, material things have only essential properties. So if a thing is to remain DI, it may not change at all. As we proceed, this audacious claim will become clearer.

The two accounts presuppose different ontological "pictures" of what a material individual is. In the first account a material individual is a familiar object of our experience, extended in space but not in time. So Novotny's parts include legs, trunk, hands, head, etc., each occupying the appropriate *spatial* region. The sum of all these (non-overlapping) regions is the region that Novotny occupies as a whole. In the second account a material individual is extended not only in

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[4] My summary of the endurantist/perdurantist controversy draws heavily on LOUX, Michael. *Metaphysics: A Contemporary Introduction.* London: Routledge, 2002. ISBN 0-415-26107-4.

[5] See e.g. FORGUSON, Lynd. *Common Sense.* London: Routledge, 1989. ISBN 0-4150-23025.

[6] It may be contrasted with the identity *at a time*, which has been called 'synchronic'. The latter has to do with what makes an entity "united", what makes it a whole. Still another "sort" of identity, sometimes called 'strict identity', has nothing to do with time at all, since it applies to abstract timeless objects, such as numbers. See e.g. SMITH, Barry, ed. *Parts and Moments: Studies in Logic and Formal Ontology.* Munich: Philosophia, 1982. ISBN 3-8840-50125; TARSKI, Alfred. *Introduction to Logic and to the Methodology of Sciences.* New York: Dover, 1995, pp. 54–67. ISBN 0-4862-8462X.

[7] The apparent self-contradictoriness of this talk can be, of course, rephrased at the expense of blatant awkwardness. For our purposes, however, I do not find it necessary.

[8] This terminology has its origin in the work of David Lewis: "Let us say that something *persists* iff, somehow or other, it exists at various times; this is the neutral word. Something *perdures* iff it persists by having different temporal parts, or stages, at different times, though no one part of it is wholly present at more than one time; whereas it *endures* iff it persists by being wholly present at more than one time." LEWIS, David. *On the Plurality of Worlds.* Oxford: Blackwell, 1986, p. 202. ISBN 0-6312-24262.

space but in time as well. Novotny's parts include all his spatial parts at all times at which they existed (or will exist), i.e. during his pre-natal life, childhood, young age, adulthood, etc. Each of these parts occupies a spacio-*temporal* "region", which is a sub-region of Novotny as a whole. In short, endurantist account takes entities to be three-dimensional whereas perdurantist account takes them to be four-dimensional.[9] For endurantists any material individual persists through time by existing as a complete whole at any given time at which it exists, whereas for perdurantists any material individual persists through time by existing as a temporal part at any given time at which it exists.[10]

Now it has become clearer why the proponents of the second approach deny the existence of such an all-pervasive phenomenon as change: change is mere appearance due to our minds' transition from observing reality at a time t_1 to observing reality at a time t_2; reality in itself, however, at any given time, remains unchanged. Novotny at t_x is just a part of Novotny as a whole, which is the (mereological) sum of all Novotnys-at-a-time. The illusion that Novotny is changing is just due to the contingent human epistemic condition: we always "see" just a *part* of Novotny, namely Novotny-at-a-time.

Let us turn now to one of the major arguments that perdurantists advance against endurantism.[11]

Suppose that,
P1 Novotny-at-the-age-of-six is non-wrinkled.
P2 Novotny-at-the-age-of-sixty-six is wrinkled.

Further, endurantists would hold
P3 Novotny-at-the-age-of-six is identical to Novotny-at-the-age-of-sixty-six.
P4 Given any two entities, if one is identical to the other, then they have all properties the same.
───
C There is an entity which is non-wrinkled and wrinkled.

Now, P1-P4 obviously imply C. C, however, is false, since it asserts the existence of an entity with materially incompatible properties. So, at least one of the premises must be false. Since for the sake of argument we have assumed that P1 and P2 are true, it is P3 or P4 that must be false. P3 amounts to the endurantist view, P4 to (Leibniz's Principle of) Indiscernibility of Identicals. The latter only few people will be willing to give up and so it is P3 that has to be abandoned. QED.

Following the dictum 'Whenever stuck in contradiction, thou shalt make a new distinction', the endurantists may say, however, that properties are time-indexed. So, the modified argument is:

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[9] Hence also the terminology of three-dimensionalism/four-dimensionalism, which has its origin in one of the most penetrating contemporary defenders of four-dimensionalism: SIDER, Theodore. *Four-dimensionalism: An Ontology of Persistence and Time.* New York: Oxford University Press, 2003. ISBN 0-1992-63523.

[10] In other words: endurantism is the view that objects do not have temporal parts, whereas perdurantism is the view that they do.

[11]   The structure of the perdurantist/endurantist controversy is led by the acknowledgment that perdurantism is intuitively less plausible than endurantism and unless there are strong reasons to adopt it, one should accept endurantism. Consequently, it is the perdurantists who feel obliged to object insuperable conceptual inviability to endurantism, with endurantists merely trying to escape the charge. See LOUX, *Metaphysics*, p. 215.

P1' Novotny-at-t_1 is non-wrinkled-at-t_1.
P2' Novotny-at-t_2 is wrinkled-at-t_2.
P3' Novotny-at- t_1 is identical to Novotny-at- t_2.
P4 Given any two entities, if one is identical to the other, then they have all properties the same.

C There is an entity which is non-wrinkled-at-t_1 and wrinkled-at-t_2.

C is true and so P1', P2', P3', P4 may be true as well and there is no need to give up endurantism.

Unfortunately for endurantists, the costs of this move are high: introducing time-indexed properties entails a very strange and revisionistic ontology – there is no gray or white color as such anymore but only grays-at-t_x and whites-at-t_y.[12]

Thus, it appears that neither endurantism nor perdurantism is very successful in squaring well with all our basic common sense intuitions about material entities, their properties and identity. Aware of the apparent impasse in the discussion between endurantists and perdurantists, Barry Smith in designing BFO attempts to resolve the problem by invoking realist perspectivalism (RP),[13] which may be roughly characterized as follows:

Realist moment of RP: There is a reality to which true ontologies correspond *independently* of actual or possible capabilities of cognitive agents.

Perspectivalist moment of RP: There is more than one true and irreducible ontology, i.e., more than one irreducible perspective of reality.

A (true) ontology is *what* we "see" from a perspective: reality as partitioned at its natural joints. A perspective is *through which* we see reality: a grid or "glasses" which gives us to see some but not all aspects of reality. Perspectives are epistemic correlates of ontologies, which are, of course, ontic.[14] Irreducibility of perspectives means that there is no perspective (at least within human reach) from which one could "see" comprehensively all of reality.

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[12] The endurantism/perdurantism controversy has to do also with the controversy about the nature of time. Presentism is the view that only present things exist, it denies reality to times and the contents of times outside the present. Eternalism is the view that non-present things exist, it considers reality of all times and their contents to be equal. For the sake of simplicity I assume in this paper that endurantists accept presentism and perdurantists accept eternalistm.

[13] This is not, of course, the only way out. For an overview of other approaches, see e.g. SIMONS, Peter. *Parts: A Study in Ontology.* Claredon Press: Oxford, 1987. ISBN 0-1992-41465.

[14] Perspectives are "what human beings adopt when they grasp the world cognitively in terms of the categories of a given ontology" (Barry Smith, personal comment).

How does Smith apply RP to the problem of DI? First, he distinguishes between SNAP and SPAN ontology, which corresponds to endurantism and perdurantism respectively.[15] Second, appealing to his RP, he asserts the truth of both and the irreducibility of one to the other. SNAP ontology is to be an inventory of entities viewed from the snapshot, i.e. statically; in fact, it is rather a *series* of ontologies "indexed" at successive instances of time. SPAN ontology is to be "an inventory (processory) of all processes unfolding through time".[16] The former is to truthfully capture static aspects of reality whereas the latter dynamic ones.

2. SNAP/SPAN and Aristotle

In this section I would first like to highlight two Aristotelian insights which are relevant for our current concerns. Then I shall compare these insights with BFO's SNAP/SPAN division.

Aristotle's Insight no. 1: Non-univocity (ambiguity) of 'being'

As Aristotle on several occasions points out, "being is said in many ways". Leaving aside various sophisticated interpretations of this claim, let me present my understanding of it.

The opposite of 'ambiguous' is 'univocal'. Every meaningful word is either one or the other.[17] In order for a word to be ambiguous it is necessary and sufficient for it to have more than one normal meaning. In order for a word to be univocal it is necessary and sufficient for it to have only one normal meaning.[18] Given the definitions, 'being' is obviously an ambiguous word and this implicates some serious troubles. First, an epistemic trouble: if 'being' is used ambiguously across various domains, these domains should be the subject-matter of various disciplines. Consequently, there would seem to be no "first" philosophy. Second, an ontic trouble: if 'being' is used ambiguously and 'being' is the most general term referring to *everything*, to the *whole of reality*, then there would seem to be more than one reality, more than one world!

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[15]BFO is inspired here by ZEMACH, Edward. Four Ontologies. *The Journal of Philosophy*, 1970, vol. 23, pp. 231–247. ISSN 0022-362X.

[16]Strictly speaking, however, this is not true: in SPAN nothing can "unfold", rather, it is "given". This, by the way, explains a fundamental difference between perdurantism (four-dimensionalism) and process philosophy. Process philosophers insist on something like "essential Heraclitean changeability" of processes, whereas for perdurantists processes are simply things with temporal parts. See e.g. SEIBT, Johanna. Process Philosophy. In *The Stanford Encyclopedia of Philosophy (Winter 2012 Edition)*. Ed. E. Zalta, URL =
<http://plato.stanford.edu/archives/win2012/entries/process-philosophy/>; RESCHER, Nicholas. Process Philosophy. *The Stanford Encyclopedia of Philosophy (Summer 2012 Edition)*. Ed. E. Zalta. URL =
<http://plato.stanford.edu/archives/sum2012/entries/process-philosophy/>.

[17] The views of the historical Aristotle on ambiguity are more complex since besides "pure" ambiguity (which he calls 'homonymy'), he admits "pros hen" ambiguity. For a detailed exegesis of this point, see HINTIKKA, Jaakko. Aristotle and the Ambiguity of Ambiguity. In *Time and Necessity*. Ed. J. Hintikka, Oxford: Clarendon Press, 1973, pp. 1−26. ISBN 0-1982-43650.

[18] Apparently, in natural languages it is very difficult to find a word that would not be ambiguous. In this sense it is not surprising that the word 'being' is ambiguous. What is usually at stake, however, is not whether a given word is ambiguous but whether it is *used* ambiguously when applied in two or more given contexts. For instance, the word 'model' is *used* univocally within fashion industry and within semantics, i.e., taken separately, but ambiguously *across* these two fields, i.e., taken jointly.

For Aristotle, of course, neither of the consequences is acceptable, the latter perhaps even unthinkable. The solution that Aristotle offers goes along the following lines: The word 'being' is used ambiguously and thus refers to more than one "reality". One of these "realities", however, is primary (namely, the substances) and the others are derivative (e.g. potentiality/actuality). The derivative reality is related to the primary one in that if the primary one did not exist, the secondary one would not exist either. In other words, the latter is existentially dependent upon the former.[19] Notice, however, that in spite of this dependence the derivative reality is *distinct* from the primary one (I shall come to this point briefly in the next section).

Aristotle's Insight no. 2: The distinction between essential and potential/actual being

What are the basic domains across which the word 'being' is used? In Aristotle's view there are four: (1) accidental, (2) essential (=categorial), (3) true and false, (4) potential and actual (*Met* V, 7). Aristotle does not elaborate much on (1) and (3) and these are irrelevant for our concerns anyway. So we are left with the "division" of being into (2) essential and (4) potential/actual.

Aristotle's fourfold distinction is, of course, well known. However, it seems that little work has been done in addressing its nature and importance. A notable exception is Jiyuan Yu who has recently argued that the distinction between essential and potential/actual being is the key to understanding Aristotle's *Metaphysics* VII, VIII, IX, especially for understanding his theory of mater and form (hylomorphism). Leaving aside the technicalities of Aristotle's hylomorphism, it is instructive to quote Yu's characterization of this distinction:

> The distinction of categorial being and potential-actual being cannot be merely verbal. When Aristotle sets out to distinguish them, I believe that what he means is that they are distinct perspectives or enquiries into reality. Since potentiality and actuality are associated with the analysis of process and function, while categorial being is fundamentally a classification of language and thought which bears on the structure of reality, we may say that the former is a dynamic and the latter a static approach.[20]

Aristotle and BFO

Now, let us draw comparisons between Aristotle's views and Smith's views as expressed in BFO. At first sight there are some striking similarities:

(A) Smith's RP appears to amount to Aristotle's non-univocity of being doctrine: Smith's 'reality' applies to everything but in each of the (fundamental) perspectives some aspects of the reality are "visible" while others are not – these in turn being visible in other perspectives. So, epistemically

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[19]For textual justification of these claims, see BARNES, Jonathan. Metaphysics. In *The Cambridge Companion to Aristotle.* Ed. J. Barnes, Cambridge: Cambridge University Press, 1995, esp. p. 69ff. ISBN 0-5214-22949. The notion of "focal meaning", introduced into contemporary Aristotelian scholarship by G. E. L. Owen, is also relevant, see YU, Jiyuan. What is the Focal Meaning of Being in Aristotle? *Aperion: A Journal for Ancient Philosophy and Science*, 2001, vol. 34, pp. 205-231. ISSN 2156-7093.

[20]   YU, Jiyuan. Two Conceptions of Hylomorphism in Metaphysics ZH. *Oxford Studies in Ancient Philosophy*, 1997, vol. 15, pp. 119-145. ISSN 0265-7651; p. 126; for more, see YU, Jiyuan. *The Structure of Being in Aristotle's Metaphysics.* Dordrecht: Kluwer, 2003. ISBN 1-4020-15372.

speaking, these perspectives are distinct, in fact, they have nothing in common. Ontically, however, they target and are transparent to the same real world. Similarly, Aristotle's 'being' applies to everything but in different senses, i.e., within distinct perspectives. Again, epistemically speaking, categorial and potential/actual being have nothing in common, though ontically speaking they target the same real world (of being).[21]

(B) Both in Aristotle and in Smith two of the most fundamental perspectives have to do with a static and a dynamic view of reality.

Concerning the last point, however, there is also some dissimilarity. SPAN ontology, following the lead of perdurantism, presents entities (processes) as existing at any moment in time as *actual*. In fact, within SPAN entities cannot "unfold" in time, they simply are in a timeless manner. In contrast, Aristotle's potential/actual being is intended to capture precisely the *changing* aspect of reality.

Unfortunately, Aristotle's considerations about potential/actual being involve some conceptual confusion. Aristotle is aware that the being of the future is different from that of the present – the former being 'potential', whereas the latter 'actual'. An entity E is green *actually* and red *potentially* if and only if it will (or at least may) become red in the future. As for the being of the past, however, it appears to be neither actual nor potential, whereas in my view it should be classified as 'potential' as well. The reason why Aristotle does not apply potentiality to the past is that he confounds modality[22] and temporality. Potentiality is not distinguished from possibility and since in a sense the past cannot be changed, it is necessary and therefore not potential.[23]

Leaving aside the temporality/modality issue, Aristotle is right, I think, in accepting into his potential/actual being the moment of change (i.e., the transition from non-actual to actual) and therefore the fact that the dynamic perspective on reality contains at least two modes of being - actual and non-actual (perhaps even three in order to distinguish the past from the future).[24] In this respect, Smith's SPAN ontology fails to be transparent to reality, since all being in it is considered to be actual. It is true that, within SPAN, entities have temporal parts but at most *one* of these parts is actual.

In my view (*pace* Aristotle), Roman Ingarden's description of processes is to be taken seriously by any SPAN ontology, which aims to be truly transparent to reality:

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[21]   Moreover, as I have said, Aristotle holds that reality in its categorial being is ontically more fundamental than reality in other senses of 'being' (notably, potential/actual). This seems to be supported by Smith as well.
[22]   That is, *logical* modality, where something is logically possible if and only if it does not involve a contradiction.
[23]   For more elaborate discussion of this point see HINTIKKA, Jaako. Aristotle on the Realization of Possibilities in Time. In *Reforging the Great Chain of Being*. Ed. S. Knuuttila, Dortrecht: D. Reidel, 1980, pp. 57−72. ISBN 9-0277-11259.
[24]   The concept of modes of being is highly suspicious to contemporary analytical metaphysicians. For a recent defense, see McDANIEL, Kris. Ways of Being. In *Metametaphysics: New Essays on the Foundations of Ontology*. Ed. D. Chalmers, D. Manley, R. Wasserman, Oxford: Oxford University Press, 2009. ISBN 0-1995-46002.

> *[C]ontinuous transience of the phases constitutes their particular mode of being* [of every determinate process]. This [mode] is essentially connected with temporality of a process, and is characterized by the following moments: (1) *One and only* phase is […] actual [during the entire development of the process]; (2) *one* new phase after another is always becoming actual; (3) an actual phase is continually losing its actuality and a new phase, just then oncoming, is becoming actual; (4) in the instant that the then actual phase occurs, the phases antecedent to it are […] no longer actual […] but have *existed* previously, while the phases subsequent to it are *not yet* in existence, but *are going to exist* (will be actual); (5) in that instant when the *last* phase attains actuality, the process has already passed.[25]

As I have indicated, the reason why perdurantist account of processes fails to be transparent to reality is the assumption that 'being' is univocal (that there is only one true perspective on reality). Endurantists correctly hold that (in SNAP view) things do not exist at other time(s) than the present. Perdurantism correctly hold that (in SPAN view) entities exist as extended along temporal line. The mistake, however, on both sides is to suppose that the notion of 'being' involved in both SNAP and SPAN is univocal.

Conclusion

Given my preceding considerations and the difficulties discovered both in the (original) Aristotelian and BFO's view of persistence, let me propose the following hypothesis:

SNAP/SPAN Enperdurantism: Any material individual persists through time (1) in SNAP view by existing as a complete whole at any given time at which it exists; (2) in SPAN view by non-actually existing (being) at past and future times. The existence transparent in SNAP view is primary whereas in SPAN derivative.

Enperdurantism, I would claim, has several advantages, integrating the insights of both Aristotle (Ingarden) and Smith. First, it can deal well with the problem I have mentioned at the end of the section on endurantism/perdurantism: In SNAP there are gray or white colors *as such* – no time index is needed, since SNAP being per se is actual – right now. In SPAN view the colors *are* time indexed; their being, however, is different (potential, non-actual) from the being to which SNAP is transparent. Second, enperdurantism does justice both to the irreducibility of ontologies (stressed by Smith) and to the unity of reality (stressed by Aristotle). Third, SPAN of enperdurantism fits Ingarden's common sense phenomenological description, which does not seem to be the case with BFO's perdurantist SPAN.

There are, of course, some difficulties as well, such as, for instance, whether the actuality of SPAN is distinct from the actuality of SNAP or whether the past as non-actual is necessary or not. It would further be important to translate the modified SNAP/SPAN into a formal language and test

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[25]IINGARDEN, Roman. *Time and Modes of Being.* Trans. H. Michejda, C. Thomas. Springfield, 1964. pp. 108-109. (Essential selection from the Polish original *Spór o istnienie świata* from 1946/1947).

its consistency and adequacy. These are issues for other occasions. The aim of this paper was modest: to suggest a modification in the philosophical underpinning of BFO. The modification, I argued, would make BFO more realistic, i.e., it would help it to "cut reality better at its natural joints". However, to what degree does such modification affect the usability of BFO in practical applications? How necessary is it to deal with it? This is another and much larger issue of how much (philosophical) realism we need in information science.[26]

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[26]Jiří Stodola has suggested a possible practical usefulness of enperdurantistically modified BFO in the current work on the interoperability and integration of two independent cataloguing systems, namely FBRR (Functional Requirements for Bibliographic Records), which was developed by librarians and is endurantistically oriented, and CRM (Conceptual Reference Model), which was developed by museologists and is perdurantistically oriented. This is a very interesting suggestion which deserves further investigation.

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