

Book Review
Persistence and Spacetime

Yuri Balashov
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Yuri Balashov's *Persistence and Spacetime* addresses a traditional issue concerning the persistence of material objects over time. Yet the approach is far from traditional. Balashov's work is rather scientifically based than just science aware. The debate about persistence is eventually brought home by taking on board Einstein's special relativity, here presented as a theory of the geometry of spacetime. Even though the text is quite technical, two communities of very different size should be interested in *Persistence and Spacetime*: metaphysicians specialized in persistence as well as scholars whose researches focus on the boundaries between ontology and physics. More generally, the Balashov's study is a great source of insights into the relation among science, common sense and philosophy: these topics are explicitly examined by several methodological observations throughout the book.

Material objects persist: they exist at different times, typically through an interval Δt . At least three accounts of persistence have been recently developed by metaphysicians, in a few words: endurance: an object persists through an interval Δt being *wholly present* at each t belonging to Δt ; perdurance: an object persists through Δt having *temporal parts* at each t of Δt ; exdurance: an object persists in Δt having *temporal counterparts* at every t in Δt . Established arguments for a, b, c derive from the problem of temporary intrinsics, the paradox of material constitution and mereological universalism. These conceptual predicaments stretch our pre-theoretical beliefs beyond their standard use. Therefore, traditional discussions have been by and large matter of a trade-off between pros and cons of each account of persistence from a conceptual analysis standpoint. According to Balashov, such a debate "continues to be rooted in the *manifest image of world* and ignore important

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scientific developments, which have rendered many common-sense notions untenable and obsolete”. Despite this basic weakness, he believes that several results of contemporary metaphysics dealing with persistence should be saved in a physics-conscious context. He takes indeed as a rule “to seek to minimize the degree of the overall ontological revision” while putting “physics inspired arguments ahead of many others”. Since “physics” refers to a wide group of theories if not to an ongoing enterprise, one might ask which theory – if any – is relevant to persistence. Balashov’s answer is special relativity (SR). The theory published by Einstein in 1905 should be regarded as “a good approximation of the spacetime of our world”. Consequently, SR is necessary in order to assess the respective merits of theories intended to be accounts of the life of bodies within our spacetime. Given these assumptions, the Balashov’s goals are the following. Firstly, he aims to state endurance, perdurance and exdurance in a relativistic framework. Afterwards, he discusses whether those statements render fitter one of the view. Being the first goal achievable without contradictions, Balashov points out that there could not be any deduction from SR to perdurance. Nevertheless he argues that his discussion provides at least two good arguments supporting perdurance.

The book is introduced chapter by chapter below. Many topics which appear in the work must have been omitted. More important, a review cannot hope to give an idea of the accuracy that distinguishes Balashov’s definitions and arguments. As a result, the general structure of the study and the remarks on metaontology that Balashov has spread around his book have been the only focuses of the following introduction.

Some methodological clarifications open the book: the problem of persistence is sketched, the goals of the research are outlined and many assumptions defended. One of the latter is worth quoting, being paradigmatic. Theories of persistence are correlated with other metaphysical theories which deal with the reality of past, present and future objects. According to presentism, only present objects are real, whereas past and future objects do not exist. On the other hand, eternalist observes that the present does not have any privileged ontological status and thus non-present objects are real as well. Balashov hastens to get rid of presentism by means of a physics-inspired argument. There is no concept of objective (frame independent) present available in the best model of our spacetime, namely Minkowski’s spacetime, hence presentism is meaningless. Other assumptions include a substantialist attitude toward spacetime, atomism and an intermediate position on the

nihilism vs. universalism debate on mereological composition. At least the last hypothesis will play a significant role in the following discussion, while atomism will be absolutely essential for simplicity's sake but harmless.

The next chapter focuses entirely on definitions. Endurance, exdurance and perdurance are stated within a generic spacetime saving their intuitive core. The main novelty here is a clear distinction drawn between perdurance and exdurance. The latter had been generally regarded as a semantic alternative to the former. Consider a spacetime worm and its temporal parts. It seems a semantic matter whether you take the worm as a whole labelling it "object" (perdurance) or choose one of its parts as the object dubbing the other parts "its temporal counterparts" (exdurance). On the contrary, Balashov says that the endurantist's main idea is also preserved by exdurance: an object is wholly present at each instant of its life in both analyses. Thus perdurance and exdurance must be told apart. Full presence will be later the feature of both exdurance and endurance whereby Balashov argues against these theories. The definitions might be briefly summarized as follows. Being P the *spacetime path* of an object O and S a generic *achronal slice* of P (S is achronal iff no point in S *temporally precedes* any other point in S), O endures iff is located in each S of P ; O perdures iff is located in P and has a temporal part in each S of P ; O exdures iff is located in a S of P and has a temporal counterpart located in each other S of P .

Chapter 3 introduces the special relativistic spacetime in the standard Minkowski's way. It begins with a Newtonian spacetime, a structure where events are separated by a definite Euclidean spatial distance and a definite temporal interval, thus rendering meaningful statements about velocities of objects. This structure is then replaced by a Galilean spacetime, which makes meaningless all the absolute ascriptions of velocities by means of declaring that there is no fact of the matter as to which objects are at rest and which are in inertial motion (only accelerations have a frame-independent meaning in classical mechanics). Therefore, being in the same position at different times is no longer an allowed concept. Finally, as Galilean structure had abolished the sameness of position, Minkowski's spacetime abolishes the concept of absolute simultaneity, hence treating space and time in the same way. Balashov states accurately the main features of such structure: length contraction, time dilation and invariance of the interval $I=c^2\Delta t^2-\Delta x^2$ between two events. Some consequences of the last characteristic are quite essential for the subsequent discussion and a brief explanation is in order. Each event e splits the

Minkowski's spacetime in three distinct regions according to the value of I (e, p). These are the absolute elsewhere or "topological present" ($I < 0$), the absolute past and the absolute future (both with $I \geq 0$). The last is the set of points reachable by a signal sent from e . So the boundaries of the future are the light-like separated points accessible only by a signal which is travelling at the light speed. The absolute past is the set of points which have e in their absolute future. In the end, the topological present is causally cut-off from e , being the set of points too far apart even for a light-speed signal and, *a fortiori*, for causal influence. An event belonging to the absolute elsewhere of e is said to be spacelike separated from e .

The definitions gathered in chapter 2 are being now translated from the generic spacetime firstly to the Galilean and then to the Minkowski's structure. No wonder if the first translation strictly resembles the current state of the art of the debate on persistence, thus proving that metaphysicians have been moving in the classical framework. Sparse exceptions do exist: Quine and Smart are responsible of an early attempt to draw conclusions about persistence from SR. However, nobody had previously tempted such a broad account of the topic. Balashov reconstructs the whole discussion well beyond the sketched suggestions of his precursors. Chapter 4 and 5 should be considered the very core of the project. Here Balashov succeeds in bringing the theories of persistence into the scientific treatment of spacetime. As a side work, the argument from vagueness to perdurance is assessed at length. Unrestricted mereological *diachronic* composition inherits his likelihood from unrestricted *synchronic* composition, thus implying the existence of temporal parts. Balashov rejects the deduction by bringing a diachronic counterexample where we do have a strong reason to restrict composition, that is violation of the law of conservation of matter and energy. Again, a physical observation puts a severe constraint on the analysis, therefore narrowing the range of possibilities. Balashov adds interestingly that these restrictions "simply follow the joints of nature".

Another metaontological dilemma rises later, when the translation of the ordinary concepts in the relativistic framework get harder. The dilemma might be suitably dubbed "adjustment or replacement", here is an instance. The familiar notion of 'moment of time' is replaced by the relativistic-inspired 'achronal hypersurface indexed to an instant in an inertial frame reference'. According to SR, inertial frames do not have any superior *metaphysical* status. Nevertheless, *descriptions* of phenomena within such kind of frames are

convenient because of geometrical reasons: laws keep their form if translated from an inertial frame to another. Therefore, the concept of an ‘achronal hypersurface indexed to an instant in an inertial frame reference’ does not have any metaphysical priority. Why should we adjust the concept of a moment of time rather than replacing it with a neutral scientific description? According to our best theory, we had better get rid of moments of time. Why must a metaphysician do the effort of translating the familiar notion in a scientifically respectable concept? One might indeed wonder whether the whole agenda of physics-oriented metaphysics is worthwhile. Balashov has a general answer here, the already mentioned principle which invites to avoid large ontological revisions. If conceptual revolutions lead too far from our common sense, they might be ineffective. Science-oriented metaphysicians bring our everyday concepts into a new environment, thereby providing landmarks in yet unexplored lands.

The end of the fifth chapter contains several refutations of many objections on behalf of endurance. Balashov especially insists that no deduction is possible from SR to perdurance. The temptation to reify spacetime paths must be resisted in order to avoid the main gate to perdurance. Multi-location offers a ground for resistance: since objects might be multi-located in several slices of an object’s path, as it is the case according to endurantists and exdurantist alike, paths are just path. They are not worm-like temporal extended objects.

Before putting to work his definitions, Balashov needs one more piece of analysis. Any account of persistence should not turn out odd if conjunctured with a theory of coexistence. What exactly is coexistence? Given eternalism, everything trivially coexists with everything. Yet there is a sense according to which dinosaurs have never coexisted with human beings. Chapter 6 deals with the second remarkable meaning of coexistence and an associated restricted meaning of existence. We would like to say that something no longer exists, has already existed or has not existed yet even if everything trivially exists without adverbial qualifications. Balashov explains the point with an analogy. Lewis argued that we need a restricted existential quantifier “there is at least one x *in* w ” in order to express the non-trivial fact that there is not any possible-non-philosopher-Lewis (in our world) even though there trivially is a possible-non-philosopher-Lewis (in some world). In other words, analysis of existence is univocal but sometimes “exists-at-t” would be as useful as “exists-at-w” in order to describe non trivial facts. Since time has become tricky, an analysis of “exists-at-t” and “coexists-at-t” must be provided. The one Balashov prefers is

Coexistence as Sharing a Hyperplane of simultaneity (CASH) because it ties coexistence to an invariant structure of Minkowski spacetime without going too far apart from our ordinary beliefs. For our purposes, we might approximate CASH as follows. Two objects located respectively in p_1 and p_2 coexist iff p_1 and p_2 are spacelike separated. CASH could be shown satisfactory because it agrees with everyday intuitions within classic limits. Furthermore, Balashov rejects what he calls “the Alexandrov-Stein coexistence”, an analysis based on several beliefs about coexistence that were originally exploited in order to analyse tensed utterances within an eternalist framework. The speaker’s present may be defined as the set of the locations of the objects with which she can interact during a short interval. The length of the interval is determined by the minimum time needed for an act of thinking. A coexistence relation among objects could then be defined as substantial overlapping of their presents. Consequently, if two objects AS-coexist, they could be causally related. As Balashov notes, no theory might be go farther from CASH. CASH-coexistent objects are spacelike separated and hence causally cut off while AS-coexistents are would-be interactor. Hence Balashov’s basic objection against AS: AS misses our beliefs about causation. Temporal precedence of causes is quoted ever since Hume as an essential feature of causation. Even in a classical framework, interacting takes time. Therefore, coexistent objects cannot interact. Furthermore, AS-coexistence relies on the concepts of a speaker’s present, not exactly an objective feature. What about AS-coexistent stars and planets?

Chapter 7 pursues the second goal of the Balashov’s research, assessing whether SR supports one of the accounts at stake. Balashov claims it does. The basic idea is the following. Imagine that Balashov is now wholly present 250 light-years apart. Then he still CASH-coexists with Napoleon and already CASH-coexists with Putin. In a sense, Putin and Napoleon are temporally *together* in the Balashov’s present although their life spans never overlap. Balashov declares the verdict unacceptable. More precisely, he claims that the situation is *trivially perspectival* and hence unproblematic for the perdurantist while *interestingly locative* and thus dooming for exdurance and endurance alike. Reasons should be sought in the common feature of the latter theories, that is full presence. Two statements must be told apart and independently defended: (i) exdurance and endurance are, but perdurance is not, committed to the locative reading of the above situation (asymmetry thesis), (ii) the locative reading is threatening (absurdity thesis). The Balashov’s defence of (i)

is simple: temporally-laden qualifications such as “already” or “still” are weakly attributed to coexistence facts among temporal parts while strongly attached to existence proposition about wholly present objects. A modal analogy may help again. Obama might have been the 45th President of the USA. In a Kripkean-standard account, we are directly speaking of Obama. According to Lewis, we are certainly talking of him but less straightforwardly. Obama might have been the 45th instead of the 44th because there is an Obama’s counterpart who is the 45th. Lewis’ worlds cannot overlap, while Kripke’s might and in fact do. Overlapping is the modal equivalent of full presence. Temporally laden qualifications on existence are thus ascribed weakly from the perdurantist’s point of view very much like modal properties are indirectly ascribed in a Lewisian account. The absurdity thesis (ii) is less beyond dispute because of the subtle argumentative structure of the chapter. One might indeed argue as follows. If a revisionist analysis of coexistence is given, our pre-theoretical opinions about coexistence facts are no longer a safe guide. It is really *strange* that Putin and Napoleon are somehow temporally together. However, we are moving in an unexplored land. A radical endurantist may declare that something has gone wrong with CASH instead of shed endurance because it makes stranger a strangeness. Otherwise, she might say that oddities are expected and should be accepted whenever a revisionist account is given. In any case, scientific facts alone could not settle the matter. Only a careful balance of the consequences could help.

The last chapter presents further evidence supporting perdurance: the argument from perspectival phenomena in spacetime. According to SR, bodies cannot keep invariant their 3D shape because of the length contraction. Balashov argues that there is an invariant 4D shape that stands behind the different 3D perspective. The 4D shape of a body is indeed frame independent and thus objective. The endurantist cannot explain why 3D perspectives of the same object fit very well together, forming a neat 4D shape. Quite the opposite, perdurance is itself a good rationalization of the phenomena. Thus, by inference to the best explanation, objects are 4D extended and hence they perdure. In the same way, how could it be that many 2D shapes represent the same object? If we come up with a 3D object which fits with all of them, we are allowed to infer plainly that we are dealing with a 3D entity. Among the refuted objections, the one put forward by Sider is remarkable and so it is the Balashov’s reply. Sider suggests endurantists to provide an account of the phenomena based on micro-facts about the locations of the mereological atoms

of a 3D object. The description of the paths of the atoms together with the rules of 3D composition suffices as an explanation. Balashov's answer is that the latter account is inferior because too detailed. Perdurantism discovers a general 4D pattern behind the raw phenomena whereas a micro-explanation is yet another description of them.

Several Balashov's remarks on metaontology have been listed previously. Perhaps the most important opens his book. He states that "the discussion is obviously limited to the realm of the physically possible and I can implement this program without considering physically impossible scenarios", therefore "the modal force of my conclusions is limited". SR does put several constraints on theoretical choice. The simplest example involves presentism: there is not any privileged framework which sets simultaneity and hence no absolute present. Consequently, while being logical possible, presentism is not physically possible. Presentism is an eligible theory in some Newtonian universes and might be the correct one in some of them. Nonetheless, this is not the case *here*. Why does this eligibility matter? More generally, what should we ask to the modal force of our analysis? For some purposes, taking into account broadest range of possibility may be appropriate. Yet this is hardly the case for the majority of philosophical enterprises. Our concepts are designed to cope with our world, that is why scientific constraints should be *put ahead*. Nevertheless, science is not a constraint on analyses at all. The discovery that an abstract space might be non-Euclidean (a mathematical achievement) and that one of this odd objects actually represents our space better than the Euclidean geometry (a physical theory) has been a great source of insights into new possibilities. Metaphysicians have gone farther beyond their *a priori* constraints, thanks to science. No doubts that adding scientific facts restricts the modal force of our conclusions. *De facto*, it helps us to imagine new possibilities.

For similar reasons, Balashov's *Persistence and Spacetime* casts new light on an old subject. Overlooked prejudices are brought to the surface. Common-sense constraints are replaced by up-to-date scientific theories. Eventually, perdurantism wins a fresh ally: special relativity. Although several conclusions might and will be disputed, Balashov has set the agenda of the persistence debate. The significance of spacetime theories for metaphysicians could no longer be neglected.