Identity Supersubstantivalism and the Ontology of Fields

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Abstract. This paper develops a renewed ontological framework for field theories within the context of Identity Supersubstantivalism, the view that material objects are numerically identical to spacetime regions and that spacetime constitutes a plenum. Standard ontologies of fields—the Property View, the Stuff View, and the Substantial Entity View—are examined and shown to be inadequate, for different reasons, as fully articulated supersubstantivalist readings of field theories. In response, the paper proposes the Refined Property View of Field (RPVF), a renewed version of the Property View that preserves the conception of fields as collections of properties while offering a more explicit account of the ontological status of the substance in which those properties inhere. According to RPVF, there exists a single spatiotemporal-material substance, internally structured into points that function as localized subjects of inherence for both geometric and material properties. Grounded in a classical substance–attribute framework, RPVF renders intelligible both the numerical identity between matter and spacetime and the plenitude thesis, while avoiding the metaphysical indeterminacies of the standard Property View. The result is a robust supersubstantivalist interpretation of classical field theories.

Keywords: Substantivalism, Supersubstantivalism, Spacetime, Physical Fields, Substance-Attribute Theory.

1. Introduction

Supersubstantivalism, as a general metaphysical thesis, affirms that spacetime is the only kind of fundamental substance or entity in our world. In turn, *Identity Supersubstantivalism*, of the type we consider in this research, is a specific supersubstantivalist variant that implies a commitment to the following theses: (a) Each material object is *numerically identical* to a spacetime region, and (b) *each spacetime region* is identified with a material object; the latter being the *plenitude thesis* of spacetime, which states that there are no empty spacetime regions.

On the other hand, in field theories, the nature of fields has been understood in three different ways. First, according to *the Property View of Fields*, fields are sets of properties possessed by the spacetime points (Field, 1980, 1989; Earman, 1989). In this ontology, spacetime acts as a substance, bearing both geometric and material or physical properties. The field is not an independent, substantial entity, but rather a distribution of material properties across the geometric structure of spacetime, the latter being conceived as the only fundamental entity. Second, according to the *Stuff View of Fields* (Hinckfuss, 1975; Malament, 1982; Teller, 1991), fields are extended substantial entities whose parts possess properties and maintain spatiotemporal relations with each other. This view dispenses with spacetime as an ontologically independent substance and reinterprets it as a relational structure derived from the internal properties and dispositions of the field itself. Finally, the *Substantial Entity View of Fields* holds that fields are independent substantial entities, different from spacetime, although in an occupation relation to it (Hoefer & Ray, 1992; Gołosz, 1999). In this interpretation, matter and spacetime are independent substances, and fields consist of (substantial) material objects whose properties are instantiated in spacetime. In this way, a dualistic ontology is postulated, in which the field exists alongside spacetime, belonging to an independent ontological category.

The Property View of Fields has given rise to an influential ontological reading of field theories aligned with supersubstantivalism. On this reading, fields are conceived as collections of properties and, accordingly, spacetime (or spacetime points) is taken to be the sole bearer of those properties. However, as will be argued in this paper, this ontological position remains incomplete. The present work proposes a distinct ontology, referred to as the *Refined Property View of Fields*, which

is compatible with a supersubstantivalist metaphysics of field theories. According to the Refined Property View of Fields, fields continue to be understood as collections of properties, but these properties inhere in spatiotemporal-material points that function as local subjects of inherence and, at the same time, as constitutive parts of a unified spatiotemporal-material whole. The difference with the Property View does not lie in the conception of fields themselves, but in the ontological status of the substance in which their properties inhere.

In recent years, supersubstantivalism has been vigorously debated in the realm of analytic metaphysics (e.g., Skow, 2005; Schaffer, 2009; Gilmore, 2014; Duncan & Miller, 2020; Giberman, 2021; Leonard, 2021; Calosi, 2022); however, this advance in the debate in analytic metaphysics has not produced a comparable impact in the realm of philosophy of physics (two notable exceptions are Lehmkuhl, 2016; Dürr & Calosi, 2021). This research aims to contribute to the current debate about supersubstantivalism, not only within the framework of analytic metaphysics but also within the framework of the philosophy of physics. In this sense, this proposal represents an effort to understand how Identity Supersubstantivalism could be possible in field theories by offering a philosophical foundation for this metaphysical position within the framework of such theories. It is precisely this fact that constitutes the novelty of this research. At the same time, this article aims to demonstrate the fruitfulness of the relationship between philosophy and physics, both in the way physics may supply arguments for or against specific philosophical claims and in the way philosophical tools may help us better understand certain features of our physical theories.

This article is structured as follows. Section 2 introduces Identity Supersubstantivalism and situates it within the broader debate on substantivalist metaphysics, contrasting it with alternative supersubstantivalist positions. Section 3 examines the three main ontological approaches to the interpretation of fields—namely, the Property View of Fields, the Stuff View of Fields, and the Substantial Entity View of Fields—and argues that each of them fails, for different reasons, to provide an adequate supersubstantivalist reading of field theories. Section 4 is devoted to the formulation and ontological foundations of the Refined Property View of Fields, showing how this proposal is articulated within a classical substance–attribute framework and how it gives rise to a determinate version of

Identity Supersubstantivalism. Section 5 then addresses the limitations identified in the Property View of Fields and shows how they are resolved within the Refined Property View of Field*s* framework, thereby consolidating the proposal and drawing together its main theoretical advantages. Finally, Section 6 concludes by summarizing the central results of this paper.

Before continuing, some clarifications on the scope of this paper are necessary. First, its aim is not to argue that supersubstantivalism is the true ontology of the physical world, but rather to explore its possible conceptual developments within the framework of field theories. Secondly, when we talk about *fields* here, we are referring exclusively to material or physical fields, that is, those fields that represent aspects of matter and to which a stress-energy tensor field can be associated. Paradigmatic examples are the electromagnetic field, the gravitational field, and the velocity, density, and pressure fields of a fluid. Thirdly, throughout the article, we use expressions such as *spacetime*, *spacetime points,* or *spacetime manifold*, assuming that these notions include, as a constituent part, the metric field.[1] This is an assumption that does not affect the content or validity of the argument presented here. Finally, the analysis carried out is framed within the context of pure and classical field theories, understood respectively as theories without point particles and as non-quantum theories. This last restriction is relevant because the fields that concern us in this research are those defined in a 3D/4D space, an area in which the discussion about supersubstantivalism, as a spacetime theory, makes full sense. The same is not true for quantum fields, which are defined in a *field space* rather than in a 3D/4D space, making the debate around supersubstantivalism much less clear in this context. These constraints are necessary to delimit the domain of application of the ontological proposal precisely and to ensure the internal coherence of the analysis developed throughout the article.

[1] See, for example, Hoefer (1996) and Dorato (2000) for a detailed discussion of both *manifold substantivalism* and *metric substantivalism*.

2. Identity Supersubstantivalism

Substantivalism affirms that spacetime is a substance or a fundamental entity, independent of matter. Formulated in this way, substantivalism remains neutral regarding what the ontological status of matter would be in relation to spacetime. Depending on this choice, two substantivalist versions can be distinguished. The first version is *dualistic substantivalism*, which considers matter to be a second type of substance, with the same ontological status as spacetime. The second version is *monistic substantivalism or supersubstantivalism,* whose *general thesis* states that spacetime is the *only* substance necessary to explain our world (see, for example, Schaffer, 2009, p. 133; Lehmkuhl, 2016, p. 4). In this second version, matter is either 'reduced' via some specific relation to regions of spacetime or is eliminated from our ontology.[2]

One of the ways to 'reduce' matter to spacetime is by identifying both entities. In effect, *Identity Supersubstantivalism* establishes that each material object is *numerically identical* to a spacetime region (although with different degrees of emphasis; for example, Lewis (1986), Sider (2001), Skow (2005), and Schaffer (2009)).[3,4] In this way, while in the dualistic position we have two kinds of substances—spacetime and matter—where material objects are in an occupation relation with spacetime regions, in supersubstantivalism we have a single substance—spacetime—that can do all the work, bearing both geometric and material properties.[5] We see, then, that the first relevant characteristic of Identity

[2] While the distinction between spacetime points and regions is not innocuous in the context of the debate about supersubstantivalism (e.g., Giberman, 2021, pp. 190–193), in this article, I will use the terms *spacetime*, *spacetime points,* and *spacetime regions* interchangeably. Of course, regions and points are related: a spacetime region is a set of spacetime points.

[3] *Qualitative identity* is a relationship between two objects that have certain (or all) properties in common. *Numerical identity* is a relationship that an object has only with itself and implies an absolute qualitative identity.

[4] Another way of 'reducing' matter to spacetime is through the notion of constitution. Thus, the *Constitution Supersubstantivalism* holds that material objects are mereologically constituted by points or regions of spacetime (e.g., Hawthorne, 2006; Gilmore, 2014) or, alternatively, that each material object coincides mereologically with a spatiotemporal region.

[5] We must distinguish between two forms of supersubstantivalism regarding the kind of fundamental properties that spacetime is allowed to bear or possess. On the one hand, *Modest Supersubstantivalism* asserts that spacetime can bear both geometric and material properties; on the other hand, *Radical Supersubstantivalism* holds that spacetime can only bear geometric properties, and therefore material properties must be reduced to geometric properties (Skow, 2005, pp. 55-57). In general, when discussing Identity Supersubstantivalism in philosophical literature, Modest Supersubstantivalism is assumed. We will do the same in this work.

Supersubstantivalism is the *numerical identity* between material objects and spacetime regions.

In addition, Identity Supersubstantivalism has a second characteristic: it considers spacetime as a plenum, meaning that each spacetime region is identified with a material object. In other words, it posits the impossibility of the existence of empty spacetime regions. Jonathan Schaffer (2009), for instance, proposes a form of Identity Supersubstantivalism that incorporates engagement with the plenitude thesis, arguing that adopting this thesis, along with certain additional principles, provides the appropriate conceptual framework for establishing the identification between material objects and spacetime regions. In his words: "Plenitude would complete a square whose other three legs are monopolization, materialization, and exhaustion […] That yields a one-to-one mapping between material objects and spacetime regions, which is a perfect opportunity for reduction" (p. 146).[6] For his part, Daniel Giberman (2021) states that the plenitude thesis, together with token identity and the harmony thesis, must be considered the basic requirements for a philosophical theory to be classified as supersubstantivalist. Regarding the plenitude thesis, Giberman states the following:

> Secondly, given that supersubstantivalism entails that spatiotemporal regions are substances that play something like the traditional role of regions, one would expect any supersubstantivalist spacetime to be 'plenumate', in the sense that there are no locations at which there are some ordinary material objects, or other ordinary geometric expanses, and yet no spatiotemporal region (p. 5).

Thus, while Schaffer sees the plenitude thesis as a desirable criterion for a supersubstantivalist position, Giberman asserts that it is a criterion that all supersubstantivalist metaphysical theories should meet.

[6] *Monopolization* means that each region of spacetime is occupied by at most one material object. *Materialization* implies that each material object occupies at least one spacetime region. *Exhaustion* states that each material object occupies a maximum of one region of spacetime. Finally, *plenitude* implies that all spacetime regions are occupied by at least one material object.

As can be seen, Identity Supersubstantivalism entails not only the ontological commitment to the numerical identity between material objects and spacetime points, but also, more generally, this commitment is articulated with a series of additional principles or criteria deemed reasonable within a metaphysics of a supersubstantivalist orientation. Depending on which principles are considered relevant, different versions of Identity Supersubstantivalism can be delineated. In particular, the purpose of this research is to examine a specific form of Identity Supersubstantivalism within the context of field theories, which assumes, alongside the always present numerical identity, only the plenitude criterion.[7]

In summary, Identity Supersubstantivalism is a metaphysical position that asserts that (a) each material object is numerically identical to a spacetime region and (b) that spacetime and material objects make up a plenum, in the sense that there are no empty spacetime regions. In what follows, we explore how Identity Supersubstantivalism can be understood within the framework of our field theories in physics.

3. Fields Ontology and Supersubstantivalist Metaphysics

From a physical-mathematical viewpoint, a *field* is a function that relates mathematical values to spacetime points. These field values can be scalars, vectors, or tensors, and represent properties associated with various physical quantities. Fields are a fundamental mathematical tool for systematically describing how certain physical quantities are distributed in spacetime, such as the strength of the electromagnetic field or the pressure and density of a fluid. However, beyond the physical-mathematical characterization of fields, a philosophical problem of great relevance arises here: What entity are these properties or field values predicated of? Are they properties directly instantiated by spacetime points, or are they attributed to some substantial or material entity distributed throughout spacetime, or do they inhere in an extended substantial field from which spacetime relations themselves emerge? The different answers to this question entail distinct ways of conceiving the

[7] For a broader discussion of the remaining principles or criteria, see Schaffer (2009, pp. 145–146), Giberman (2021, pp. 5–6), and Moulton (2016, pp. 95–96).

kind of entity that fields ultimately represent within the structure of physical reality. To avoid confusion, in what follows, we will reserve the term 'field' for the ontological discussion that will be conducted. When we refer to the mathematical function, we will speak of field values or *field properties*.

The debate about the nature of the fields has taken place within three ontological positions. First, the position that we will call the Property View of Fields (hereafter, PVF) states that fields are nothing more than collections of properties that are directly possessed by the points of spacetime (e.g., Earman, 1989, p. 155; Field, 1989, p. 181). In this view of fields, spacetime is conceived as a substance, since spacetime points play the role of field properties bearers and allow the individuation of material objects. Hartry Field states that if fields are properties of spacetime points, then this assumes that spacetime points exist insofar as they are the supports for field properties, thus arriving at a substantivalist reading of field theories (see Field, 1980, pp. 35-36; 1989, pp. 181-184). However, although metaphysically substantial, spacetime remains a purely geometric and immaterial entity, since it is intrinsically endowed only with geometric properties, such as topological, differential, or metric properties. The material properties that spacetime points instantiate are contingent properties of those points. Finally, we should note that, while spacetime points are considered the bearer of field properties, a field, according to this ontological position, is simply the set of those properties, without reference to the spatiotemporal substance that bears them. Fields can then be considered as states of the spatiotemporal manifold.

On the other hand, the ontological position that we will call the Stuff View of Fields (hereafter, SVF) (Hinckfuss, 1975, pp. 141–142; Malament, 1982, p. 532, fn. 11; Teller, 1991, p. 382) states that the PVF can be read perfectly well in material (or relational) terms and not only in spatiotemporal terms. This ontological position inverts the roles of substance and attribute proposed by the PVF, stating that, instead of assigning field properties to points in spacetime, we can assign spatiotemporal locations to parts of the field, conceived as a field stuff. Thus, in this position, fields are extended substantial entities whose parts possess properties and maintain spatiotemporal relations with each other. This view dispenses with spacetime as an ontologically independent substance and reinterprets it as a relational structure derived from the internal properties and dispositions of the field itself.

Finally, the Substantial Entity View of Fields (hereafter, SEVF) states that fields are substantial entities in themselves that possess certain properties, which are independent of spacetime, obtaining two substantial entities: spacetime and fields (e.g., Hoefer and Ray, 1992, p. 577; Golosz, 1999, p. 8). From this perspective, associating field properties with spacetime points means that, at each point, the properties of a substantial entity—the field—are instantiated, with the field standing in an occupation relation to those spacetime points. Thus, the three ontological approaches differ in their views on the quantity of necessary entities in order to explain the world: whereas in the PVF and SVF, we have one fundamental entity, spacetime in PVF and fields in SVF; in the SEVF, we have two fundamental entities, spacetime and fields.

What can we say about supersubstantivalist metaphysics in the framework of the ontological discussion of field theories? At first, the SVF and SEVF should be discarded as supersubstantivalist options. The first of these, because it is explicitly conceived as a relationalist option, and the second, because it represents a dualistic substantialism by postulating two fundamental entities. On the other hand, nonetheless, the PVF has given rise to an interpretation of field theories that is consistent with supersubstantivalism. As we saw above, the first step toward this interpretation of field theories is due to Field (1980, 1989), who offers an argument in favor of substantivalism (not supersubstantivalism) by stating that, since spacetime points are the substratum bearing field properties, then these points must be substantial. John Earman (1989) then interprets Field's argument as supporting supersubstantivalist metaphysics of field theories by highlighting the fact that spacetime points are not only substantial in a relevant sense but would also constitute the only substance necessary in models intended to represent our world. In this regard, Earman states the following:

> The second embellishment comes into its own under what can be called supersubstantivalism, the view that space is the only first-order substance in the sense that space points or regions are the only elements of the domains of the intended models of the physical world…
> …Indeed, modern field theory is not implausibly read as saying the physical world is fully described by giving the values of various fields,

> whether scalar, vector, or tensor, which fields are attributes of the space-time manifold M…" (p. 115)

Schaffer (2009, pp. 142-144) agrees with Earman that the PVF favors a supersubstantivalist reading of this type of theory. Schaffer asserts that general relativity (and quantum field theory) can be understood in supersubstantivalist terms, since matter in this theory is represented by fields, which would be nothing more than properties of spacetime, as expressed in the PVF. In the same vein, Carl Hoefer (1996) states that "[m]athematically, the matter field contents could also be thought of as 'properties' of space-time points—a perspective that seems to embody a kind of 'super-substantivalism,' in that space-time (or its points) are the only real substances in existence" (p. 13, fn. 11).

Although the PVF provides an ontologically economical interpretation of field theories from a supersubstantivalist perspective, it remains ontologically incomplete in certain respects. In particular, the PVF is grounded in the general supersubstantivalist thesis—namely, that spacetime is the only substance—without committing to any specific version of supersubstantivalism. As a result, some aspects of its metaphysical underpinnings remain underdetermined. Most notably, the PVF does not specify whether the relevant relation between spacetime and matter should be understood in terms of identity, constitution, eliminativism, or some alternative, and consequently leaves unexplained how material objects are to be reduced or identified with spacetime points. This lack of specification does not undermine the core insights of the PVF, but it does limit its capacity to function as a fully articulated supersubstantivalist ontology. As has been emphasized in the literature, adopting a determinate version of supersubstantivalism when interpreting physical field theories can lead to a deeper and more informative understanding of both the metaphysical position itself and the theories it aims to interpret (cf. Lehmkuhl, 2016, p. 2).

Second, the PVF does not explain how spacetime, a geometric entity that possesses only geometric properties, can act as a substance bearing material properties (cf. Wayne, 2008, p. 4). Regardless of which ontology is correct for fields, they contain mass-energy and can interact with other fields or material objects. An explanation is needed here of how this might occur if the property-bearing substance

corresponds to an immaterial, geometric, merely spatiotemporal structure. In Section 5, we will revisit these limitations of PVF and offer a deeper analysis of each of them within the framework of the ontology proposed in this paper.

Up to this point, no fully satisfactory supersubstantivalist reading of field theories has emerged. We have examined three main ontological options for fields: the PVF, the SVF, and the SEVF. The latter has been set aside insofar as it amounts to a form of dualistic substantivalism, positing both spacetime and fields as distinct substances, while the second is best understood as a relationalist ontology rather than a supersubstantivalist one. The PVF, by contrast, comes closest to a supersubstantivalist position; however, as we have seen, it remains ontologically incomplete due to its limitations concerning both the nature of the substance in which properties inhere and the specific version of supersubstantivalism it presupposes. In what follows, I propose a renewed approach—the Refined Property View of Fields—which preserves the core insight of the PVF, namely the conception of fields as collections of properties, while providing a more explicit and robust ontological account of the substance in which those properties inhere. This proposal will be developed and justified in detail in Sections 4 and 5.

4. Refined Property View of Field

The ontological core of the *Refined Property View of Field* (RPVF) proposal can be articulated through the following theses:

- RPVF-S: There exists a single substance: the spatiotemporal-material whole.
- RPVF-P: This substance is mereologically composed of spatiotemporal-material points.
- RPVF-C: The points are the proper parts (in the functional sense: subjects in which properties are inherited), that is, the constituent parts of the whole.
- RPVF-I: Geometric and material properties inhering in points.
- RPVF-F: Fields are collections of geometric and material properties that inhere at points.

Let us now turn to the justification of each of the theses that constitute the ontological core of the RPVF. It is useful to begin by noting that interpretations of field theories—such as those examined in Section 3—operate, either explicitly or implicitly, within a substance–attribute framework of classical origin. Within this general framework, a substance is conceived as a concrete, ontologically basic entity, endowed with independent existence, which does not require inhering in anything else and which functions as the ultimate subject of inherence of attributes. Attributes, by contrast, are ontologically dependent: they exist in a substance and cannot subsist independently of it. Classical theory further distinguishes between constitutive features that determine what kind of entity a substance is—expressed at an essential or classificatory level—and accidental properties that characterize it in certain contingent ways without fixing its identity. This substance–attribute scheme, understood here in a general and non-technical sense, provides the conceptual background that will allow us to justify the theses mentioned above (see Hoffman and Rosenkrantz, 1997; Lowe, 1998).

A substance is distinguished from a mere aggregate in virtue of the kind of unity it exhibits. Whereas aggregates lack an intrinsic principle of organization and can be understood as mere sums of parts, substances possess a unifying structure that confers identity at the whole and grounds an asymmetric relation of ontological dependence between the whole and its parts (Koslicki, 2018, ch. 7; Pasnau, 2004). Based on this distinction, thesis RPVF-S finds clear metaphysical support: the spatiotemporal-material whole qualifies as a substance in the sense specified here. In this context, we may speculate that the 'unifying structure' of such a substantial whole could be given, at least in part, by the organization provided by the fundamental laws of the corresponding physical theory. As has been noted, thesis RPVF-S not only maintains that the spatiotemporal-material whole is a substance, but also that it is the only fundamental substance. This substance monism follows naturally from the fact—shared with the PVF—that fields are conceived as collections of properties: since properties require an ontological subject in which to inhere, there is no need to posit more than one substance, whether conceived as purely spatiotemporal, as in the PVF, or—as proposed by RPVF-S—as spatiotemporal-material.

On the other hand, classical substance theory does not prohibit a substance from having proper parts (cf. Lowe, 1998; Pasnau, 2004; Koslicki, 2018). Such parts, however, are not autonomous substances ontologically prior to the whole, but rather integral parts whose ontological status depends on the substantial unity they constitute. This feature fits naturally with the case of the spatiotemporal-material whole. In field theories, the ultimate objects of predication correspond to points that represent events; according to thesis RPVF-P, these points can be understood as genuine proper parts of the substantial whole.

At the same time, in accordance with thesis RPVF-C, points play the role of substrates in a functional sense, that is, as local subjects of property inherence. Within this framework, it is natural to maintain that field properties—both geometric and material—inhere immediately in points, although they ultimately inhere in the spatiotemporal-material whole as the primary substance. This is precisely the thesis RPVF-I. Points thus function as local subjects of predication without constituting substances in their own right: they are ontologically dependent on the whole, and their role is analogous to that of the integral parts of a classical substance, which can bear accidents without thereby acquiring the status of autonomous substances.

Finally, thesis RPVF-F concerning the notion of a field does not introduce any entity or additional ontological commitment beyond those already established by RPVF-I. Strictly speaking, RPVF-F does not constitute an independent ontological thesis, but rather an explicit articulation of what already follows from the ontological core of the RPVF. Indeed, RPVF-I maintains that both geometric and material properties jointly inhere in spatiotemporal-material points. This claim fixes three fundamental aspects of the proposed ontology: first, what kinds of entities exist, namely geometric and material properties; second, how they exist, that is, as ontologically dependent properties rather than as substances; and third, where they exist, namely in points that function as local subjects of inherence. Now, this characterization coincides exactly with the notion of a field as understood in the PVF, that is, as an assignment or collection of properties defined at points. Thesis RPVF-F, therefore, merely makes explicit the ontological reading of the term *field* in light of the previously established ontology, without adding new metaphysical

assumptions. In this sense, a field is, in the RPVF as well, a collection of properties defined at points, in the same basic sense in which it is so in the PVF.

Now that RPVF has been presented, one could immediately raise the following criticism. If, in field theories, the spatiotemporal-material points said to manifest both characteristics typically classified as spatiotemporal and characteristics typically associated with materiality, then it seems legitimate to ask: Is RPVF not, after all, a relationalist ontology disguised as supersubstantivalist? If the point is at once spatiotemporal and material, what justifies taking its spatiotemporal aspect, rather than its material aspect, as the fundamental one?

Nevertheless, this criticism loses much of its force once the ontological core of RPVF is carefully considered. First, the proposal does not assign ontological priority to either spacetime or matter; rather, it maintains that the very dichotomy between them is ontologically unfounded. In the framework of RPVF, what exists in the physical world is not two interrelated entities, but a single class of fundamental entity: substantial spatiotemporal-material units, in which geometric and material aspects are constitutively integrated. From their origin, these points are ontologically complete, exhibiting both spatiotemporal and material structure. Second, RPVF is not a relationalist ontology, since it does not reduce spacetime to a set of relationships between independent material entities. By contrast, in this proposal, the points themselves are proper parts of a substance, and their location, structure, and properties do not depend on external relations. This identity is not merely conceptual or operational, but ontological in the strong sense. For this reason, RPVF is not a covert version of relationalism, but a radical ontological reformulation in which the single substance that makes up the physical world can no longer be divided between matter and spacetime without losing its metaphysical unity.

The second criticism to be addressed concerns the very notion of supersubstantivalism presupposed by RPVF. If supersubstantivalism holds that spacetime is the only fundamental substance, then in what sense can RPVF be regarded as compatible with it, given that the fundamental entity posited by this ontology is a spatiotemporal-material unity rather than a merely spatiotemporal one? Should the term *supersubstantivalism* not be abandoned, since the proposal no longer maintains that spacetime (in its purely geometric sense) is the fundamental

substance, but instead posits a richer, ontologically integrated substance that exceeds the purely spatiotemporal?

This objection is well taken, since RPVF does, in effect, appeal to a notion of supersubstantivalism that departs from its traditional formulation. Nonetheless, I maintain that this revised notion still merits being regarded as genuinely supersubstantivalist. What defines supersubstantivalism in the strict sense is not merely an ontological monism of substances, but the claim that this unique substance is spacetime. RPVF does not abandon this claim but rather reformulates what we mean by *spacetime* in ontological terms, moving beyond its purely geometric characterization. RPVF conceives spacetime as a substance spatiotemporal and material at once, whose geometric and material aspects are inseparable. In this sense, RPVF does not reject supersubstantivalism but rearticulates it, eliminating the conceptual separation between spacetime and matter in favor of a unified substance. From this perspective, the use of the term *supersubstantivalism* remains legitimate, since RPVF represents an internal development of supersubstantivalism rather than a departure from its principles.

A third criticism concerns the risk of trivializing the notion of matter within the RPVF framework. According to this proposal, a substantial entity would exist even in cases in which certain relevant material properties—such as charge or energy–matter density—take a null value. However, from the standpoint of physics, a null value of a field—for example, a vanishing value of the stress–energy tensor—is usually interpreted as the effective absence of matter or interaction at that point. If this is so, the following difficulty arises: in what sense is it legitimate to continue characterizing the point as spatiotemporal-material when it instantiates no determinate material property? In that case, the plenitude thesis defended by the RPVF would seem to drain the very notion of matter of empirical content, by detaching it from the effective presence of instantiated material properties.

In response to this objection, it should be noted that the RPVF is not required, within the scope of the present work, to offer an exhaustive theory of the relation between materiality and the effective values of physical properties. As argued by Schaffer (2009), the notion of matter should not be understood as dependent on the effective instantiation of certain properties with non-zero values, but rather on the ontological status of the substance that bears them. From this perspective, a null

value of a field magnitude does not imply the absence of a spatiotemporal-material point, but only the absence of a determinate property whose determinable remains ontologically present (Wilson, 2013; French, 2014). The RPVF is compatible with this line of response: the spatiotemporal-material character of points is not defined by the effective values of the properties they instantiate, but by their ontological nature as constitutive points of a single fundamental substance. A detailed development of this response—particularly a precise articulation of the distinction between determinable and determinate properties as applied to field theories—goes beyond the aims of the present article and will be addressed in future work.

A fourth criticism that may be raised against the RPVF is that this ontology is not compatible with the dynamics of field theories. In field theories, material fields evolve, exhibit changes, and can interact; however, the substantial whole itself does not change. This objection rests on a misunderstanding of where the dynamic content is located within the ontology of the RPVF. In the RPVF, as in standard field-theoretic practice, dynamics are not attributed to changes in the underlying substance itself, but to the evolution of the properties instantiated in it. Points do not undergo intrinsic changes; rather, they function as stable subjects of inherence. What evolves, interacts, and propagates are the field properties that inhere in those points. This is fully consistent with the dynamics of field theories, which are encoded in differential equations governing the variation of field values across spacetime, and not in transformations of the spatiotemporal points themselves. Consequently, the RPVF does not eliminate physical dynamics; it simply locates them at the correct ontological level. The distinction between a stable substance and dynamically evolving properties is precisely what allows the RPVF to preserve the explanatory role of field dynamics while maintaining a coherent substance–attribute ontology. Far from being incompatible with field dynamics, the RPVF offers a metaphysically transparent account of how dynamic change is realized: not through changes in the substance, but through variations in the properties it bears.

Lastly, it is important to note that, although RPVF posits a spatiotemporal-material ontological unity, this does not imply that the two aspects are indistinguishable at every explanatory level. On the contrary, ontological identity allows, without contradiction, a conceptual distinction between fields and spacetime, insofar as different aspects of the same fundamental entity are

highlighted: on the one hand, its material properties, on the other, its geometric structure. This functional distinction is both legitimate and consistent with physical practice and theorizing, in which fields are treated as dynamic entities, and the spatiotemporal structure is conceived as a background framework.

5. Refined Property View of Field and the limitations of Property View of Field

From the standpoint of a supersubstantivalist metaphysics, the RPVF avoids the problems faced by the PVF. First, recall that one of the difficulties of the PVF lies in the fact that, although it adopts the general supersubstantivalist thesis according to which spacetime is the only substance, it does not commit to any specific supersubstantivalist version. As a consequence, the PVF leaves it ontologically indeterminate whether the relation between matter and spacetime should be understood in terms of identity, constitution, elimination, or some other metaphysical relation; accordingly, it does not explain how material objects are reduced to or identified with spacetime points. The RPVF resolves this indeterminacy by explicitly endorsing Identity Supersubstantivalism, articulated through theses UVF-S and UVF-A, which specify both the nature of the fundamental substance and the structure and ontological status of its constituents. In the RPVF, it is not only affirmed that there exists a single substance, but it is also determined what kind of entity it is—the spatiotemporal-material whole—how it is mereologically structured, and what role points play as subjects of property predication. In this way, the reduction of material objects ceases to be an obscure or merely assumed thesis and comes to be understood as an ontological identification: the ultimate bearers of material properties are not purely geometric points, but constitutively spatiotemporal-material points. Thus, whereas the PVF offers a general supersubstantivalist reading compatible with multiple rival metaphysical interpretations, the RPVF provides a strong supersubstantivalist reading that clarifies the ontological relation between matter, spacetime, and fields.

Second, RPVF resolves one of the most significant philosophical tensions within the PVF as a supersubstantivalist ontology: the difficulty of conceiving a purely geometric and immaterial entity—spacetime—as a substance capable of

bearing material properties. From a metaphysical perspective, it is problematic to argue that an ontologically immaterial entity, characterized solely by topological, differential, or metric properties, could possess material attributes such as mass-energy density or electric charge. RPVF dissolves this tension by positing that the substance is not a purely geometric spacetime entity composed of points but a spatiotemporal-material unit, i.e., a fundamental entity whose structure inseparably includes both geometric and material properties.

In RPVF, the material aspect of spatiotemporal-material points is not an added, contingent feature superimposed on an otherwise geometric point, but a constitutive aspect of the points themselves. Unlike PVF, where spacetime points are conceived as purely geometric entities that merely bear material properties, RPVF characterizes points as intrinsically spatiotemporal-material constituents of the single substance that makes up the physical world. As such, materiality is not something introduced by a relabeling maneuver, but a feature that fixes the ontological nature of the subjects in which field properties inhere. This reconceptualization has three important consequences. First, it secures plenitude, since there are no 'empty' regions, even in regions where certain field properties take null values. Second, it dissolves the spacetime–matter dichotomy by rejecting the assumption that geometry and materiality correspond to distinct ontological categories. Third, it explains how points can serve as adequate bearers of material properties without appealing to purely geometric points. In this way, RPVF constitutes not a trivial renaming of the PVF ontology, but a substantive reformulation of the ontological status of the substance bearing of properties.

Thus, RPVF marks a substantive shift in how the relationship between spacetime and matter is conceived within the context of field theories. In the PVF, materiality is accounted for exclusively at the level of properties: spacetime is conceived as purely geometric entities that can contingently bear material properties such as density, charge, or energy. Materiality, on this view, is not intrinsic to the points themselves, but resides entirely in the properties they may or may not instantiate. In RPVF, by contrast, materiality is integrated at two ontologically coordinated levels. First, at the level of the substance, points are characterized as spatiotemporal-material constituents of the substantial whole. Materiality is therefore not a contingent feature added to an otherwise geometric basis, but a

constitutive aspect of the being of the points themselves, inseparable from its spatiotemporal character. Second, at the level of instantiated properties: the spatiotemporal-material points instantiate determinate material properties, such as those represented by the stress-energy tensor. In this way, materiality is both constitutive of the subjects of inherence and realized through the instantiation of specific material properties. This two-level integration shows that RPVF does not merely rename the elements of the PVF ontology, but rather revises the ontological status of the points in which field properties inhere.

6. Conclusions

In this article, the Refined Property View of Fields has been defended as an interpretation of fields compatible with supersubstantivalism. The central thesis has been that, although the Refined Property View preserves the fundamental intuition of the Property View—namely, that fields should be understood as collections of properties defined at points—it goes beyond it by offering an explicit characterization of the ontological status of the substance in which those properties inhere.

The first advantage of the proposal is that it allows us to move beyond a merely general commitment to supersubstantivalism and to articulate a specific version of it. By identifying the single fundamental substance with the spatiotemporal-material whole, and by characterizing points as proper parts that function as local subjects of inherence, the Refined Property View renders intelligible both the thesis of numerical identity between matter and spacetime and the thesis of plenitude. These cease to be underspecified metaphysical assumptions and instead follow directly from a clearly formulated substance–attribute ontology.

Another advantage of the Refined Property View is that it dissolves the tension, present in the Property View, between a purely geometric substratum and the instantiation of material properties. By conceiving points as constitutively spatiotemporal-material, the Refined Property View provides ontologically adequate bearers for the geometric and material properties described by field theories, without multiplying substances or abandoning the conception of fields as collections of properties. In this sense, the Refined Property View should not be

understood as a rejection of the Property View but rather as its natural successor: it preserves its ontological economy while correcting its metaphysical indeterminacy. In this way, the Refined Property View offers a robust, coherent, and philosophically well-motivated version of supersubstantivalism, capable of substantively advancing the metaphysical interpretation of contemporary field theories.

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