1 Introduction: Against Fantology

Consider two competing world views in a rough outline. According to the first, everything that is consists in a plurality of constantly evolving *processes* in which nothing stays the same. A paradigmatic example of such an entity is a river that is in constant flux. The second presents a completely different view of the fundamental nature of being: it is constituted by *substances*, that is, persisting independent countable property-bearers like inanimate bodies. These world views give different answers to the question about the categories of being. The ultimate metaphysical questions are then what are the *categories of being* (ontological categories, henceforth 'categories', for short) and what are their relations?

Formal ontology is initially the *branch* of metaphysics, a field of study addressing these classic questions. Therefore, an answer to them is *a* formal ontology: a *category theory*. Formal ontology is also an *approach* to metaphysics that provides theoretical tools to discuss the equally perennial methodological follow-up question: how are we supposed to solve the aforementioned problem about categories, including the possible fundamental categories? 'Formal ontology' is then an expression that needs to be disambiguated. It has three different connected meanings: (1) a branch of metaphysics; (2) a category theory; and (3) an approach to metaphysics.

This is primarily an Element about formal ontology as an approach, although we also discuss some contemporary formal ontologies as category theories. Indeed, it is the first systematic, detailed, and historically informed overview of formal ontology. We shall introduce and defend a *second order*, that is, *metatheory* of the formal ontological approach rather than any category theory or an exhaustive overview of contemporary formal ontologies. This metatheory involves an account of formal ontology as a main branch of metaphysics and a nominalist second-order view in which categories – whatever they are – are not entities numerically distinct from their members. The present Element is then primarily an exercise in *metametaphysics* that is, the field of philosophy studying the nature of metaphysics: its subject matter, branches, method, concepts, epistemology, and semantics.

In the formal ontological approach, categories are *analyzed* by the ways in which entities are, that is, by *forms of being* or *ontological forms*, such as being independently. Therefore, ontological forms determine the membership of categories. For example, if an entity exists in an ontologically independent, numerically identical, persisting, and property-bearing way, some formal ontologies as category theories consider it a member of the category of substances. Consequently, a tenable metatheory of formal ontology needs a satisfactory account of ontological form and its difference from being or existence. We will propose such an account later.

Formal ontologists then do not leave categories implicit or intuitive, consider them just part of 'ideology' (Quine 1953: ch. VII),[1] or read categories from the alleged logical form of propositions. By contrast, in the current analytic metaphysics, a general approach directly inspired by the syntax of *predicate logic* has taken a dominant role in formulating the problem about the actual categories and their relations, other metaphysical questions, and competing answers to them. Following the formal ontologists Barry Smith (2005), E. J. Lowe (2013), and Ingvar Johansson (2016), we call it *fantology*. Smith characterizes fantology as:

> [t]he doctrine to the effect that one can arrive at a correct ontology by paying attention to certain superficial (syntactic) features of first-order predicate logic . . . More specifically, fantology is a doctrine to the effect that the key to the ontological structure of reality is captured syntactically in the 'Fa' (or, in more sophisticated versions, in the 'Rab') of first-order logic, where 'F' stands for what is general in reality and 'a' for what is individual. Hence, 'fantology'. (Smith 2005: 153–4)

Rather than seeing fantology as any specific category *theory*, we consider it a *paradigm* to conduct metaphysical investigation and the study of categories based on a certain set of unquestioned assumptions. These assumptions can be divided into two larger sub-claims. The first is that there is such a thing as the *logical form* of descriptive sentences spelled out by the well-formed formulas of predicate logic. Consequently, there is a preferred – although perhaps not a unique – way to formulate our descriptions by formalizing them in predicate logic. Second, this logical structure *mirrors* the categorial structure of being. In other words, there is an indirect way to provide an account of the categorial structure by considering how the referring expressions are categorized in predicate logic.

There is a certain family of different views about the categorial structure one can adopt in this paradigm. These views are constrained by taking logical syntax as a model in forming logically correctly structured claims about reality. Similarly, different metaphysical problems and views are formulated by means of the privileged logical language of predicate logic. Finally, the core of the fantological conception is the following *assumption* about *category distinctions*: existents are divided into particulars (the referents of singular terms), on the one hand, and properties and relations (with some definite adicity, that is, the number of places, the referents of predicate terms), on the other.

[1] The ideology of a theory consists of predicates only applying to certain entities rather than signalling any commitment to entities corresponding the predicates. By contrast, the ontology of a theory is formed by its commitments to existing things: its ontological commitments. Quinean ideology does not make any sharp distinction between categorial and non-categorial predicates (e.g., *being a substance* vs *being round*).

One popular representative of this approach is the traditional Russellian ontological view that maintains that properties and relations are specific kinds of entities of their own, property or relation universals that are directly possessed (exemplified) by particulars. Here, properties are considered a special case of relations, one-place relations (Russell 1903, 1912, 1918; Armstrong 1978, 1997; Hochberg 2000).[2] Particulars, in turn, exemplify universals with certain specific adicity, that is, the number of 'places'. Thus, the ways properties and relations occur as constituents of reality are constrained by rules completely analogous to those of the logical syntax: like predicate expressions, properties and relations are monadic, dyadic, triadic, and so on, depending on the number of particulars they must be combined with to constitute complete property/relation exemplifications ('facts').

The different *fact ontologies* (e.g., Russell 1918; Armstrong 1978, 1997; Hochberg 2000) develop these ideas further by reifying the exemplifications of properties/relations as facts. Irrespective of one's willingness to assume facts – or any singular entities corresponding to exemplifications of properties/relations – one may assume that *all* basic constituents of reality are possible referents of singular terms or one- or many-place predicates. In first-order predicate logic, one can take an arbitrary open formula 'ϕx' of a given language having only the variable 'x' as free and consider 'ϕx' a predicate expression. According to the *abundant conception of properties*, any such predicate refers to a general entity, 'the property ϕ of x' or 'the property of being ϕ' (the abundant conception is easily generalized to many-place predicates and the corresponding relations). For example, *being a human and that 2+2=4* may be considered a property of David Armstrong in this conception if 2+2=4 is a necessary truth. Hence, predicate expressions are assumed to stand for abundant properties/relations. Similarly, all singular terms are assumed to refer to entities belonging to a single category: *particulars*.

It is important to acknowledge that for drawing the particular/universal distinction, the advocate of the fantological approach must make essential use of *exemplification*: property/relation universals are entities that can be exemplified by (one or more) particulars, but not vice versa. Moreover, they may add that universals are potential referents of predicate expressions ('properties') and capable of multiple location (as wholes, at a time), while particulars are not.[3]

[2] Russell was a full-blown advocate of the two central claims of fantology in 'The Philosophy of Logical Atomism' (Russell 1918). In his other works cited here, the general picture is more complicated. We are grateful to the Russell scholar Dr Anssi Korhonen for drawing our attention to this.

[3] See MacBride (2005) for a criticism of the different proposed ways to draw the particular/universal distinction in the fantological context (see also our discussion of this distinction in Section 4).

Thus, a logical syntax-driven generality is characteristic of this fantological conception of particulars, properties, and relations. Properties and relations are referents or denotations of predicate expressions. Properties such as the property of *being red* are 'unsaturated' entities, or rather, worldly counterparts of open formulas ('Rx').[4] Correspondingly, the standard referents of singular terms, particulars are assumed to be *concrete objects*.[5] Particulars have (exemplify, instantiate) properties and are related in different ways. The fantological framework does not specify the categorial nature of 'concrete objects' in any more detail. This seems to have motivated the idea of considering objects *bare particulars*, objects that lack all necessary features except particularity, individuality, and the capability of exemplifying universals.[6]

Within the fantological paradigm, it is in its more recent developments considered the least problematic assumption of an ontological theory that there are particulars.[7] Moreover, concrete objects like stones, humans, and electrons are regarded as the paradigmatic examples of particulars. The main disagreements among the metaphysicians working in this paradigm have concerned the existence and ontological status of properties and relations. One alternative here is to maintain that all entities are particulars (in the sense of concrete objects) and that the predicate terms have a plural reference: they apply to a plurality of particulars.[8] Another, less radical and more popular alternative is to re-construe properties and relations as non-spatiotemporal (i.e., abstract) particulars and individuals: sets of concrete objects (Lewis 1983, 1986).

Since our main purposes in this Element are metametaphysical, our aim is not to spell out the specific difficulties coming with the different metaphysical views formulated in the fantological paradigm (see Smith 2005, Lowe 2013). Instead, let us take another look at the two main sub-claims or pillars of fantology that were mentioned earlier. Both sub-claims were explicit elements of Bertrand Russell's (1918) logical atomism. It seems that they have been

[4] Here 'unsaturated' means an entity (property or relation) that must be completed by a certain number of objects in order to occur as a constituent of reality.

[5] In special cases, universals or abstract objects might also be taken as referents of singular terms. In such cases, the special use of singular terms is annotated by calling them 'abstract singular terms' (e.g., see Loux 1978).

[6] Fact ontologists Gustav Bergmann (1967) and David Armstrong (1997) have been prominent advocates of bare particulars, Armstrong calling them 'thin particulars'. See Perovic (2017) for an overview of the recent discussion.

[7] For instance, Armstrong (1978) frames the problem of universals as a question of whether there are properties/relations in addition to concrete particulars (referents of singular terms). Thus, the existence of particulars is considered the least problematic. See also Devitt (1980) and Lewis (1983) for a similar view about concrete particulars.

[8] See Goodman and Quine (1947) for a classical statement of the rejection of other entities than just concrete particulars.

transformed into more implicit background assumptions of a large part of the later analytic metaphysics. One significant transitory figure here was Willard van Orman Quine (1948), who took predicate logic ('canonical notation') as a vehicle for expressing ontological commitments of the different ontological views. Under the influence of Quine and David Lewis (1983, 1986), Quine's criterion of ontological commitment has become a widely – but not unanimously – accepted standard to assess ontological commitments of the different metaphysical views.

Perhaps the mainstream view in Quinean metaphysics has been the reconstrual of properties/relations as sets of particulars. However, the talk about particulars (as referents of singular terms) and properties and relations (as referents of one- and many-place predicates) has still been in a central place in analytic metaphysics and its applications. Moreover, influential analytic metaphysicians (e.g., Armstrong 1978; Loux 1978; Lewis 1986) have taken predicate logical expressions having the form 'Pa' or 'Rab', and so on, or their variants formed in colloquial language such as 'a is P', as a principal tool to formulate metaphysical problems such as the problem of universals[9] and the problem of intrinsic change (see Lewis 1986, 202ff.).

Thus, although there is perhaps not any explicit commitment to the claim about the logical form of all meaningful descriptive sentences, the more recent advocates of the fantological approach have continued the practice of construing descriptive sentences in the canonical notation of predicate logic. Among philosophers working in the paradigm, there has also been disagreement about the existence or nature of certain ontological problems like the problem of universals.[10] These larger-scale disagreements or specific metaphysical disagreements notwithstanding, the advocates of the fantological approach proceed to postulate entities belonging to general categories (particulars, sets, properties, n-place relations, states of affairs) that are put to a one-one correspondence with the categories of the non-logical expressions of predicate logic (see earlier).

Predicate logical language has a structure stipulated by the rules of logical syntax, which tell us how we can form sentences and other well-formed

[9] See Armstrong's (1978: 1–17) discussion of the problem of universals and the different (extreme) nominalist answers to that problem. Although Armstrong formulates the problem of universals in terms of common nature in the introduction of the book (Armstrong 1978: xii), he provides the more explicit formulations of the problem by means of properties expressed by the corresponding predicates. In framing the problem of universals, Michael Loux (1978) speaks about 'attribute agreement': he takes it to be an agreed fact that objects have monadic or many-place attributes and suggests that this must be accounted for.

[10] See Lewis' (1983: 201) comments on Michael Devitt's (1980) and Armstrong's (1980) views about the one over many problem ('the problem of universals').

formulas from basic expressions. The fantological approach assumes without any clear argument that this structure could function as a guide to categories. Since we could have constructed a very different kind of formal language, this point of departure seems metaphysically arbitrary. Here serious metaphysical argumentation is replaced with stipulation based on the structural characteristics of *one* artificial language.

Moreover, as Smith (2005: sec. 19) argues, we can apply predicate logic to metaphysical reasoning without making fantological assumptions. The basic strategy is simple. First, we may assume that singular terms are the only expressions referring to specific entities. By contrast, predicate expressions do not correspond to any entities. Rather, we use predicates to make claims about a certain specific type of internal relations, that is, 'formal ontological relations' ('FORs', for short) between entities (see Smith & Grenon 2004; Lowe 2006: ch. 3; see also Section 3).[11] Existential dependence is a good candidate for an FOR. For example, it seems that you depend for your existence on your brain specifically. Then there holds the FOR of specific or rigid existential dependence between you and your brain. The term 'formal ontological relation' comes from the point that they determine ontological forms, by which categories are analyzed. Therefore, we can use singular terms to refer to entities belonging to several distinct categories, described by predicates, such as sets, substances, universals, modes, tropes,[12] processes, and events.

This approach has of course its limitations because it is usually presupposed that singular terms refer to countable entities with definite identity conditions (countable individuals) and it is controversial whether there are fundamentally such entities.[13] In any case, it would be a mistake to assume that there *must be* entities belonging to the single category of 'concrete objects/particulars' corresponding to singular terms because of one's preferred logic.

Looking at things from a different angle, by construing alternative formal languages, we can raise serious doubts against the idea of *the* logical form of our

[11] Tentatively, internal relations and hence FORs are relatedness of entities rather than beings numerically distinct from their relata (see later). In general, relatednesses of entities are their standings in a relation to something without reifying this relation as an additional entity. For example, you and this Element stand in the relation of numerical distinctness without there being a third entity: the relation of numerical distinctness.

[12] Tropes are simple or thin particular natures, for example, determinate masses and electric charges (see Hakkarainen 2018; Keinänen, Keskinen, & Hakkarainen 2019). In contrast to modes, which are particular properties of objects, tropes do not primitively modify or characterize their bearers (Lowe 2006: 97).

[13] Johanna Seibt (2018) introduces the monocategorial ontology of general processes, which are not countable as discrete units. Similarly, Lowe (1998: ch. 3) argues that not all entities need to be considered 'countable individuals'.

descriptions being revealed by their translation to a language constructed in accordance with the rules of logical syntax of standard predicate logic. For instance, philosophers of language and metaphysicians (e.g., Gupta 1980 and Lowe 2009) have developed logics for common names/sortal terms, which are not considered specific kinds of predicates.[14] These developments are significant in showing that we need not rely solely on predicate logic in an exact description of metaphysical problems such as the problem of universals.

Formal ontology as a branch of metaphysics is the investigation of ontological forms and categories. They are studied directly in it, without recourse to the peculiar characteristics of a representative medium, for instance, predicate logic. Categories are analyzed by ontological forms rather than read from the categories of representations. Ontological forms provide a tool to assess the clarity, exactness, and intelligibility of different category systems or their parts. Fantology, by contrast, constitutes a misleading attempt to construct a basis for formal ontology as a category theory by means of a single representative medium. Fantology is a theoretical straitjacket that makes it hard to see alternative category systems that do not easily fit it, such as certain process ontologies and trope theory. We will argue that the formal ontological approach liberates metaphysics from the fantological straitjacket.

This we can learn by beginning from a different starting point than in fantology: metaphysics and ontology in the phenomenological tradition. Accordingly, we will summarize Edmund Husserl's (1859–1938) and his students Edith Stein's (1891–1942) and Roman Ingarden's (1893–1970) metaviews of formal ontology in the next section. It leads us to Smith's, Kevin Mulligan's, and Peter Simons' introduction of formal ontology to analytic metaphysics from phenomenology in Section 3, which also includes discussing Lowe's (1950–2014) formal ontology and strong essentialism. In Section 3, we will argue further that neither Smith, Simons, nor Lowe has advanced a tenable account of ontological form. We shall defend our alternative character-neutral relational theory of ontological form in Section 4. It builds the foundation for our nominalist relationalism about categories in the same section. Section 5 is devoted to corroborating our metatheory of ontological forms and categories by showing what we can do by it. In this final section, we apply our theory to the fundamentality and non-fundamentality of categories, the analysis of some category theories, such as priority monism and trope theory, and the unification of metaphysics, its branches, and problems.

[14] Moreover, Lesniewski's Ontology is a logical system that has expressive power comparable to first-order predicate logic, but whose non-logical expressions can all be considered as individual or plural names (see Simons 1982).

2 A Very Short History of Formal Ontology

2.1 Edmund Husserl

'Formal ontology' is a technical term introduced by Husserl in his *Logical Investigations* (1900–1) (Husserl 1970, vol. 1: 310).[15] To understand formal ontology, which is our present aim, we need then to take a quick look at Husserl's notion of it. His notion is connected to the intentionality of consciousness that was one issue that drove him in his way up to *Logical Investigations* (Richard 2015; Moran 2017). Intentionality was a central topic to his teacher Franz Brentano (1838–1917) (*locus classicus*: Brentano 1973: 68). Intentionality and understanding it properly are, indeed, essential to his phenomenological approach (Moran & Cohen 2012: 167).[16] Every conscious act like perceiving intends towards something (*etwas* in German), be it a tree or triangle (Moran & Cohen 2012: 170).

Husserl is then motivated to describe formal ontology repeatedly as considering something in general (*etwas überhaupt*) or object as such (*Objekt an sich*). Object as such is any possible thing (*Ding*) whatsoever that can be the bearer of predicates true of it (Moran & Cohen 2012: 228, 317). Indeed, in Husserl's theory of judgement, object is anything of which something is predicated; one may predicate green of the tree, for instance (Moran & Cohen 2012: 174–5). Since the notion of this kind of object is very thin in content, it comes close to possible entity or being and should not be understood as a concrete or abstract particular, not to speak of Kant's thing in itself. Yet an object as such should be something *that really can exist*, that is, a possible object, such as a concrete particular like a tree (Hartimo 2019). Ontology as a science of essences[17] and hence formal ontology must concern possible objects in Husserl's view. Therefore, formal mathematics cannot offer us a formal ontology. It does not concern what really can exist; it is too far-removed from perception for that (Hartimo 2019).[18]

Nonetheless, what offers us a formal ontological theory is one thing, what formal ontology as a field of study is, is another; we need to distinguish a theory representing a formal ontology from a theory or view *about* formal ontology as

[15] This section is written for our systematic purposes and is not therefore intended to be an exercise in Husserl, Stein, or Ingarden scholarship, still less in phenomenology.

[16] As it is to Alexius Meinong's (1853–1920) theory of objects (*Gegendstandstheorie*), which distinguishes the psychological content of experience from intentional object (Marek 2021).

[17] Husserl believes that we can intuitively grasp the pure essence or *eidos* of any object by varying its features freely in imagination and discerning what stays the same throughout the variation process. Pure essence thus refers to the invariant features or necessary form without which the investigated phenomenon is inconceivable (Belt 2021; cf. Spinelli 2021).

[18] According to Hartimo (2019), Husserl realised this as late as 1929 in *Formal and Transcendental Logic* (Husserl 1969).