

# **Empirical concepts: Their meaning and its emergence**

Hans Radder

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## **Abstract**

This article presents a detailed, novel account of the emergence of (the meaning of) empirical concepts. Acquiring experience and empirical concepts is shown to be the result of multifaceted, cognitive processes, which require both material realization and conceptual interpretation. Generally speaking, the meaning of empirical concepts consists of several distinct components, but it includes at least a structuring and an abstracting component. These two meaning components are abstract entities, which can be justifiably interpreted as real objects.

On this basis, I address the subject of emergence. The primary claim is that the abstracting meaning component (but not the structuring one) emerges from its underlying empirical processes: it both depends on and transcends these processes. This claim is expounded by discussing relevant similarities and dissimilarities between the emergence of abstract meanings and a range of central features of emergence prominent in recent debates on this topic. The conception of empirical concepts with emergent abstracting meaning components involves an interpretation that avoids the problematic extremes of both empiricism and Platonism.

**Keywords** Empirical processes and concepts; structuring and abstracting meaning components; abstract but real objects; emergence of the abstracting meaning components

## **1. Introduction**

The aim of this article is to explain and defend the claim that part of the meaning of empirical concepts emerges from underlying empirical processes. Addressing this specific kind of emergence requires substantial additional work in the form of providing an appropriate account of the philosophically intricate notions of experience, empirical concepts, and their meaning. For this purpose, I will revisit and (slightly) revise my earlier account of the meaning and the abstract nature of concepts. More generally, I have to engage in debates on the nature and existence of abstract objects. I also need to consider the relevant philosophical views concerning emergence and its role in scientific practice and ordinary life. On that basis, I will demonstrate that and how the abstracting meaning component of empirical concepts emerges from their underlying empirical processes.

Historically, emergentism flourished during the second half of the nineteenth and the early decades of the twentieth century, but its popularity strongly declined in the subsequent decades (see, e.g., McLaughlin 2008[1992]). Since about the 1970s and up to the present, however, there has been a remarkable revival of interest in and support for emergentist theses. This revival coincided with the acknowledgment of substantial problems for reductionism, both in science and in philosophy. What has resulted is an extensive debate on the different kinds of emergentism (and reductionism), which has brought about in-depth accounts of the central philosophical features of emergence and the variety of emergent phenomena in science. Thus, the introduction to a useful reader on the topic (Bedau and Humphreys 2008)

distinguishes seven central, interconnected issues: the definition of emergence; the kind of things that can emerge; the scope of emergent features; the differences between ontological and epistemological interpretations of emergence; the relation between synchronic and diachronic emergence; emergence and the idea of a layered reality; and the question of the dependence and autonomy of emergent features.

Most current accounts address the emergence of natural or mental phenomena and, accordingly, they study the possible roles of emergence from the perspectives of the natural sciences or psychology. My focus in this article will be on concepts and their meaning as social entities and, in particular, on emergence as a feature of our social ontology. As such, this view clearly contrasts to most of the standard approaches to emergence. Since concepts are not natural entities, it is not part of a philosophy of nature. I will moreover argue that such a view also differs from those approaches in the philosophy of mind that localize emergent mental phenomena in *individual* minds or brains. In this *general* sense, the views developed in this article are closer to John Searle's social ontology of institutional facts and to Kenneth Silver's related account of emergence within social systems.<sup>1</sup>

Given the specific focus of this article, a focus on concepts and meaning, some of the above-mentioned central issues of emergence will be discussed in detail, while others will be dealt with more occasionally or will be referenced as background knowledge. A further consequence of this focus is that making specific claims about the emergence of the meaning of empirical concepts requires a substantive explanation of the relevant notions of experience, empirical concepts and their meaning. Without such an explanation, no substantial conclusions can be drawn about, for instance, what kind of objects emerging meanings are, what their scope is, and how they can be both dependent and autonomous.

For these reasons, the article first addresses, in sections 2, 3 and 4, the complex notions of experience, concepts and meaning. These sections draw on bodies of literature that are not standardly connected to each other. On the one hand, they are based on recent work in the philosophy of experimentation, observation and perception; on the other, they substantially engage with philosophical studies of concepts, meaning, abstraction and abstract objects. In section 2, I introduce and explain the notion of experience. Basically, acquiring experience is taken to be the result of complex cognitive processes, which require both material realization and conceptual interpretation. The third section, then, focuses on empirical concepts and their meaning. It presents a differentiated account of the latter, which includes (at least) a structuring and an abstracting meaning component. Section 4 shows that these two meaning components are abstract entities, and it argues that they can be justifiably interpreted as real entities.

Based on the results of these three sections, I tackle the subject of emergence. Section 5 offers a review of the core themes in the current debates on this subject. It discusses and evaluates those characteristics of emergence that are the most relevant in the context of this article. These characteristics are taken up again in section 6, which provides a detailed discussion of the emergence of (the meaning of) empirical concepts. Its outcome is that the abstracting meaning component (but not the structuring one) can be said to emerge from its underlying empirical processes. A significant feature of this account is that it includes the emergence of abstract entities.

## **2. Realizing and interpreting empirical processes**

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<sup>1</sup> See Searle (1995) and Silver (2021). However, the more specific aspects of the view presented in this article differ significantly from those of Searle and Silver.

If we want to make sense of the emergence of the meaning of *empirical* concepts, we need an appropriate account of the notion of experience and the processes through which it can be acquired. This account will be provided in in this section. My summary explanation exploits the results of a variety of studies, both by me and by many other authors.

We empirically engage the world by means of the cognitive processes of perception, observation and experiment. Actually realizing such processes requires that we, as human organisms, interact with the world. An important feature of these interactions is that they are always mediated. This is obviously the case in those observational and experimental scientific practices that depend on the use of a great variety of instruments, both simple and complex. Just think of the routine uses of thermometers, microscopes, brain scanners, and the numerous other instruments. In addition, these practices may include the uses of glasses, contact lenses or hearing aids that some of the observers or experimenters wear. What is more, allegedly ‘unaided’ observation is mediated as well, namely through the particular characteristics of the human organism, which constitutes an instrument that affords humans a *specific* access to the world. Bats and dogs, for instance, experience the world quite differently from humans, because of the much greater impact of their auditory (bats) and olfactory (dogs) interaction with their surroundings.

Yet, there is an important further distinction between the ‘unaided’ human instrument, the organism, and the other instruments mentioned. The uses and results of thermometers, microscopes and brain scans require a conceptual interpretation. Consider the case of a simple mercury thermometer. Its successful use requires an interpretation that tells us that the temperature measurement has been performed under the right conditions and that the indicated position  $n$  on the numerical scale means that the temperature of the measured object is  $n$  degrees. Human observers, in contrast, are self-interpreting instruments. In the case of human observations (both fully ‘unaided’ and the ones aided by glasses etc.), we apply this interpretation ourselves. Like the ‘reading’ of a thermometer, these interpretations are only seemingly direct. In fact, they depend on first learned and then routinely (and usually non-consciously) applied interpretation, a fact that will become explicit when someone else challenges the correctness or veracity of our observation.

Such ‘unaided’ observation is often called ‘perception’. Because of the similarities between perceptions mediated by the human organism and the observations and experiments that depend on ‘external’ instruments, I take them together within a general conception of ‘experience’ and related notions, such as ‘empirical’ processes and ‘empirical’ concepts. These notions are meant to cover the different kinds of empirically engaging the world (perceiving, observing and experimenting).<sup>2</sup> As various studies of embodied, embedded cognition and many analyses of concrete empirical practices have shown, both ordinary perception and scientific observation and experimentation are complex, spatiotemporal processes. In addition to conceptual interpretation, successful realization of these processes requires specific interventions in the material and social world.<sup>3</sup>

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<sup>2</sup> For detailed arguments supporting the claims made in this section and for refutations of a range of actual and possible counterarguments, see Radder (2012[1984/1988], chap. 3), (1996, chaps. 2 and 6), (2006, part 1) and (2021).

<sup>3</sup> For some of the many relevant studies, see Hanson (1972), Shapere (1982), Hacking (1983), Heelan (1983), Kosso (1989), Galison (1997), O’Regan and Noë (2001), Anderson (2003), Vallor (2009), Bem and Looren de Jong (2013, chap. 9), Brewer (2015) and Boyd (2018).

Thus conceived, this usage of the term ‘empirical’ (systems, processes, concepts) implies a radical departure from the empiricist tradition. The idea that acquiring experience requires no more than ‘keeping one’s eyes open in an unprejudiced way’ is fully inadequate. More specifically, we need to get rid of the inappropriate dichotomy between experience on the one hand and ideas, concepts and theories on the other. The primary reason is that, in actual practices, these notions prove to be inextricably entangled, a point that has been confirmed by a variety of well-developed philosophical arguments.<sup>4</sup> As we will see throughout the subsequent sections, this conception of experience and empirical processes entails a view of conceptual meaning and its emergence that differentiates it from other philosophical views of these topics, such as empiricism or Platonism.

### 3. Empirical concepts and their meaning components

Before I can address the subject of the meaning of empirical concepts there is the question of how to distinguish these from non-empirical concepts. My answer to this question builds on the broad notion of experience sketched in the preceding section. The kinds of concepts discussed in this article are concepts that figure in synthetic propositions, that is, they are about those features of systems and processes that require *specific* engagements with the world. For this reason, I call them ‘empirical concepts’. Furthermore, the relevant concepts apply, or may apply, to a range of individual cases. Consider for instance the sentences ‘tomatoes are red’ (in the sense of ordinary, ripe tomatoes) and ‘electrons have spin- $\frac{1}{2}$ ’. These sentences include the empirical concepts of ‘tomato’ and ‘electron’ and of ‘red’ and ‘spin’.<sup>5</sup> That is to say, these concepts are about, or refer to, types of non-linguistic entities and properties. This excludes a variety of terms that we routinely use in linguistic expressions, such as the terms ‘are’ and ‘have’ that occur in the aforementioned sentences. It also excludes terms referring to unique things, such as proper names like ‘Amsterdam’ or ‘the Sun’.

This explanation illustrates my use of the notion of empirical concepts. I think that an explicit and complete definition that covers all empirical and non-empirical concepts is difficult to attain. First for practical reasons: there are simply too many words and phrases, too many kinds of them and too many contexts of their uses. Second, a strict demarcation between terms referring to linguistic and to non-linguistic things will be confronted with philosophical niceties akin to the distinction between the analytic and synthetic. Discussing these in detail

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<sup>4</sup> Decades ago, Norwood Hanson (1972) and Dudley Shapere (1982) already argued that observation is never direct or unmediated, because it essentially depends on specifiable background information. See also Kenneth R. Westphal (2015) for an in-depth criticism of Willard Van Orman Quine’s radical empiricism and a detailed exposition and defense of Wilfrid Sellars’s critique of the myth of the given. I think that many, if not most, present-day philosophers agree with the view that experience is always mediated, even if debate continues about its precise philosophical and practical implications. See, for instance, Allan Franklin (2015), who agrees that what we know influences what we observe and admits that the implied practical problems (e.g., concerning the design and interpretation of experiments) can be mitigated but not fully avoided. At the same time, he argues that theory-ladenness does not entail the philosophical thesis of the incommensurability of paradigms or worldviews.

<sup>5</sup> In a similar way, Friedrich Steinle interprets ‘magnetic pole’ and ‘electricity’ as empirical concepts, which he defines as ‘those elements [of our thinking] that enable us to describe and deal with the empirical world, without them bearing an explicit explanatory character themselves’ (Steinle 2009, 309).

would go far beyond the main aim of this article. Therefore, I assume that the presented explanation of the notion of empirical concepts, supported by the many examples that can be relatively easily understood and employed, suffices for the purpose of this article.<sup>6</sup>

Concepts frequently function as building blocks of propositions, and empirical concepts as those parts of propositions that make them synthetic. Linguistic phrases, in particular sentences, express concepts in a specific language. Often, concepts are taken to be identical with their meaning. However, following Hilary Putnam (1975, 268-271), a more cautious view is to define the meaning of concepts as a set of components. This allows a more differentiated account of the identity (or similarity and dissimilarity) of concepts. For instance, if the expressions of a concept in different languages are synonymous, the underlying concept is usually taken to be the same. Yet, synonymy of such expressions may be difficult to establish. In practice, there may only be overlap of specific meaning components, while other components exhibit clear differences. In these cases, a partial identity of concepts, for certain of their meaning components, may be established, but not a full identity of the complete concepts.

My discussion in this section builds on the detailed account presented in Radder (2006, chaps. 8-11), saying that the meaning of empirical concepts includes, at least, a structuring and an abstracting component. In addition, there may be, and usually will be, other components, for instance, Fregean senses, connotations, metaphors, stereotypes, or whatever idiosyncrasies may be taken to be pertinent to the relevant concept. However, the discussion here will be restricted to the structuring and abstracting meaning components. Because the novelty of this account primarily concerned the abstracting component, the focus of my 2006 book was on the nature and role of this component, while the structuring component was treated in less detail. In this article, I address and compare both meaning components in a more balanced way.

As we have seen, successfully realizing empirical processes requires a conceptual interpretation of their performance and their results, an interpretation that includes one or more empirical concepts. On this basis, the *structuring meaning component* of an empirical concept can be defined as

a type of material/linguistic signs that refers to (a part of) the common result of a specifiable set of actually realizable empirical processes.

This general definition includes various phrases that require further explanation. In providing this explanation, I use again the simple sentences ‘tomatoes are red’ and ‘electrons have spin- $\frac{1}{2}$ ’ by way of illustration.

While writing this section on my computer, the *material/linguistic signs* are the material configurations on my computer screen.<sup>7</sup> But, if printed or spoken by me, they could also be specific ink patterns on paper or particular sound vibrations in the air. What is more, when written or printed by others in different fonts or pronounced by people with different

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<sup>6</sup> But note that this account entails, for the case of concepts, a replacement of the distinction between the empirical and the theoretical by that between the empirical and the non-empirical.

<sup>7</sup> Specific practices may involve the use of conceptual signs that are *not explicitly* linguistic. Just think of the many traffic signs on the streets; or of a referee in a football game who blows a whistle and uses a specific bodily sign to indicate the occurrence of an offside position. Yet, such signs can only serve their function if there is some (accepted) linguistic description of their meaning.

voices, each of these three forms of material/linguistic signs will be differentiated into many distinct material realizations.<sup>8</sup> Furthermore, the number of realizations may be multiplied by adding the material/linguistic configurations of uncontroversial translations of the mentioned sentences into other languages.

Although it is not always the case (some people say that my handwriting is illegible), the many different realizations of material/linguistic signs are often routinely taken as equivalent. What this equivalence shows is that these material/linguistic signs are *types*. Of course, in concretely writing about them, I can only use my own, particular realizations. In fact, however, the set of equivalent material/linguistic signs is diverse and immense. In addition to the set of signs employed up to the present, it includes equivalent signs that no one has used so far, that no one will ever use, that no one has ever thought of, or will ever think of, using. Because of this indeterminacy we are dealing with a type of material/linguistic configurations, which is irreducible to a specifiable set of tokens.

But of course such configurations are not merely about matter and language. Calling them ‘signs’ means to interpret them as not being self-referential but as tokens of concepts, in particular empirical concepts, that are about ‘something else’, namely an *intended referent*. The two mentioned material/linguistic sentences, for instance, include the tokens of the empirical concepts of ‘tomato’ and ‘electron’ and of ‘red’ and ‘spin’. Thus, these signs possess both material/linguistic and conceptual characteristics.

The notion of *empirical processes* has been explained in the previous section. As we have seen, such processes involve the use of empirical concepts. On the broad account of experience, this includes not just the concepts of ‘tomato’ and ‘red’ but also those of ‘electron’ and ‘spin’. Because experience is human experience, the occurrence of empirical processes is, by definition, human-dependent. These processes need to be *actually realizable* by human beings through interventions in the material and social world.

Successful realizations of concrete empirical processes generate specific *results*, for instance, the sentences ‘this tomato is red’ and ‘this electron has spin- $\frac{1}{2}$ ’. Because the structuring component concerns separate concepts, and not propositions, the reference of the signs is to *a part* of these results. In the two example sentences, the signs refer to the intended referents of the four mentioned concepts (thus, the non-empirical notions ‘this’, ‘is’ and ‘has’ are not relevant to the present discussion).

Moreover, as explained above, the relevant concepts are not merely about individual things. Therefore, they do not refer to a singular result of an empirical process but to (a part of) the *common* result of empirical processes. Empirical processes with a common result are actually realizable if they have been, or can be, successfully *reproduced*.

Finally, there is the notion of *structuring*. Once we have acquired a certain concept, it selects both the kind of things to which it refers (its domain of application) and determines the conditions that are taken to be relevant and irrelevant in correctly applying it to an empirical process (see Radder 2006, chap. 8). The significance of conditions of relevance and irrelevance in applying a concept entails that part of its structuring meaning derives from its relations to other concepts. For instance, the meaning of the concept of red implies that the weight of an object is irrelevant to its being red.<sup>9</sup> Through their theory-laden or interpretative

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<sup>8</sup> I prefer the notion of realization over that of instantiation. The former includes both the active procedure and the resulting product of realizing empirical processes. When referring exclusively to the product, it coincides with the notion of instantiation.

<sup>9</sup> On this point, see also Mary Hesse’s network model of property concepts (Hesse 1974, chap. 2).

role, concepts *structure* the empirical processes in which they are realized in (theoretically, conceptually) specific ways.

Second, there is the abstracting meaning component of empirical concepts. This component can be defined as

a type of material/linguistic signs that refers to (a part of) the common result of an indeterminate set of potentially realizable empirical processes.

Thus, a substantial number of the phrases of this definition coincide with the ones used in the definition of the structuring meaning component. Therefore, the above explanation of the meaning and role of material/linguistic signs, types, empirical processes, and (a part of) common results applies equally to the abstracting meaning component. Yet, there are two important differences, which have to do with the potential realizability and the indeterminacy of the set of empirical processes, and more generally with the implied account of abstraction. As I will explain in section 6, these features make a crucial difference regarding the emergence of the meaning of empirical concepts.

The two basic features of my account of abstraction are ‘leaving out’ (all aspects of the realization processes apart from their intended result) and ‘setting apart’ (in the specific sense of considering the meaning of this result in abstraction from its past and present realization processes). That is to say, abstraction is conceived as a procedure of separating a product from the processes that have realized it thus far. This conception is significantly different from the ‘classical doctrine of abstraction’, which sees abstraction as a way of ‘summarizing’ concrete tokens by means of abstract types. It also means that the primary contrast is not between abstract and concrete but between product and process: the product is abstracted from its realization processes. Finally, such abstraction procedures are by no means exceptional. In conceptual discourse, both in science and in ordinary life, they are followed as a matter of course.<sup>10</sup>

From this perspective, a central point of empirical concepts is their *extensibility*: the conceptually interpreted result of a particular empirical process *might* be extended by realizing it in the future on the basis of a set of novel empirical processes that are substantially or even radically different from the ones in which it has been realized thus far. That is to say, a future reproduction of this result is only *potentially realizable*, and not actually. These different processes may be fully unknown at present or they may even remain unknown forever (Radder 2006, chap. 9).

Furthermore, how many of such future realizations there will be is *indeterminate*, for two reasons. First, we cannot know in advance whether we will be able to successfully realize such distinct processes in the future. Second, we cannot know in advance whether we will even consider and attempt the realization of these processes in the future. Electrons may be created in experimental processes on beta decay realized by human beings; and they may be annihilated in the inverse experimental processes. Because it is uncertain how many of such experiments will come to be performed, the intended referent of the concept of electron is indeterminate. Assuming that the set of potential realizations is ontologically predetermined would require the implausible doctrine of the complete determination of human history, in full detail. From what we do know about human history thus far, no convincing arguments for

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<sup>10</sup> See Radder (1996, 76-85) and (2006, chaps. 10, 11 and 13). See also Martínez and Huang (2011) and Carrillo and Martínez (2022) for detailed discussion of similarities and differences of this conception of abstraction with other cognitive accounts (in particular, those of Nancy Cartwright and Nancy Nersessian).

such a strongly deterministic doctrine can be derived. Consider the number of future tokens in the set of red things. I might have the plan to paint one wall of our living room in red next week, but my wife might disagree and think it should be painted blue. Or she might agree but the particular hue of red we had in mind is, for normative environmental reasons, suddenly not available anymore. Claiming that the outcomes of these, and all comparable, plans are, in fact, fully predetermined is an instance of speculative philosophy that lacks a plausible justification.

However, this indeterminacy should not be misunderstood as implying that claims of potential realizability are mere fancy. In fact, actual replications of the results of empirical processes have often been successful. In the course of the history of agriculture, red tomatoes have been produced in quite different ways, for instance by novel processes of genetic modification resulting in cubical tomatoes. Something similar holds for the substantially different ways of generating electrons and electron spin in the course of the history of science and technology, and for the different realizations of red things in human history in general.

The role of the notions of reproduction and reproducibility (implied in the idea of a common result) requires some further explanation. The definition of the structuring meaning component mentions the common result of actually realizable empirical processes (as interpreted by the relevant empirical concept). Here, the reproducibility claim refers to actually successful reproductions. Nevertheless, this claim remains *fallible*, since it may come to be criticized as incorrect and hence withdrawn. In contrast, the definition of the abstracting meaning component mentions the common result of potentially realizable empirical processes (as interpreted by the relevant empirical concept). Here, the reproducibility claim is not based on previous reproductions, but it anticipates future possibilities. Such future attempts at reproduction may be, or may not be, successful. Therefore, this reproducibility claim is not merely fallible but rather *hypothetical*.

As Lieven Decock (2014, 64-65) has rightly noted, the dynamics of conceptual development are not limited to *extension* to novel empirical processes, because they may also bring about conceptual innovation and change. My account acknowledges this point. A successfully realized extension to a substantially novel domain of phenomena entails a shift in both meaning components. First, because a particular possibility has proved to be an actuality, the intended referent of the abstracting component decreases with one less (part of a) common result of a potentially realizable empirical process. Second, the structuring component now structures an additional domain of novel phenomena. If this shift is substantial, it may lead to positing a new concept for the novel domain.<sup>11</sup> Yet, the meaning of such new concepts can be analyzed again in terms of their structuring and abstracting components.

As the definitions show, both meaning components are explained in terms of their reference, of what they are about. Usually, this feature of concepts is called their intentional content (see, e.g., Prinz 2002, chap. 9). Accordingly, I have described the referents of empirical concepts as intended referents. My theory aims to take into account both the actual and the potential role of concepts. For this reason, it differentiates between two forms of intentional content of an empirical concept: its structuring intentional content and its abstracting intentional content. By adding the abstracting meaning component, the theory acknowledges the heuristic, forward-looking role of concepts in innovative processes. Empirical concepts are not only about ‘what is’ but also about ‘what could possibly be’ (Radder 2006, 183-185).

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<sup>11</sup> But note that this article is not meant to provide an account of the dynamics of this kind of conceptual change.



The structuring and abstracting component constitute core meanings of empirical concepts. In addition, further meaning components will be relevant. This is especially the case if we examine the learning, possession and cognitive content of the concepts of individual people. Here a host of interesting issues present themselves.<sup>12</sup> I cannot address these issues here. What I want to emphasize, however, is that the meaning of empirical concepts cannot be reduced to the (mental or brain) states of individuals. In the next section, I argue that the meaning components are abstract entities. As such, they are not localizable in individual minds or brains.<sup>13</sup>

A feature of this account that is especially relevant in the context of this article is the fact that the intentional content of concepts, the set of their intended referents, is not fixed by a reality that is independent of the existence and/or knowledge of human beings. Instead, central features of this set may change as a consequence of developments in human history. When whales are reconceived as mammals instead of fishes, the intentional content of the concept of fish changes. The set of indivisible, elementary particles once included atoms, protons and neutrons, but nowadays these objects are held to be composite. While traditional economists restricted labour to wage labour, currently it is often taken to include domestic labour as well. More generally, the claim that the intended referents of empirical concepts are, once and for all, fixed by a human-independent reality wrongly assumes the invariability of both the concepts themselves and their realizability in empirical processes.

#### 4. The abstract nature and reality of the meaning of empirical concepts

In section 6 I will examine the possible emergence of the two meaning components. Part of this examination concerns the question of the nature and reality of these components. Accounts of emergence need to specify what it is that emerges and whether the emerging entities can be considered real. For this purpose, this section first explains and defends the abstract nature of the meaning components of empirical concepts and, second, argues for the reality of these abstract objects.

The basic characteristic of abstract objects is that they lack a specific spatiotemporal location. That is why I also call them nonlocals. In the previous section, both the structuring and the abstracting meaning component of empirical concepts have been defined as types, namely types of material/linguistic signs. As we will see below, types are abstract objects. Therefore, the two meaning components of empirical concepts are abstract as well.<sup>14</sup> Because of the differences between the abstracting and the structuring meaning component, a discussion of these components as types of signs is not the full story. To be sure, as a type (of material/linguistic signs) the abstracting meaning component is also an abstract object. But in the case of this component there is an additional reason for its abstractness, which derives from its intended reference to an indeterminate set of potentially realizable empirical processes. Clearly, possessing the property of ‘being about an *indeterminate* set of *potentially* realizable processes’ cannot be paraphrased as applying to a collection of particular token

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<sup>12</sup> Although my view of intentional content differs from Jesse Prinz’ informational semantics, his (2002) book includes a wealth of relevant insights concerning the nature and function of concepts.

<sup>13</sup> For more specific arguments, see the critique of mentalist and localist interpretations of concepts in Radder (2014, 27-30).

<sup>14</sup> This does not exclude that concepts, apart from these meaning components, also possess concrete, physical features. After all, they are expressed by means of material tokens.

processes each of which occurs at a specifiable spatiotemporal location. This is the second reason why this meaning component is an abstract object.

To develop these points, I draw on Linda Wetzel's (2009) book *Types and tokens: On abstract objects*. In this book, she convincingly argues that types, especially linguistic types, are abstract objects. While the individual tokens of a type, if they exist, exist in space and time (or in relativistic space-time), this does not apply to the types themselves. Types (such as the type of red things) cannot be found at a particular spatiotemporal location or at some collection of specifiable locations. Empiricists and nominalists have always been critical about the (philosophical and scientific) legitimacy of abstract objects. Therefore, they have tried to eliminate talk of types or to paraphrase it away, as merely 'a manner of speak' for kinds of phrases that they see as philosophically 'more respectable'.

Against such views, Wetzel shows, first, that talk of types can be found in all kinds of human activities whenever people seek (a measure of) generality; second, that there are good reasons to assume that types exist; and third, that we cannot do without types, because the many attempted empiricist or nominalist reinterpretations and paraphrases fail.<sup>15</sup>

Based on an examination of numerous examples, Wetzel's first conclusion is that 'type talk is *pandemic*. It is not occasional; it is not unusual; it is the norm' (Wetzel 2009, 21). Illustrations of types and their contrast with tokens can be found everywhere: in philosophy and its various branches (e.g., the public meaning of a type of sentence may differ from the ironic meaning assigned to a token of the same sentence by some individual); in science and its different disciplines (e.g., when referring to 'the electromagnetic field' in physics); in technology (when we talk about 'the personal computer'); and in art (e.g., Beethoven's 9<sup>th</sup> symphony is a type, which does not coincide with any of its particular performances<sup>16</sup>). In particular, the type-token distinction in the use and study of languages is analyzed and illustrated by Wetzel in great detail. It covers what I said in the previous section about the great diversity of the material/linguistic tokens of types of signs, but it includes many more illustrations, characteristics and analyses of such signs.

Thus far, I have argued that the structuring and abstracting meaning components of empirical concepts are abstract objects. The second major question of this section, which is also immediately relevant for the issue of their emergence, is this. Even if it is admitted that speaking about abstract objects is pandemic and that it cannot be eliminated or paraphrased away, what about the claims concerning the reality of these objects? That is to say, what can be concluded from these empirical and methodological facts with respect to the ontological and epistemological status of abstract objects?

Saying that a certain object 'really exists' without explaining what is implied by that phrase, is not saying very much (cf. Fine 1986, 129-131). So, what can be meant by claiming that abstract meaning components can be real? For a start, there is a crucial difference with the usual issues concerning scientific realism. In the case of scientific claims about non-

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<sup>15</sup> Wetzel's extensive defense of the third point, the impossibility of paraphrasing away type talk, primarily addresses a somewhat older body of philosophical work within, or significantly influenced by, the empiricist tradition. For details, I refer the reader to her book (2009, chaps. 3-5 and 7).

<sup>16</sup> Perhaps describing such a unique work of art as 'a type' might be debated. This does not undermine the main point, however, which is that it is an abstract object the meaning of which is not exhausted by a specifiable set of distinct actual performances. Following Hans-Georg Gadamer's ontology of artworks, Peter Peters also concludes that 'playing works of art is fundamentally unfinished: their meaning is never exhausted as long as we continue to play them in new situations' (Peters 2019, 18-19).

human reality, realists should require that the existence of the relevant objects does not depend on the existence of human beings; and in the case of biological, psychological or sociological claims about human reality, they should at least require that the existence of the relevant objects does not depend on human knowledge (Radder 2012[1984/1988], 82). That is to say, a realist ontology underlying *these kinds* of scientific knowledge claims says that the real is independent of the existence and/or knowledge of human beings.

However, the criteria for the reality of human concepts and their meaning do not need to meet these stricter requirements of scientific realism. Of course, the existence of concepts and their meaning depends on the existence of human beings. What is more, it also depends on the existence of human knowledge. As explained in the two previous sections, acquiring and correctly applying concepts depends on explicit or implicit knowledge of the instruments that mediate our access to empirical reality. Still, in spite of such dependences it makes full sense to pose realist questions, as we routinely do in the case of particular technological artifacts. For instance, when we ask whether a quantum computer really exists or whether it still is a promise. This view agrees with Susan Haack's interpretation of socially constituted objects. Partly referring to Searle's account of institutional facts, she argues that "real" contrasts not with "artifactual" or "mental" [or, we may add, "social", HR], but with "fictional, a figment" (Haack 2007, 162).

In view of these points, the question then is what kinds of reasons we may have to posit the reality of abstract objects, in particular of abstract meaning components. I first discuss Wetzel's vindication of reality claims concerning abstract objects and then add some further arguments. Wetzel (2009, chap. 2) argues that there are no good general reasons to deny the existence of abstract objects, and of types in particular. She first notes that many sentences including type terms are justifiably taken to be true. For instance, the sentence 'the Tarahumara frog, which lived in Arizona, has disappeared from the United States', which denotes a type of frog, is accepted by biologists as true. Her general argument for the reality of types, then, is the following.

Why think that because certain sentences are true, certain objects exist? The answer is: the sentences say or imply the objects exist, and the sentences are true, so (absent overriding objections) the objects exist. I think that this intuition is so powerful that it should carry the day. (Wetzel 2009, 24-25)

She goes on to argue that this intuition is straightforwardly supported by the different criteria Quine and Gottlob Frege have proposed for the existence of objects to which we refer and quantify over in true sentences. Finally, she discusses and refutes an alleged 'overriding objection' to her general argument. The major problem of the belief in abstract objects, it says, is that they cannot be known because they cannot causally act on us as knowers. That is, the possibility of a real causal impact of an object or event on a human being is taken to be a criterion for acquiring sound knowledge of this object or event. Wetzel (2009, 30-43) discusses three variations of this criterion and concludes that they are inadequate. We can, to mention just one convincing counterexample, have predictive knowledge of future events (say about the weather tomorrow), even if these events are, at the moment, causally inaccessible.<sup>17</sup>

In addition to Wetzel's criticisms of these causal criteria, we could note that these criteria are crucially dependent on a philosophical interpretation of 'causation'. As we have

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<sup>17</sup> An important other counterexample is taxonomical knowledge. Like future events, taxa cannot causally interact with human knowers. For an extensive discussion of the significance of the taxonomic style of knowing in the history of the sciences, see Kwa (2011, chap. 8).

seen, critique of types is often framed within an empiricist point of view. For *strict* empiricists, however, an appeal to real causation, as is being made in the mentioned causal criteria, is out of the question (see Radder 2021). However, if causation is reinterpreted in an empiricist way as basically a correlation (or even if it is taken to include a counterfactual claim), there is no problem at all to claim that types may (in this sense) ‘causally’ act on human knowers.

Yet, even if we interpret Wetzel’s argument in the above quotation as exclusively applying to types, it might be challenged by nominalists (see, e.g., Kearns 2010). However, my discussion applies to a specific kind of types. Therefore, it can remain neutral about the more general claim that *all* types are real abstract objects. Apart from that, the claim of the existence of the relevant types of material/linguistic signs can also be made on the basis of Putnam’s internal realism. This is the view that

*what objects does the world consist of?* is a question that it only makes sense to ask *within* a theory or description. Many ‘internalist’ philosophers, though not all, hold further that there is more than one ‘true’ theory or description of the world. ‘Truth’, in an internalist view, is some sort of (idealized) rational acceptability.<sup>18</sup>

Elsewhere, I have shown that internal realism is not a plausible interpretation of (our knowledge of) the natural world, primarily because it cannot account for referential stability under conceptually discontinuous theoretical interpretations.<sup>19</sup> However, as we have seen in section 3, the intentional content of empirical concepts depends on human knowledge, and changes of this content in the course of time are the rule rather than the exception. Thus, there is no ‘overriding objection’ to apply the internalist notion of existence to the two meaning components of empirical concepts and argue from the pandemic use and uncontroversial acceptance of such types of material/linguistic signs to their existence.

An additional argument may reinforce the realist interpretation of these abstract objects. As Ernan McMullin (1984, 30-35) has suggested, the heuristic fruitfulness of theoretical entities may be a reason for affirming their reality. His argument also applies to the abstracting meaning components of empirical concepts. As we have seen, these components facilitate the making of novel predictions and hence possess cognitive, heuristic fruitfulness. Anticipating the extension of abstracted empirical results to novel situations, even if never guaranteed, has proved to be successful in many cases. My appeal to this argument is relatively modest, however. Even if it may be seen as ‘not decisive by itself’, it helps to shift the burden of proof to the critics of the reality of these abstract objects.

## 5. Emergence: The current debates

As noted at the beginning of this article, recent decades have seen a remarkable revival of interest in, and defenses of, the phenomenon of emergence.<sup>20</sup> In this section, I briefly consider

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<sup>18</sup> Putnam (1981, 49). Moreover, by including the dependence on theories or descriptions Putnam’s view is, in this respect, closer to mine than Wetzel’s.

<sup>19</sup> Therefore, I disagree with the term ‘only’ in the above quotation (see Radder 2012[1984/1988], 109-110). This book develops an alternative account of science consisting of a combination of referential realism and conceptual relativism.

<sup>20</sup> See, e.g., Anderson (2008[1972]), Nagel (1974), Bhaskar (1979), Schweber (1993), Emmeche, Køppe and Stjernfelt (1997), Kim (1999), Silberstein (2002), Bedau and

the common themes in the current debates on emergence. This will enable me, in the next section, to examine whether, and in which way, these themes are also relevant to the emergence of the meaning of empirical concepts. In general, I am sympathetic to the many positive accounts of emergence. However, I will also add several qualifications and point out some of the limitations of these accounts, which unnecessarily restrict the scope of the notion of emergence.

In a first, preliminary way, emergence can be described as follows. Complex systems may, and often do, possess novel, emergent features not possessed by the underlying, simpler systems of which they are composed. This synchronic description can then be supplemented by a diachronic account, explaining how complex processes may acquire such novel features arising from underlying simpler processes. Of course, this starting point requires a lot of further explanation, especially of the notions of complexity and novelty, the nature of emerging features and the meaning of underlying systems and processes.

Typical approaches to emergence assume a layered conception of reality. They start from a more or less fixed hierarchy of levels, for instance between the physical, the biological, the mental and the social. The basic characteristic of emergence, then, is that higher levels may display novel features that depend on but are not fully reducible to features of the lower ones. Yet, emergence does not necessarily require a strictly layered reality, in the sense of a fixed hierarchy of levels. From a more general perspective, emergence may also apply to the relation between *domains* of more complex and less complex systems and processes. This perspective allows for the occurrence of emergence within the traditional level of physics and even within the sublevel of quantum physics (for examples, see Anderson 2008[1972]; Schweber 1993; Silberstein 2002, 96-98; Blachowicz 2013; De Haro 2019). Furthermore, one may question whether emergence is *always* related to complexity. In the next section I argue that this is not necessarily the case.

Conceiving of emergence in terms of a layered reality or in terms of connected domains of reality implies that emergentism is an ontological thesis. It is about the (general) structure of the world. In this article, I also argue for an ontological interpretation of emergence. Yet, this does not mean that epistemological issues can be ignored. If we want to avoid mere ontological speculation, we have to provide arguments for our ontological claims. Such arguments should include cases of successful knowledge claims (and their methodological underpinning) concerning emergent features. The subsequent section will illustrate the relevance of this point.

Often, emergentism and reductionism are seen as opposing views. In a way, this is correct. The basic characteristic of emergence given in the preceding paragraphs implies that emergentism is anti-reductionist. In as far as it is considered an ontological thesis, it is, by definition, incompatible with ontological reductionism. The primary reason for this irreducibility is the novelty of emergent phenomena.<sup>21</sup> However, anti-reductionist views do not need to be emergentist. An example is the belief in substance dualism concerning the

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Humphreys (2008), Vision (2011), Blachowicz (2013), Nagtzaam (2014), De Haro (2019) and Havlík (2020).

<sup>21</sup> Sebastian De Haro argues that reduction and emergence may ‘coexist’ (De Haro 2020, 2) or can be ‘happily reconciled’ (2020, 8). What he means is that the theories of the emergent phenomena and of their underlying level can be ‘linked’ through intertheoretical correspondence relations. However, the irreducibility claim implies that emergent phenomena cannot be *fully* reduced to an underlying level, not that there are no linkages between these levels. Put differently, it is hard to see how the novelty of emergent phenomena can be reconciled with full reduction.

relation between body and mind, according to which the mind (or soul) may survive the death of the body. Another illustration is the agnostic belief that the irreducibility of alleged emergent features is not a sign of novel dimensions of reality but merely a consequence of substantial and lasting limits to what can be known.

Next, there is the notion of novelty. Again, it can be interpreted in various ways. It may, for instance, simply be taken to mean that the novel features do not occur or arise at the underlying domain. Or it may be interpreted in an epistemological sense, saying that these features cannot be fully deduced, predicted, explained, represented, or understood on the basis of our knowledge of the underlying systems and processes. In this article, I use the general idea of being novel in the ontological sense of being of a new kind as compared to the features of the underlying systems or processes.

A further point relates to this ontological nature of the novel features. Not all cases of emergence are equally novel from a broader philosophical perspective. An often-used example is the emergent property of fluidity, which is possessed by liquids but not by the separate molecules of which these liquids are composed. It is a clear example of ‘more is different’. Such cases are obviously important from a scientific (and a philosophy of science) perspective. Yet, they stay within a conception of a purely physical universe and do not necessarily address the emergence of non-physical ontological entities. In contrast, many debates on emergence focus on the relation between body and mind, or between the physical and the mental. In as far as the mind or the mental is seen as situated in a non-physical realm they go beyond the idea of a purely physical universe and thus address an issue of broad and basic ontological novelty.

Finally, there is the much-discussed issue of the distinction between types and tokens. This individual thought (or this pain) of mine is a token of the type of all thoughts (or of all pains). The question then is whether emergence (and also reduction) is only a relation between tokens or also between types (ontologically); or (epistemologically) whether it applies to our knowledge of the relevant tokens or also to that of the types. There is a similar question about the relation between micro- and macrophysics: is emergence at the macro-level limited to individual events or does it include the existence of general patterns of its own kind, which cannot be fully explained by the microphysical laws?

For a variety of reasons, type reductionism has been strongly questioned and enjoys far less popularity today than several decades ago (Silberstein 2002; Vision 2011, chap. 6; Bem and Looren de Jong 2013, 214-222). Does this also apply to emergent types? According to some authors, it does. For example, the elaborate study of emergence presented in Vision (2011) is limited to (property) tokens. Other authors disagree. Thus, P.W. Anderson states that ‘the microscopic equations of motion are in a sense violated’ and ‘each level can acquire a whole new *conceptual* structure’ (Anderson 2008[1972], 226 and 228, my emphasis). In the same spirit, my account of the emergence of meaning will defend the significance and reality of the emergence of abstract types.

## **6. The emergence of conceptual meaning**

In the book *The world observed/the world conceived*, I suggested that the meaning of empirical concepts can be seen as emerging from underlying empirical processes (Radder 2006, 116). Based on the results of the preceding sections, I can now develop this brief suggestion (just one paragraph) in much more detail. I will discuss this subject for the two meaning components separately.

As we have seen, the *structuring* meaning component of an empirical concept (its structuring intentional content) is an abstract entity, defined as ‘a type of material/linguistic signs that refers to (a part of) the common result of a specifiable set of actually realizable empirical processes’. There is, however, an important reason to deny the emergence of this meaning component. The problem is that there is a two-way dependence between the structuring component and its realization processes. On the one hand, the existence and nature of this component is dependent upon the successful realization of the relevant empirical processes. On the other hand, however, the successful realization of these empirical processes depends on an interpretation in terms of the relevant concepts. It is these concepts that structure the empirical processes in specific ways. This conceptual dependence holds both in a diachronic sense (in the cognitive processes of grasping the structuring meaning of the concept) and in a synchronic sense (concerning the grasped structuring meaning of the concept). This fact also implies that the structuring meaning component is not a novel feature as compared to its underlying realization domain.

This argument is in line with conclusions concerning the role of realization and supervenience in other accounts of emergence. Thus, a prime example of an emergent property token in Vision’s account concerns emergent properties of a particular statue of Pericles that is realized in a physical lump of clay (Vision 2011, 63-69). He emphasizes that this kind of realization is not symmetric: properties of the piece of clay are not realized in properties of the statue. More generally, the physical features of the non-emergent base should be describable without invoking the character of the emergent property (Vision 2011, 64). If this is not the case, we do not have an instance of emergence. My argument for not assigning an emergent status to the structuring meaning component agrees with this conclusion. Furthermore, the fact that the existence and nature of the structuring meaning component is not supervening on the underlying empirical processes is even more obvious. In this case, supervenience would mean that no change of the structuring meaning is possible without a change in the empirical processes. However, when the specification of such processes themselves depends on conceptual interpretation, the notion of supervenience does not apply.

In contrast, the *abstracting* meaning component of empirical concepts *can* be seen as an emergent entity. This component has been defined as ‘a type of material/linguistic signs that refers to (a part of) the common result of an indeterminate set of potentially realizable empirical processes’. Being a type, it is an abstract entity, like the structuring meaning component. However, its emergent character derives from the specific procedure by which it is abstracted (and by which it differs from the structuring component). This procedure of abstracting first leaves out from the empirical process everything but its (intended) result and then sets this result apart from this process. By being severed from its spatiotemporal realization processes and conceived in isolation from these specific processes, the result becomes an abstract entity (or, in case the result is a proposition comprising empirical concepts, it includes abstract entities).

Thus, the claim is that the abstracting intentional content of empirical concepts is an emergent entity. Several questions often posed about emergence (as mentioned in section 1 and discussed in section 5) can now be answered for this kind of emergence in relatively simple ways. First, the abstracting intentional content of empirical concepts *emerges from* the set of past and current empirical processes to which the concept has been applied thus far. Furthermore, in addition to this from-what question, the question of *how* this may happen is also clear: by being the result of a specific process of abstraction (in the sense explained above). Moreover, these answers to the ‘from what’ and ‘how’ questions are also applicable to cases of diachronic emergence. The diachronically realized procedures of abstraction (the

‘leaving out and setting apart’) generate synchronic emergent entities in the form of abstracting intentional contents.<sup>22</sup>

Next, there is the issue of the *dependence and autonomy* of emergent entities. In the case of the abstracting intentional content the emergent entity depends on the set of past and current empirical processes to which the concept has been applied thus far. Without these processes, there is nothing from which an entity could be abstracted. At the same time, as a genuine abstract object it cannot be reduced to the set of empirical processes on which it depends. However, interpreting this irreducibility in terms of autonomy is inadequate, because of the strong connections between the notions of autonomy and independence. Much more appropriate is the notion of transcendence, as explained in Radder (1996, 83-85; 2006, 122-125). The meaning of the abstracting component of empirical concepts transcends the meaning these concepts have on the basis of their uses in past and present empirical processes.

Furthermore, the abstractness of this meaning component constitutes its *radical novelty* as compared to its underlying base of empirical processes. Finally, even if this kind of emergence does not apply to all conceivable concepts, it does apply to all empirical concepts. Given the broad notions of experience and empirical, and hence the huge number of (actual and possible) empirical concepts, the *scope* of this kind of emergence is huge as well.

As mentioned in the introductory section, this account situates the emergence of the abstracting meaning component in the realm of social ontology. Hence, the noted differences with the emergence of natural phenomena should be obvious. Moreover, this account of the emergence of conceptual meaning is also significantly different from theories about the emergence of mental phenomena. Consider, for instance, the emergence of qualia, that is, conscious subjective experiences, a much-debated topic in the mind-body debate in analytic metaphysics. Jaegwon Kim even states that ‘if anything is going to be emergent, the phenomenal properties of consciousness, or “qualia”, are the most promising candidates’ (Kim 1999, 18). Paradigmatic examples of such phenomenal mental states are claimed to be ‘sensations such as a headache, a tingle in one’s leg, an itch, drowsiness, orgasms, an after-image, and perceptual experiences such as of a blue patch or the taste of cinnamon’ (Vision 2011, 13-14).

I think that this approach is debatable for three general reasons. The first is that the main point seems to be a defense of the significance and value of the subjectivity of experience against the (alleged) objectification of a purely scientific approach.<sup>23</sup> This issue, however, is not necessarily related to the idea of emergence as the rise of ontological novelty from an underlying basis. For this case, I have no problem in accepting the agnostic view (mentioned in the previous section) that this specific kind of irreducibility may be a

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<sup>22</sup> See also Havlík (2020), who explains the connection between diachronic and synchronic emergence in terms of a diachronically realized synchronicity.

<sup>23</sup> In his seminal, strongly anti-reductionist article, ‘What is it like to be a bat?’, Thomas Nagel (1974) claims that the relevant feature of the physical is its objectivity, in striking contrast to the basic subjectivity of conscious *individual* experiences, not only of humans but also of (higher) animals, such as bats. A similar emphasis on the significance and irreducibility of subjective experience can be found in the pragmatist tradition. William James and Alfred North Whitehead, for example, advocated a radically humanistic form of empiricism, which explicitly argued against the scientific imperialism of their days (see the extensive discussion in Mostajir 2021). An instructive, critical discussion of a range of philosophical views about the nature of phenomenal states and concepts can be found in Ludwig (2015, 158-170).



consequence of lasting scientific ignorance. Yes, the history of science provides many examples of progress in our understanding of the world, including our human existence. In spite of this, just as often epistemic progress engenders novel kinds of ignorance. Thus, the history of science by no means supports the speculative claim that, ultimately, science will be able to accomplish a full and final understanding of anything in the universe (including the full details of my personal experience of ‘a tingle in my leg’).<sup>24</sup> A second problem of this approach to emergence is that the mentioned kinds of qualia are taken to be *the* paradigmatic examples of human mental life. In my view, they are the more mundane examples. Limiting the debate to qualia leaves out the really challenging cases, such as the emergence of abstract entities (including thoughts, meanings and values).<sup>25</sup> Thirdly, the protagonists of qualia emphasize the importance of a first-person approach to phenomenal experience, but it is always the I, the first person singular, never the we, the plural. This view entails a further problem for this approach, which is the neglect of the constitutive role of society: either the social does not exist at all or it exists only in a derivative way, as an aggregate of the mental properties and preferences of individuals. Instead of this individualism, I emphasize the constitutive role of society, for ontology and for a social epistemology, an approach that aims to transcend the usual dichotomy between the objective and the subjective.<sup>26</sup> From this perspective, concepts and their meaning are not, or not primarily, conceived as mental objects. Therefore, in this respect the account of the emergence of conceptual meaning transcends the qualia framework of the mind-body debate.

In sum, the basic idea of this account of emergence is the combination of the dependence and transcendence of abstract, emergent entities. These two notions play a similar role as the ideas of fundamentality and novelty, which John Symons (2018) sees as the defining characteristics of emergence. As explained, the notion of transcendence implies the occurrence of substantial novelty. Instead of fundamentality, however, I prefer the related notion of the dependence of emergent meaning on *underlying* empirical systems or processes. ‘Being underlying’ shares certain features with ‘being fundamental’, but the former avoids the foundationalist connotations of the latter. Especially in the realm of human concepts and social ontology it is advisable to avoid possible connections to foundationalism.

The resulting account of the emergence of the abstracting meaning component is also significantly different from both Platonist and Aristotelian interpretations. The aspect of dependence implies that the abstracting meaning component is not a Platonic idea, which would exist in some pre-given, eternal kingdom of essential forms. On the contrary, it is the existence of relations of dependence that distinguishes emergentism from Platonic views in which the higher level is assumed to exist independently from the lower level. On this point, my emergentist account differs from the views of Wetzel, who seems to advocate a Platonist interpretation, at least for the case of mathematical entities.<sup>27</sup>

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<sup>24</sup> See also Philip Kitcher (2017, 113), who argues that ‘the idea of a “theory of everything” is an absurd fantasy’.

<sup>25</sup> For instance, if abstract entities exist, it seems impossible to maintain, as David Ludwig proposes, that abstract and physical objects ‘describe *the same reality* in terms of different but equally fundamental ontologies’ (Ludwig 2015, 157, my emphasis).

<sup>26</sup> See Bhaskar (1979, 124-137) and Radder (2019, chaps. 5-6). See also the critical discussion of Patrick Heelan’s views (who follows Edmund Husserl in his first-person, phenomenological approach to perception) in Radder (2006, chap. 6).

<sup>27</sup> See Wetzel (2009, 36, my emphasis), where she endorses the ‘*a priori* conceptual nature of mathematical truths’.

Furthermore, the aspect of transcendence entails that this account of the emergence of abstract meanings goes beyond Aristotelian interpretations of abstraction. Cartwright, for instance, endorses the Aristotelian view that ‘the general exists only in the particular’. An abstract concept, such as ‘force’, ‘is not a new, separate property different from any of the arrangements that exhibit it’ (Cartwright 1999, 44). Apparently, she concludes from her criticism of Platonic interpretations of abstract concepts that such an Aristotelian interpretation is the only plausible alternative. From the perspective of the emergentist account developed in this article, this ignores the important distinctions between the structuring and the abstracting meaning component of empirical concepts. As we have seen, the meaning of the abstracting component cannot be reduced to the features of a specifiable set of actually realizable empirical processes.

There is another respect in which the account of the emergence of meaning goes beyond the way in which debates on emergence are often framed. Consider the idea that emerging entities always arise from collective and complex systems or processes. This idea seems to be implied in, or is suggested by, the slogans that ‘the whole is more than the sum of its parts’ or that ‘more is different’. The close connection between emergence and collectivity or complexity is often emphasized in scientific perspectives on emergence (Bedau and Humphreys 2008, 209-211). In his illuminating analysis of the relationship between collectivity and emergence, Robert Nagtzaam upholds the claim explicitly.

Emergent phenomena are *collective* in nature: emergence is a concept that only has meaning for large numbers of entities. ... This reflects the import of *scaling*: emergent entities become manifest as we move up the scale from the micro-cosmos to the macro-cosmos in space and time. ... These scales reflect a powerful tendency inherent in nature to form a *hierarchy* of organizational levels. (Nagtzaam 2014, 120)

Yet, not all philosophical perspectives on emergence include this emphasis on collectivity or complexity. As mentioned before, Vision’s main example concerns emergent properties of a particular statue of Pericles that is realized in a physical lump of clay. The property that emerges in this case (being a statue of Pericles) results from a difference in identity conditions of the lump and the statue.<sup>28</sup> The latter will persist as the same statue of Pericles even if it has been damaged by losing a hand. Similarly, in the case of the emergence of the meaning of empirical concepts, the relevance of collectivity and complexity is unclear or even absent. The abstracting intentional content does not simply arise (as a ‘natural tendency’) from some kind of complex organization of, or collective cooperation by, underlying parts. Instead, the process of abstracting is routinely practiced and the resulting intentional content is routinely affirmed by human beings.<sup>29</sup> Yet, as we have seen in section 4, the heuristic function of extensible concepts and the often successful extension to novel processes constitute good reasons to justify claims about the existence of the relevant meanings. These facts also indicate that this kind of emergence cannot be understood within a framed dichotomy between *objective* or *subjective*, as implied in the qualia debate.

The principal results of this account of empirical concepts, their meaning and its emergence can be summarized as follows. A first step is the explanation of the cognitive notion of experience (perception, observation and experimentation) in terms of conceptually

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<sup>28</sup> Vision (2011, 63-69). Andy Clark (2001, 112-116) discusses other cases of emergence that do not depend on collective behavior.

<sup>29</sup> Something similar applies to the examples of the emergence of social properties (such as the property of being a five-dollar bill) discussed in Silver (2021, 7870).

interpreted and spatiotemporally realized empirical processes. On this basis, I have defined the notion of an empirical concept and its structuring and abstracting meaning component. Next, these components have been shown to be abstract, but nonetheless real, objects. Finally, I have argued that the abstracting (but not the structuring) component emerges from the empirical processes in which the concept has been realized thus far. Thus, the suggestion mentioned at the start of this section has been confirmed, be it in a slightly adjusted way. Furthermore, I have explained both similarities and differences with other recent accounts of emergence. The crucial similarities are the features of dependence and transcendence (with its implied notion of significant novelty). The most important differences concern the abstract nature of emergent meanings, the absence of the idea of complexity, and the avoidance of the dichotomy between the subjective and the objective.

## Acknowledgments

*Luctor et emergo* (I struggle and emerge/surface) is the motto of the very watery Dutch province of Zeeland, the Netherlands, where I grew up. I hope that not merely its first but also its second part applies to my account of the complicated subjects discussed in this article. If so, the surfacing of this article is also due to helpful comments on its earlier drafts by Lieven Decock, Sebastian De Haro, Christian Krijnen, David Ludwig and Ken Westphal. I would also like to acknowledge feedback from a referee of this journal and from the members of the research group on philosophy of science and technology at the Department of Philosophy of VU University Amsterdam.

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