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Against the Linguistic Strategy for the Ontic Conception of Scientific Explanation

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Ontic Conception of Scientific Explanation

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Rebecca Fensholt

Philosophers of science are interested in characterizing the nature of scientific explanation. Much of the debate has been about which format or structures best represent, and thus explain, scientific phenomena. Pushing back against these representational views, Craver has been developing an *ontic* account of scientific explanation. According to this view, explanations are not representations of things in the real world but are the things in the world themselves. In a recent paper, Craver (2013) argues in favor of the ontic view by appeal to our use of the word 'explain.' In this paper, I evaluate Craver's *linguistic strategy* and argue that it fails to provide support for the ontic view. Craver introduces a distinction between four senses of 'explain' and argues that one sense - the ontic sense - is the literal and foundational sense. This is taken to justify the ontic view. In this paper, I argue that linguistic tests for primacy do not privilege the ontic sense of 'explain,' and in fact, indicate that the ontic sense is subordinate. I conclude by raising some general questions about the merits of the linguistic strategy as method of justification for the ontic view of scientific explanation.

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I. Introduction

Explanation is an activity at the heart of scientific practice. What makes something a scientific explanation, and in particular, a *good* scientific explanation? This question is of interest to many in contemporary philosophy of science. Most current answers to this question are *representational*: they claim that a good or successful explanation is one that accurately depicts the phenomenon in the world that is to be explained. There are debates over the form this representation should take, but most accept this representational approach. Recently, Craver (2007, 2013) has put forth an *ontic conception* of explanation that breaks away from the representational tradition. According to the ontic view, explanations are not mere representations of ontic structures in the world. Rather, explanations *are* the ontic structures in the world that we depict with models, diagrams, schemas, and other representational formats.

In a recent paper, Craver (2013) defends the ontic view by performing a close analysis of the word 'explain.' According to this *linguistic strategy*, Craver argues that 'explain' is ambiguous. It has four senses, and one sense - the ontic sense - is the literal and foundational sense. It is literal

because when we talk about explanations as having a mind-independent existence, we are speaking literally about explanations. In that case, according to Craver, sentences that use the ontic sense of 'explain' give us insight into the nature of explanations, thereby demonstrating that explanations are ontic. The ontic sense is foundational because the adequacy of all other types of explanations partly depends on whether or not they reveal ontic explanations.

In this paper, I argue that Craver's linguistic strategy fails to provide an adequate defense of the ontic view of scientific explanation. In the next section, I lay the groundwork for the ontic view by surveying recent accounts of explanation in philosophy of science. In section three, I detail Craver's linguistic strategy for defending the ontic account of explanation. Section four contains my own linguistic analysis which I use to show that, even if Craver is granted all of his assumptions about language, his arguments fail to support the ontic view. Linguistic tests for the word 'explain' provide evidence that contradicts the claims made by Craver in his linguistic strategy. In the fifth section, I highlight a number of other problems facing the linguistic strategy for defending the ontic view of explanation. Whether or not the ontic view is the best approach to explanation is up for debate. What I hope to show in this paper is that the linguistic strategy fails to defend the ontic view as a sensible alternative to the representational views of explanation.

II. Background

If science aims at describing and understanding the world, then explanation is indispensable to the enterprise. There are two fundamental questions concerning explanation in philosophy of science. First, what is a scientific explanation?¹ Second, what makes a good scientific explanation? A simple answer to the first question is that scientific explanations are explanations that are used in science.

¹There are two demarcation projects contained in this question: first is distinguishing scientific explanations from ordinary explanations, and second is distinguishing explanation from other achievements in science (such as prediction). Here, I would like to generalize away from these projects and the disputes that follow.

When scientists explain an event, they do so by representing that event in some way. If a doctor needs to explain to an aphasic patient's family why their relative suddenly lost the ability to produce grammatical speech, she may explain the expressive aphasia by telling the family that the patient's sustained damage to parts of the brain that control language production.² If an astrophysics professor wants to explain the final velocity of a spacecraft to a classroom full of students, she may explain the velocity by writing the relevant information - the ratio between the rocket's mass before and after burning its fuel - in the form of an equation on the board. As these examples illustrate, scientific explanations often appear to be representations, such as verbal communications, equations, models, and diagrams.

The question of what types of explanations are good explanations is a question about the types of representations that explain best. Some representations are simply not explanatory. A still life drawing may represent a vase of wilting daisies, but a botanist would not use this particular piece of artwork to explain why the flowers have wilted. However, the botanist could explain why daisies wilt by drawing the vascular system of a daisy with the air bubbles that have formed in its vessels after being cut, preventing water from flowing up the stem. Although still life drawings and anatomical drawings are both representations, only the latter is a representation that explains. So the normative question about explanation asks, between explanatory representations, which explain *best*? Are statistical models more explanatory than deductive arguments? Do causal mechanisms explain more adequately than idealized models? Contemporary philosophers of science are concerned with questions like these.

Representational views of explanation are the current default views in philosophy of science. They are the successors to purely epistemic approaches to explanation from the mid-twentieth century, and they have recently been the target of criticism from proponents of a new

² Expressive aphasia is a communication disorder caused by damage to a language center of the brain commonly referred to as the Broca's area. It is characterized by an inability to produce or comprehend grammatical speech, while the ability to produce or comprehend meaningful words remains intact.

approach to explanation, the ontic conception. The purpose of this section is to detail these three general approaches to explanation: epistemic, representational, and ontic. A purely epistemic approach to explanation, the Deductive-Nomological Model of explanation, emerged in the twentieth century. It took explanations to be deductive arguments describing natural laws, but as philosophers soon realized, this approach failed to provide a sufficient or necessary account of explanation. Upon the widespread acknowledgement of this account's failure, new representational views emerged that set out to develop accounts of explanation that focus on accurate depictions of phenomena. Like the preceding view, these views have an epistemic component. However, they are constrained by the real world in ways that purely epistemic views are not, so they also have an ontic component. More recently, a purely ontic view of explanation has developed. On this view, explanations are not representations of ontic structures in the world; rather, explanations are ontic structures. Each of these views is presented in more detail below.

2.1 An Epistemic Approach: the Deductive-Nomological Model

In the mid-twentieth century, the Deductive-Nomological (DN) Model was the prevailing account of explanation in philosophy of science. It is associated with the logical empiricists, particularly Hempel for his thorough accounts of the DN Model (Hempel and Oppenheim, 1948; Hempel, 1965). According to this view, to explain a phenomenon is to show how its occurrence was to be expected given the laws of nature and the state of the world at a particular time. In this way, the Deductive-Nomological Model is *epistemic*. Explanations take the form of valid deductive arguments. At least one premise must describe a law of nature, and that premise must be essential for deriving the conclusion, or the sentence describing the event.

The DN Model is widely considered to be a failed account of explanation for being *too* epistemic. By focusing exclusively on the features that a successful argument must have, the

account does not place enough restrictions on the required connection between the argument and the phenomenon to be explained. The connection is weak enough that arguments can be pulled apart from the events that they explain. That is, it allows for sound arguments that fail to track the phenomenon they allegedly explain. This turns out to be problematic for many cases that satisfy the DN Model's criteria but do not strike us as explanatory in light of its failure to adequately represent the world. For example, consider the following argument:

(2.1.1) All infants who have significant damage to the Broca's area of the brain are unable to form complex grammatical sentences.

Jane is an infant who had significant damage to the Broca's area of her brain.

Therefore, Jane is unable to form complex grammatical sentences.

According to the DN Model, example (2.1.1) explains Jane's inability to form complex grammatical sentences because the conclusion can be expected from the premises. However, this argument is not obviously explanatory because it contains information that we consider to be irrelevant to the event - it contains reference to two sufficient causes for Jane's aphasia (her infancy and the damage to her brain). The particular problem here is that deductive arguments are not harmed by irrelevancies, but it seems as though explanations are. The connection between the arguments and the real world is weaker than what we want in the connection between explanations and the real world. This causes doubts about the claim that explanations are deductive arguments. Philosophers of science constructed numerous counterexamples to the DN Model that highlighted this and other troubling consequences of its ability to pull apart from the real world.³ These counterexamples prompted widespread agreement that adequate explanations should accurately depict the world.

³ Salmon (1989, 46-50) provides a survey of the strongest of these counterexamples.

2.2 The Representational Views

As the DN Model's problems came to light, philosophers of science worked to develop different approaches to explanation. The focus was on establishing accounts that cannot be pulled apart from reality, so the epistemic aspect of any view must be constrained by an ontic aspect. That is, explanations must have epistemic features, but they also must have features that tell us what the world really is like. According to these views, explanations are representations that accurately track ontic structures in the world. Their task is to determine what type of depictions do this best; that is, which representations best explain.

One early account put forth by Railton (1978, 1981) is the *Ideal Explanatory Text* theory. The IET theory posits a hypothetical text that contains every true piece of causal or nomological information relating to an event. So, an ideal explanation is a textual representation of every piece of explanatory information that is relevant to a non-ideal explanation (i.e. an explanation that we would actually give). One way to understand this is to think about the ideal explanatory text as the perfect, complete, final textbook to the universe. An ideal explanatory text for expressive aphasia would be that textbook's chapter on aphasia. It would include every piece of relevant, explanatory information to aphasia such that it would adequately and completely explain every instance of aphasia. Another early alternative to the DN model is Salmon's *Statistical Relevance* view (1971), which takes statistical models to be explanatory representations. For Salmon, an explanation is the set of all of the information that is statistically relevant to an event. For example, the lesion in the Broca's area of the brain is statistically relevant to a patient's aphasia because the lesion in the Broca's area changes (increases) the probability that the patient will be unable to produce complex grammatical sentences, so this is one part of the explanation of the aphasia. The full explanation will include every single event that has made a difference in the probability of that event occurring. A more recent account is the *Causal Mechanical* view as articulated by Machamer, Darden, and

Craver (2000). This view aims capture the types of explanations actually used in contemporary science, which the authors realized often appeal to mechanisms. For example, an explanation of expressive aphasia will reference the mechanism responsible for language production and describe its entities, such as the language centers of the brain, and activities, such as blood flow between those centers.

This is by no means a comprehensive overview of representational accounts of explanation. The debate over which representations best explain is expansive and has carried on for decades. Even among those who agree on the types representations that are most explanatory, there are still disagreements over the details of how those representations explain.

2.3 The Ontic Conception of Explanation

According to a more recent view, explanations are not representations. Craver, like other proponents of the ontic view, argues that explanations are not representations of ontic structures; rather, ontic structures *are* explanations. He thinks that the philosophical debate over representations is driven by confusion about the nature of explanations. He says that questions about representations are questions about psychology, not explanation. As Craver himself puts it, “The representational subsumption view is a plausible hypothesis about psychology of understanding (2013, 27),” but the philosophical discussion over explanation should turn its focus away from representations and to the actual things that they represent. The ontic view contends that explanations do not have an epistemic component. If we want the actual explanation for a patient’s expressive aphasia, we won’t find it by revealing part of an ideal explanatory text, modeling the statistical relevance relations, or sketching the causal mechanism. If we want the actual explanation, we must look to the brain itself. There lies the real, ontic explanation. Craver describes ontic explanations as follows:

Ontic explanations are not texts; they are full-bodied things. They are not true or false. They are not more or less abstract. They are not more or less complete. They consist in all and only the relevant features of the mechanism in question. There is no question of ontic explanations being ‘right’ or ‘wrong,’ or ‘good” or ‘bad.’ *They just are* (2013, p. 40).⁴

On this view, explanation are actual things in the world, so we don’t have to worry about explanations inadequately representing the world. The ontic account offers a way to move beyond the philosophical dispute over representations, but the view has been met with resistance from the philosophical community. In an attempt to provide a sensible account of the ontic view, Craver (2013) introduces a *linguistic strategy* of defense. He distinguishes between the way that representations explain and the way that ontic structures explain by highlighting the ambiguity in the word ‘explain.’ He argues that ‘explain’ is ambiguous and has multiple, distinct senses, one of which is ontic, and the ontic sense is privileged over the other senses.⁵ For Craver, a sentence uses the ontic sense when it is used to talk about explanations existing mind-independently. We can find the ontic sense in sentences such as, “Jupiter’s high gravitational influence explains why it has so many moons,” or, “Scientists are still looking for explanations for many phenomena.” According to Craver, any sentence that talks about explanations (i.e. any sentence which uses variances of the words ‘explain’ or ‘explanation’) as if they are ontic is a piece of evidence in favor of the ontic view. The linguistic strategy for defending the ontic account is built upon this evidence.

⁴ Emphasis added.

⁵ A word can be said to have multiple senses if it has multiple distinct but related meanings.

III. The Linguistic Strategy for the Ontic View

In a recent paper, Craver (2013) attempts to provide a sensible and appealing defense of the ontic view. He introduces a linguistic strategy that is based on an analysis of the word ‘explain.’ The strategy is used to show that ‘explain’ has an ontic sense and that this is its literal and foundational sense. This is used to support the ontic view of explanation. In this section, I lay out the linguistic strategy as a four-step process, summarizing each step individually and explaining how Craver puts them together to form a defense of the ontic view. Step one is to disambiguate the word ‘explain’ by proposing multiple senses of the word and coming up with a sentence that illustrates each hypothetical sense. The second step is to show that these proposed senses - specifically, the ontic sense - are actual and distinct senses of ‘explain’ by applying a combinability test for ambiguity to the sample sentences. Step three presents arguments for the ontic sense being the single literal and foundational sense of ‘explain.’ The fourth and final step is to use this as evidence to support the ontic view.

3.1 Step One: Senses of ‘Explain’

The first step of Craver’s linguistic strategy is to propose a set of multiple, distinct senses of ‘explain.’ Craver says that we use ‘explain’ in four different ways, or as if it has four different senses: communicative, textual, cognitive, and ontic.⁶ Here are four sentences about explanations of expressive aphasia, each representing one of the four sense of ‘explain,’ respectively:

(3.1.1) The doctor explains the patient’s expressive aphasia.

⁶ Craver describes these as modes and as senses, but I refer to them as senses throughout this paper. Also, in the original paper, Craver introduces the communicative sense first, the ontic sense second, the textual sense third, and the cognitive sense fourth. I have slightly rearranged this order here to group together all three representation-involving ways of talking about explanations.

(3.1.2) Lichtheim's model explains the patient's expressive aphasia.

(3.1.3) The doctor's mental representation of the patient's expressive aphasia explains the patient's expressive aphasia.

(3.1.4) The lesion in the Broca's area of the brain explains the expressive aphasia.

The *communicative sense* of 'explain' is used in sentences that discuss an explaining act performed by an intentional agent. In (3.1.1), the doctor explains the aphasia if she has communicated some relevant information about the patient's aphasia to an audience so that the audience will come to understand why the aphasia has occurred. This might be her verbal communication to the patient's family, or perhaps a paper that she has published in a scientific journal. Other examples of this sense include a professor explaining to a class why an economic principle is justified, a text message explaining why you had to cancel plans with your friend, or this paragraph in which I am explaining to the reader what the communicative sense of explanation is.

The second sense of 'explain' is the *textual sense*. In this sense, the text itself is the thing doing the explaining, such as in (3.1.2). Lichtheim's model is a simple diagram of the language centers of the brain, the pathways between them, and the types of aphasia that can be predicted when one of those centers or pathways is damaged. The model itself explains the patient's expressive aphasia if, for example, a group of students are reading about the patient as a case study and refer to the model to explain why a particular lesion resulted in this particular type of aphasia.⁷

Craver's third sense of 'explain' is explicitly added in an effort to include some representational views of explanation in philosophy of science. Craver refers to this as the *cognitive*

⁷ It might strike the reader as odd that the textual sense does not include texts that are used as aids in communicative acts of explaining, such as the doctor using a simplistic illustration of a brain to show the patient's family where the lesion has occurred. However, for Craver, this would still be communicative because the picture is not explaining; rather, the doctor is explaining by using the picture as a visual aid. Similarly, this paper is a communicative explanation because I, Rebecca Fensholt, am using text merely as an aid to help me explain the ontic view.

sense of explain, illustrated by (3.1.3), and this is supposed to exemplify a view that ties explanation to the activation of a mental model of an event. There is a close relationship between explanation and understanding on this view. If the activation of the mental representation has facilitated an understanding of the aphasia, then the mental representation can be said to have explained the aphasia.

In Craver's *ontic sense* of 'explain,' states of affairs explain events. In (3.1.4), the aphasia isn't being explained by some representation of the brain damage - it is explained by the damage to the brain itself. The ontic explanation is the state of affairs in which a lesion in the Broca's area of the brain impacts speech production and comprehension. The lesion explains the aphasia regardless of whether it is ever represented in any communicative, textual, or cognitive explanation. The ontic sense of 'explain' is the most important for motivating the ontic account of scientific explanation.

3.2 Step Two: Ambiguity of 'Explain'

After proposing his four senses of 'explain,' Craver's next step is to demonstrate that the word is really ambiguous and does have a distinct ontic sense. According to Craver, 'explain' is ambiguous because it is impossible to meaningfully combine two sentences using different senses of 'explain' into one sentence. If two sentences using a single word can be meaningfully combined into one, then the sentences both use a single sense of that word there is no evidence of ambiguity:

(3.2.1) The doctor and the nurses explain the patient's expressive aphasia.

(Communicative + Communicative.)

The combined sentences in the example above meaningfully combine, so they must use 'explain' in the same sense and, therefore, do not provide evidence for ambiguity. If two senses fail to

meaningfully combine with each other in a single sentence, however, then this would be sufficient evidence to say that those sentences use two distinct senses of the word. Craver argues that the ontic sense fails to combine with each of the other senses:

(3.2.2) The doctor and the lesion in the Broca's area of the brain explain the patient's expressive aphasia. (Communicative + Ontic)

(3.2.3) Lichtheim's model and the lesion in the Broca's area of the brain explain the patient's expressive aphasia. (Textual + Ontic)

(3.2.4) The doctor's mental representation of the expressive aphasia and the lesion in the Broca's area of the brain explain the patient's expressive aphasia. (Cognitive + Ontic)

According to Craver, each of these sentences shows that the ontic sense does not meaningfully combine with any of the others. This shows that 'explain' is ambiguous. Importantly, it has an ontic sense that is distinct from the senses that are used in sentences about communication, texts, or mental representations.⁸ Now that he has demonstrated that 'explain' has a distinct, ontic sense, he can proceed onto the third step of the linguistic strategy - demonstrating that the ontic sense is the literal and foundational sense.

⁸ The three other sentences also fail to meaningfully combine into one sentence which, according to Craver, demonstrates that each of these is also a distinct sense. However, Craver's does not spend much time on these given that his strategy only requires that the ontic sense be disambiguated as a distinct sense.

3.3 Step Three: Ontic Sense as Literal and Foundational

Craver makes two points in favor of the ontic sense being privileged over the other senses of 'explain.' First, he argues that the ontic sense is the literal sense. This is because the ontic sense must be interpreted literally in order to grasp some of the ways that we talk about explanations. For Craver, a sentence such as, "Scientists are still looking for explanations of phenomena," is evidence that the ontic sense is literal. When we hear this sentence, we think of scientists conducting research, perhaps trying to identify a cause of cancer or testing water samples for contamination, aiming at uncovering some explanatory ontic structure. Craver would say that this is the right way to think about these sentences, and this shows that the ontic sense is literal. It means that scientists are looking for ontic structures when they look for explanations; so, ontic structures are explanations. If, for example, the textual sense was literal, then the literal interpretation of this sentence would be that scientists are still looking for diagrams or models of phenomena. This brings to mind a mental image of several people in lab coats rummaging through boxes, looking for previously undiscovered diagrams of mutant fruit fly strains or the complete written history of pollution discharge into an aquifer. Craver argues that if any other sense was literal, then sentences that are used to talk about explanations as if they exist mind-independently would be "strained, if not literal nonsense (Craver, 2013: 36)." However, we do not think of these types of sentences as being ungrammatical or nonsensical, so the ontic sense must be the literal sense of 'explain.'

The second point is that the ontic sense is foundational. This means that the communicative, textual, and cognitive senses depend on the ontic sense. Craver argues that communicative, textual, and cognitive explanations depend on ontic explanations because their adequacy is partly determined by how well they deliver accurate information about ontic structures. When the doctor explains the patient's aphasia, the adequacy of her communicative explanation is partly determined

by how accurately she describes the lesion in the Broca's area of the brain, and this is also the case for the textual and cognitive explanations. According to Craver, the lesion in the Broca's area of the brain is the ontic explanation for the expressive aphasia. Therefore, the communicative explanation - as well as the textual and cognitive explanations - depends on the ontic explanation. This is evidence that the ontic sense is the foundational sense.

3.4 Step Four: Support for the Ontic View

At this point, Craver has offered reasons to think that 'explain' is ambiguous, it has an ontic sense, and the ontic sense is both the literal and foundational sense of 'explain.' For Craver, this is sufficient to support the ontic conception of explanation. He takes it as a descriptive fact that we speak of explanations as if they are ontic, and he has argued that this reveals to us that explanations are, by nature, ontic. All other types of explanations are trying to reveal something about an ontic explanation. If explanation is a goal of science, and if the adequacy of scientific explanations depends on how well they deliver accurate information about ontic explanations, then the ontic account ought to be taken seriously in the philosophical debate over explanation.

IV. Against the Linguistic Strategy

In the previous section, I described Craver's linguistic strategy as having four steps. The third step is the most crucial. This is where Craver moves from the claim that 'explain' has an ontic sense to the stronger claim that the ontic sense is the literal and foundational sense of 'explain,' and this is the basis for his defense of the ontic view. Despite the fact that it contains the most crucial pieces for the linguistic strategy, Craver's own discussion of this step moves quickly, making a few key assumptions that are easy to miss. In this section, I first clarify some of the assumptions that Craver

makes and evaluate their merits from a linguistic perspective. Then, I turn to the arguments that Craver has provided for the ontic sense being literal and foundational. In both cases, the arguments are flawed. Lastly, I introduce linguistic tests that could be used to support Craver's claims about the ontic sense being literal and foundational and demonstrate that linguistic evidence does not support Craver's claims, thereby showing that the linguistic strategy fails to support the ontic view.

4.1 A Linguistic Analysis of the Ambiguity of 'Explain'

Craver takes 'explain' to be ambiguous on the basis of its having multiple senses, and one sense that is literal and foundational - the ontic sense. Following this argument requires a good bit of unpacking, as well as an introduction to some linguistic concepts. First, ambiguity can come in many forms, only some of which depend on a plurality of senses. Second, even if a word is ambiguous because it has multiple senses, it's not necessarily the case that it will have only one literal sense. Third, a sense is foundational if it's the case that all other senses are derived from that sense. Below, I clear up the confusion on these three points before proceeding to an analysis of Craver's arguments. In order to accept the claims that Craver makes, the word 'explain' must take a form of ambiguity known as *polysemy*, the polysemy must be motivated by metaphorical applications of 'explain' in multiple contexts, and the ontic sense must be *primary* over all other senses.

The term 'ambiguous' is broadly used to describe sentences or words that have multiple meanings or senses. Some words are ambiguous because they have multiple unrelated meanings. These are *homonyms*. We say that two words are homonymous if they are unrelated but sound alike, such as the homophones 'bear' and 'bare,' or look alike, as with the homographs 'bank' (financial institution) and 'bank' (side of a river). This is contrasted with *polysemy*. We say that a single word is polysemous if it has multiple related meanings which, to avoid confusion, are

referred to as *senses*. The word 'mouth' may be called polysemous because it has more than one sense - it can be used to describe the the part of an animal's lower face that opens or the part of a river that opens up to a larger body of water. We can say that 'mouth' is ambiguous because it is used differently in the two cases, and it is polysemous because the different uses are related in a way that 'bank' (financial institution) and 'bank' (side of a river) are not. Given the fact that Craver has described 'explain' as having multiple senses, it seems that he takes it to be polysemous.

In order for polysemy to occur, a word's conventional meaning must be stable enough to be applied in other contexts. If some application eventually becomes stable and conventional, then it is a new sense of that word. This application takes one of two forms: *metaphor* and *metonymy*. The form of polysemy that 'mouth' takes is metaphorical. The word was initially only used to describe an opening in an animal's lower face until the conventional use of the word became stable enough to be applied metaphorically in other ways, such as the opening of a river. In the case of metonymy, a word is polysemous if it can refer to something else closely associated with that word. For example, 'the Pentagon' can refer to either the building itself, as well as the Department of Defense or the people who work for the Department of Defense. Metaphor is a new figurative application of a word in some context, whereas metonymy is a new literal application of a word. To make this distinction clear, consider the sentence, "The Pentagon made a statement." This could be read as containing either a metaphor or a metonymy. If it is read metaphorically, we would take this figuratively to mean that the building left some type of impression on its visitors. On the metonymic reading of this sentence, we would take this literally to mean that someone who speaks on behalf of the Department of Defense has released a statement regarding some event.

Polysemous words have multiple senses, and one of those senses is primary over all others. For metonymy- and metaphor-driven polysemous words, the primary sense is the sense from which all other senses are derived. Unlike metonymy which has multiple literal senses, the primary sense in a metaphor-motivated polysemy is the *only* literal sense. Usually, considerations for

primacy are limited to senses that are currently in use. For example, the primary sense of 'happy' is the pleasure sense (e.g. "Amy is happy,"), so sentences that use 'happy' literally are those that use the pleasure sense. Derivative senses of 'happy,' such as the excessive sense (e.g. "trigger-happy"), depend on the pleasure sense, so it is also foundational. We would not consider the infrequently used good-fortune sense of 'happy' (e.g. "O happy dagger, this is thy sheath,") to be primary because it is no longer widely-used, despite the fact that it is older than the pleasure sense and that the pleasure sense was originally derived from this sense. The takeaway here is that *only* for metaphor-driven polysemous words is it the case that the primary sense is the only literal sense and the foundational sense.

Here is how these distinctions are important for the linguistic strategy: Craver argues that sentences such as, "Scientists are still looking for explanations for many phenomena," uses 'explain' in the literal sense, and this literality is supposed to show that the ontic sense is somehow privileged over the other senses. Additionally, the claim that all other senses of 'explain' depend on the ontic sense is also supposed to privilege the ontic sense. In order for these claims to be justified, Craver must take 'explain' to be a metaphor-motivated polysemous word. This fits consistently with his characterization of the ambiguity of 'explain' and with his arguments about the ontic sense being literal and foundational.

I grant Craver that 'explain' is, in fact, polysemous and that the polysemy is motivated by metaphorical applications of the word. This means that if the ontic sense is demonstrably primary, then the linguistic strategy can be used to defend the ontic view. However, there's a catch. If it turns out that there is no reason to think that the ontic sense of 'explain' is primary, then Craver's linguistic strategy fails to support the ontic view. Furthermore, if there is any evidence that the ontic sense is actually subordinate to some other sense, then this method of argumentation should be abandoned entirely.

4.2 The Arguments for Primacy

Craver's third step was to show that the ontic sense of 'explain' was both literal and foundational, which we now take to mean that the ontic sense is *primary*. He presents arguments for both points, but neither argument actually gives us reason to think that the ontic sense is primary. His first argument is in defense of the ontic sense as the one literal sense of 'explain.' Craver contends that we could not grasp the meaning of sentences such as, "Scientists are still looking for explanations for many phenomena," if the ontic sense was not literal. What he's saying is that the *literal interpretation* of sentences that use the ontic sense can only be understood if the ontic sense is literal. That may be true, but that isn't a reason to think that the ontic sense *actually is* literal. This point is clear when we see that the same reasoning applies with all of Craver's senses of 'explain': The literal interpretation of (3.2.1) only makes sense if the communicative sense is literal, the literal interpretation of (3.2.2) only makes sense if the textual sense is literal, the literal interpretation of (3.2.3) only makes sense if the cognitive sense is literal, and the literal interpretation of (3.2.4) only makes sense if the ontic sense is literal. This is all true, but it doesn't tell us which sense is actually literal. It just tells us that sentences that use the literal sense of 'explain' - whatever sense that actually turns out to be - are the only sentences that will make sense when interpreted literally.

With a metaphor-motivated polysemous word, only sentences that use the primary sense can be interpreted literally. All sentences that use a derivative sense must be interpreted figuratively because they use a figurative, or metaphorical, application of the word. We can still grasp the meaning of sentences that use metaphorical applications of words - this must be true or else we would never use metaphor in the first place and there would be no metaphor-motivated polysemous words. It may be the case that the ontic sense is literal and that the sentence, "Scientists are still looking for explanations for many phenomena," is interpreted literally to mean that scientists are conducting research aiming to reveal the ontic structures responsible for many

phenomena. However, it just as well may be the case that some other sense is literal. The sentence would still mean that scientists are conducting research aiming to reveal the ontic structures responsible for many phenomena, but we only get this meaning by interpreting the sentence figuratively. The fact that sentences that use the ontic sense can only be interpreted literally if the ontic sense is literal, then, is not enough to justify that the ontic sense actually is the literal sense.

Craver's second argument for the primacy of the ontic sense concerns the relationship between ontic explanations and other types of explanations. He argues that there is an "asymmetric direction of fit between the representation-involving ways of talking about explanation and the ontic mode (Craver, 2013: 36)." The other senses of 'explain' depend on the ontic sense because the adequacy of our representational explanations depend on how well they reveal information about ontic explanations. He concludes that the ontic sense is fundamental and that the ontic view is important for evaluating scientific explanations.

There are two big problems with this argument for the linguistic strategy. First, this is not a linguistic argument. That is, this is not an argument about the linguistic notion of dependence. Whether or not representation-involving ways of talking about explanation depend on the ontic way of talking about explanation is a separate question from whether representation-involving explanations depend on ontic explanations. Craver purports to be making a claim about the first type of dependency, but his only support comes from the second type of dependency. We have no evidence that the other senses of 'explain' depend, in any way, on the ontic sense. This may be an argument in defense of the ontic view, but it is not an argument about language and it does not belong in the linguistic strategy.

Not only is this argument not linguistic, but it also simply doesn't give us reason to think that ontic structures are ontic explanations. The argument can be gleaned from two quotes:

(4.2.1) It would appear that the adequacy of our communicative acts, our

scientific texts, and our mental models depend in part on whether they correctly inform us about the features of the world that cause, produce, or are otherwise responsible for the phenomena we seek to explain (2013, 36).

(4.2.2) Explanatory communications, texts, and representations are evaluated in part by the extent to which they deliver more or less accurate information about the ontic explanation for the *explanandum* phenomenon (2013, 37).⁹

In the first quote, Craver is noting that representational explanations are partly dependent on “features of the world that cause, produce, or are otherwise responsible,” which are ontic structures. In order to motivate the ontic view, he must show why those ontic structures are explanations. In the second quote, he moves straight to making an explicit claim that representational explanations depend on ontic explanations without providing a reason to think that explanations are ontic. Whether or not representational explanations depend on ontic structures is a separate question from whether or not ontic structures are ontic explanations. We don’t get a reason to move from the initial claim that representational explanations depend on ontic *structures* to the claim that representational explanations depend on ontic *explanations*, and we still do not have a reason to think that explanations are ontic.

Neither argument for the primacy of the ontic sense - the argument for it being literal or the argument for it being foundational - actually support the ontic view. In both cases, one must already accept that explanations are ontic in order to accept the conclusion. This shows that the particular method of argumentation provided by Craver is insufficient for defending the ontic view. In order for the linguistic strategy to support the ontic conception of explanation, it must be the case that the ontic sense of ‘explain’ is the primary sense. The rest of this section introduces a different linguistic

⁹ An *explanandum* phenomenon is the event that is to be explained.

method for determining primacy which includes a number of linguistic tests that will be applied to 'explain.'

4.3 The Evidence for Primacy

Craver's method of defense for the ontic view was argumentative, and the arguments that he provided were insufficient to show that the ontic sense is primary. Given that the question about primacy is a linguistic one, we should use linguistic evidence to determine primacy, not argumentation. There are two types of evidence that can be used to reveal the primary sense of a polysemous word: linguistic and empirical.¹⁰ As I will show below, the linguistic evidence produced by these tests do not support the ontic sense as a candidate for primacy. Either they fail to provide conclusive evidence or they actually provide evidence that the ontic sense is subordinate. The applicable tests for linguistic evidence of primacy are: (a) earliest attested meaning, (b) predominance in the semantic network, (c) use in composite forms, and (d) grammatical predictions (Taylor & Evans, 2003).¹¹

(a) Earliest attested meaning

The earliest attested meaning reveals the earliest use of the word - the sense which was stable and conventional enough to support polysemization. The first known documented appearance of the word 'explain' occurred in 1425,¹² and the word is used is not used in the ontic sense: "to provide

¹⁰ Although we may speak of these tests as "revealing" primacy, the results of these tests should not be taken as conclusive proof of primacy. It would be more appropriate to consider these tests to be "narrowing strategies" whose results can be used as a body of evidence to support a hypothesis that one sense is primary.

¹¹ Taylor and Evans (2003) include an additional test that may be helpful for narrowing down candidates for primacy, but it is specific to cases that do not apply to 'explain.' It compares senses across synonyms and antonyms, such as 'on' and 'off,' but this test is not applicable in the case of 'explain' because it lacks a direct antonym.

¹² "That tho thingis, whiche in wrokyng trewly I am ofte tymes experte, I may plenerly explane tham." (Oxford English Dictionary, "Explain.")

an explanation for something; to make plain or intelligible, to clear of obscurity or difficulty (Oxford English Dictionary).” The first entry for the ontic sense of explain appears in 1786, over 350 years after the first appearance of ‘explain.’ The etymological evidence does not indicate that the ontic sense is primary and, furthermore, it provides evidence that the ontic sense is actually subordinate.

(b) Predominance in the semantic network

Predominance in the semantic network refers to all the different ways that ‘explain’ is used, even within a single sense, and then determine which sense is primary by determining which sense has the most unique usages. For example, ‘window’ has one sense in which it is an opening that lets in light and another sense in which it is an opportunity, but the first sense is the primary sense because it has many more unique usages - house window, door window, car window, etc., - than the second sense which has only the one unique usage. For this test, the ontic sense has one unique usage which would, at best, put it on equal grounds with any other sense that has one unique usage. This test also does not provide evidence that supports the ontic sense’s primacy.

(c) Composite forms

The third test for primacy looks at the sense(s) used in composite forms. A composite form is simply a form of a word that has additional elements. For example, the word ‘table’ has many composite forms. It has compound composite forms, such as ‘tablecloth,’ and particle composite forms, such as ‘table tennis.’ Composite forms are most likely to take the primary sense given its stability and conventionality, so the sense that is most often used to form a composite is likely to be the primary sense. I consider ‘explain’ to have three composite forms: ‘explain away,’ ‘explain oneself away,’ and ‘explain into.’ These three composite forms do not rely on the ontic sense of ‘explain,’ and composite form that could rely on the ontic sense. The third test also does not produce evidence in favor of the ontic sense and does indicate that the ontic sense is subordinate to

the sense(s) used in these composite forms.

(d) Grammatical prediction

The final linguistic test for primacy is grammatical prediction. This test requires finding sentences in which one sense can be derived from an implicature provided by another sense. The sense which all others can be traced back to using this method can be considered the primary sense. To make this point clear, consider the preposition 'over' (Taylor and Evans: 2003, 49). There is a sense in which 'x is over y' means something like 'x is on top of y,' but another sense in which it could mean 'x is covering y.' While these two senses are clearly related, they are distinct in terms of the spatial orientation of x in relation to y. Grammatical prediction shows that the on-top-of sense of 'over' is likely to be primary to the covering sense of 'over' by looking at sentences such as, "The tablecloth is over the table," which uses 'over' in the on-top-of sense but also contains an implicature which can give rise to the covering sense. This test would be run repeatedly with all contexts until each implicature can be traced back to a single primary sense.¹³ A comprehensive test for grammatical predictability is beyond the scope of this paper, so it is possible that all senses may be traced back to the ontic sense. However, I believe that it is more likely that the ontic sense of 'explain' can be traced back to an implicature from some other sense. In particular, I think that it is most likely to be traced back to a causal communicative sense of 'explain,' in which someone explains a phenomenon by revealing its causes. This sense of 'explain' would presumably be traceable to some other communicative sense.

As I mentioned above, empirical evidence may also be used to reveal the primary sense of a word. Some tests in cognitive linguistics and psycholinguistics have uncovered significant differences in the ways that we process primary and subordinate senses of words. Studies have shown that

¹³ This process may be continued into archaic senses, but we may cut this off at the furthest traceable sense that is currently in use.

primacy has an effect on the amount of time that it takes to process a word in reading comprehension tasks.¹⁴ Specifically, primary senses are processed more quickly than derivative senses. The type of empirical evidence that can be taken from these types of tests may be used to argue against the linguistic evidence provided above. If there existed empirical evidence for the primacy of the ontic sense of ‘explain,’ then Craver may well be able to find empirical evidence to support the ontic view in the face of the linguistic evidence presented above.

Craver’s linguistic strategy for defending the ontic view rests on the assumption that ‘explain’ has one primary, literal sense, and the argument that this primary sense is ontic. Even if we grant Craver this assumption, which I have argued is reasonable, I have shown that we have good reason to deny his conclusion that this linguistic analysis provides support for the ontic view. In line with Craver’s strategy, I have offered alternative methods - both linguistic and empirical - that may help determine the primary sense of ‘explain.’ None of the accepted linguistic tests for primacy support the ontic view and, furthermore, some provide evidence that the ontic sense is actually subordinate. It is possible that Craver could find empirical evidence for the primacy of the ontic sense. However, in the next section I present a number of deeper flaws with the linguistic strategy that ought to discourage Craver, or any proponent of the ontic view, from pursuing this strategy any further.

V. Broader Concerns for the Linguistic Strategy

The previous section detailed issues with the crucial step in the linguistic strategy used to motivate Craver’s account of the ontic view of scientific explanation. In addition to the particular issues outlined above, there are many broader issues to consider with this line of argumentation. In closing, I discuss additional problems that are specific to other features of the linguistic strategy

¹⁴ See Cuyckens, Frisson, Sandra, and Brisard (1996), Foraker and Murphy (2012), Gibbs and Matlock (1997), Klepousniotou et al. (2012), Pickering and Frisson (2001), and Sandra and Rice (1997).

introduced by Craver, as well as general problems that arise from using any linguistic argument to defend the ontic view.

5.1 Combinability as a Test for Ambiguity

I do not disagree or deny that 'explain' is ambiguous, but there are some concerns about the combinability test that Craver uses to demonstrate its ambiguity and, more importantly, that it has an ontic sense. What Craver's combinability test is really showing is that 'explain' can exhibit *zeugma*, a figure of speech in which more than one sense of an ambiguous word is activated in a single sentence. For example, zeugma is exhibited by the sentence, "The soldiers died in battle and in vain," because a locational sense of 'died' is activated in relation to the phrase 'in battle,' but the phrase 'in vain' activates a goal sense of 'died.' For comparison, the sentence, "The soldiers died bravely and honorably" does not exhibit zeugma because the words 'bravely' and 'honorably' activate the same sense of 'dies.' The fact that 'die' is able to exhibit zeugma in certain contexts (as demonstrated with the sentence, "The soldiers died in battle and in vain") is evidence that it is ambiguous - it has more than one distinct sense.

The zeugma test is an unreliable test for a few reasons. The first is perhaps the most obvious - the test is entirely subjective. It relies on the judgments of native speakers to determine whether or not a sentence sounds "acceptable." A sentence can be said to exhibit zeugma if it is acceptable, but not *too* acceptable. There is no way to characterize the criteria of the test without extreme vagueness. This vagueness can lead to a disparity in results. That is, it is possible that the sentence "The soldiers died in battle and in vain" will sound more or less acceptable to one person than it does to another. So might be the case with a sentence such as, "Jon and the textbook explained the Hodgkin-Huxley model of action potential to me." The fact that such a sentence exhibits zeugma to Craver doesn't necessarily indicate that it will exhibit zeugma for anyone else.

For this reason, the ambiguity of a word should not depend solely on evidence from the zeugma test.¹⁵

5.2 Craver's Four Senses

Craver's strategy for disambiguating 'explain' is problematic for the senses that he selects. It seems that the senses he chooses (communicative, textual, cognitive, and ontic) are not motivated by any linguistic categorization. Rather, his four senses correspond to four types of philosophical views of explanation. This might make a view more appealing to philosophers of science who find their own view represented among Craver's senses, but there is no reason to think that these senses - or their labels - appropriately capture the multiple senses of 'explain.' The categories of communicative and textual sense ought to be replaced with many senses that represent different types of communication or texts, different goals of explaining, and unique semantic selections of each sense. That which Craver calls the cognitive sense is not, in fact, a unique sense of 'explain' - it's a particular application of another established sense. It simply isn't the case that senses of 'explain' fit neatly into categories that directly correspond to philosophical accounts of explanation.

Most problematic is Craver's ontic sense itself. It is indisputable that we speak of explaining in the way that Craver describes as ontic. However, it is not so clear that this is appropriately described as an "ontic sense." In fact, some of the sentences that Craver claims to use an ontic sense of 'explain' would be more aptly described as using a causal sense of 'explain,' which is not included in Craver's four senses. When we say something like, "The lesion in the Broca's area of the brain explains the patient's expressive aphasia," we are acknowledging that the lesion has caused the

¹⁵ For a fairly comprehensive list of acceptable tests for ambiguity, see Zwicky and Sadock (1975). In fact, this paper discusses a more stringent test for constructions that "combine" sentences in this way, known as the conjunction reduction test for ambiguity. I have used the term "zeugma" because Craver's examples do not fit the criteria to undergo the conjunction reduction test for ambiguity. This may be another reason to critique the linguistic strategy, but a discussion of the conjunction reduction test is beyond the scope of this section.

aphasia. That is, the so-called ontic sense of ‘explain’ takes *X* to explain *Y* if it is the case that *X* causes *Y*. It is not clear if there is any reason to describe this as the ontic sense other than the fact that the ontic view of explanation is concerned with these types of sentences. This unjustified labeling tips the scale in favor of the ontic view and does not appropriately describe the sense of ‘explain’ that it intends to. Not only does the linguistic strategy for defending the ontic view fail to show that the ontic sense is primary, but it also fails to defend the very claim that ‘explain’ has an ontic sense.

5.3 ‘Explain’ and ‘Explanation’

An important requirement for Craver’s argument to go through is that ‘explain’ and ‘explanation’ must have the same sense profile. That is, each and every sense for ‘explain’ must also be a sense of ‘explanation,’ and vice versa. This is required because the ontic sense is derived from the ambiguity of ‘explain,’ but the evidence for the ontic sense’s primacy is derived from uses of the word ‘explanation.’ However, this assumption is unqualified by Craver and it is unjustifiable from a linguistic perspective. ‘Explain’ and ‘explanation’ are different words, and despite their apparent relation to each other, we have no reason to assume that they will have the same sense profile.¹⁶ More importantly, even if ‘explain’ and ‘explanation’ did have the same sense profile, it still would not be justified to combine evidence from two distinct words the way that Craver has done in this strategy.

VI. Conclusion

In this paper, I have not argued against the ontic view or claimed that the ontic conception fails as

¹⁶ ‘Explanation’ is the result of the nominalization of the verb ‘explain,’ which we can infer on the basis of its suffix, *-ation*, which is a nominalizing affix. Despite their apparent relation, they are still separate words.

an account of explanation. What I have done is show that Craver's linguistic strategy for defending the ontic view fails to support the idea that the ontic view provides a sensible, appealing alternative to representational views on the basis of language. First, I described the contemporary landscape of the philosophical debate over explanation, including the problems that the ontic view claims to fix. Then, I presented Craver's linguistic strategy for defending the ontic conception of explanation as a four-step process that shows the ambiguity of 'explain' and demonstrates that the primary sense of the word is ontic. The core of the paper contained a refutation of the linguistic strategy, particularly problems with the third step - the one that is intended to show that the ontic sense is literal and foundational, or primary. Finally, I have presented additional problems with the linguistic strategy itself.

I want to conclude by casting further doubt on the idea that a linguistic strategy would work to establish the ontic view. Beyond the problems with Craver's particular strategy for defending the ontic view, there are broader questions to consider about using any linguistic strategy to defend an ontic account of explanation. First, it is implausible to suppose that all languages will have the same sense profile for their nearest equivalents of 'explain.' Craver even acknowledges in a footnote that the German word '*erklären*,' which translates to 'explain,' does not have an ontic sense, but he does not provide any reason to think that the senses of 'explain' should be privileged over the senses of '*erklären*,' or its nearest equivalent in any other language (2013, 31). Even more curious is the very idea that an ontic view should get its evidence from language. Whether or not language should ever be used to inform metaphysics is a question far beyond the scope of this paper, but it seems odd that the strongest evidence that Craver could provide for the ontic account of explanation actually comes from arguments about language. These broad questions should continue to be raised against any future formulation of the ontic conception of scientific explanation.

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