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# Epistemological Realism and Onto-Relations

## **Abstract**

The traditional concept of knowledge is a justified true belief. The bulk of contemporary epistemology has focused primarily on that task of justification. Truth seems to be a quite obvious criterion—does the belief in question correspond to reality? My contention is that the aspect of ontology is far too separated from epistemology. This onto-relationship of between reality and beliefs require the epistemic method of epistemological realism. This is not to diminish the task of justification. I will then discuss the role of inference from the onto-relationships of free invention and discovery and whether it is best suited for a foundationalist or coherentist model within a theistic context.

## **Keywords**

epistemology, scientific realism, philosophy, anti-realism, empiricism, positivism, theism, ontology

## **Cover Page Footnote**

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## THE ONTOLOGICAL STATUS OF REALITY AND ITS RELATIONSHIP TO EPISTEMOLOGY

God created both us and our world in such a way that there is a certain fit or match between the world and our cognitive faculties. This is the adequation of the intellect to reality (*adequation intellectus ad rem*). The main premise to *adequation intellectus ad rem* is that there is an onto-relationship between our cognitive or intellectual faculties and reality that enables us to know something about the world, God, and ourselves.<sup>1</sup> This immanent rationality inherent to reality is not God but it does cry aloud for God if only because the immanent rationality in nature does not provide us with any explanation of itself.<sup>2</sup>

In reality all entities are ontologically connected or interrelated in the field in which they are found. If this is true then the relation is the most significant thing to know regarding an object. Thus, to know entities as they actually are what they are in their relation “webs”. Thomas Torrance termed this as onto-relations, which points more to the entity or reality, as it is what it is as a result of its constitutive relations.<sup>3</sup>

The methodology of the epistemological realist concerns propositions of which are *a posteriori*, or “thinking after,” the objective disclosure of reality. Thus, epistemology follows from ontology. False thinking or methodology (particularly in scientific knowledge) has brought about a failure to recognize the intelligibility actually present in nature and the kinship in the human knowing capacity to the objective rationality to be known.<sup>4</sup>

Lorenzo Valla (1406-1457) developed the interrogative (*interrogatio*) rather than the problematic (*quaestio*) form of inquiry. Valla’s mode of inquiry was one in which questions yield results that are entirely new, giving rise to knowledge that cannot be derived by an inferential process from what was already known. This method was similar to the works of Stoic lawyers and educators like Cicero and Quintilian; that is, questioning witnesses, investigating documents and states of affairs without any prior conception of what the truth might be. Valla transitioned from not only using this method for historical knowledge but also applied it as “logic for scientific discovery.”<sup>5</sup>

Valla’s logic for discovery was the art of finding out things rather than merely the art of drawing distinctions and connecting them together. He called for an active inquiry (*activa inquisitio*). John Calvin (1509-1564) applied this method to the interpretation of Scripture and thus became the father of modern biblical

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<sup>1</sup> Alvin Plantinga, *Where the Conflict Really Lies: Science, Religion, and Naturalism* (Oxford: Oxford University Press, 2011), 269.

<sup>2</sup> John Morrison, *Knowledge of the Self-Revealing God in the Thought of Thomas Forsyth Torrance* (Eugene, OR: Wipf and Stock, 1997), 106. Thomas Torrance, *God and Rationality* (Oxford: Oxford University Press, 1971), 93-94.

<sup>3</sup> Morrison, 106.

<sup>4</sup> Thomas Torrance, *Theological Science* (Oxford: Oxford University Press, 1969), 76-80.

<sup>5</sup> Thomas Torrance, “Einstein and Scientific Theology,” *Religious Studies* 8 no. 3 (1972): 236-237.

*exegesis* and interpretation.<sup>6</sup> Francis Bacon (1561-1626) applied it to the interpretation of the books of nature, as well as to the books of God, and became the father of modern empirical science.<sup>7</sup>

This methodology created a split between subject and object, knowing and being, and gave rise to phenomenalism. Newton claimed that he invented no hypotheses but deduced them from observations produced rationalistic positivism, which engulfed contemporary European thought. This split's gulf was widened by David Hume's (1711-1776) criticism of causality and inference, depriving knowledge of any valid foundation in necessary connections obtaining between actual events and of leaving it with nothing more reliable than habits of mind rooted in association.<sup>8</sup> Hume weighed heavy in Immanuel Kant's (1724-1804) philosophical development. Given the Newtonian understanding of space and time, Kant transferred absolute space and time from the divine *sensorium* to the mind of man (the transfer of the inertial system), thus intellect does not draw its laws out of nature but imposes its laws upon nature. According to Kant one cannot know the *Ding an Sich* (thing itself) by pure reason; one is therefore limited to the sensual and shaping mental categories of the mind. That which comes through sensation the intuitions are shaped by the mind's *a priori* categories. It is in this sense that Kant played an essential part in the development of the idea that man is himself the creator of the scientific world.

Throughout Albert Einstein's work, the mechanistic universe proved unsatisfactory. This was made evident after the discovery of the electromagnetic field and the failure of Newtonian physics to account for it in mechanistic concepts. Then came the discovery of four-dimensional geometry and with it the realization that the geometrical structures of Newtonian physics could not be detached from changes in space and time with which field theory operated. Einstein stepped back into stride with Newton and his cognitive instrument of *free invention*. It was *free* in the sense that conclusions were not reached under logical control from fixed premises, and it was *invented* under the pressure of the nature of the universe upon the intuitive apprehension of it. Einstein used Newton and Maxwell's partial differential equations in field theory to develop a mode of rationality called *mathematical invariance*. Mathematical invariance established a *genuine ontology* in which the subject grips with objective structures and intrinsic intelligibility of the universe.<sup>9</sup>

This also meant a rejection of Kant's synthetic *a priori* whereby knowledge of the phenomenal world is said to be reduced to an "order" without actual penetration into the *Ding an Sich*.<sup>10</sup> Einstein's *categories* are not some form of Kantian *a priori* but conceptions that are freely invented and are to be judged by their usefulness,

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<sup>6</sup> Valla served in conjunction with Andrea Alciati (1492-1550) as Calvin's primary influence for his biblical interpretation.

<sup>7</sup> Torrance, "Einstein," 237.

<sup>8</sup> *Ibid.*, 240.

<sup>9</sup> *Ibid.*, 241-242.

<sup>10</sup> Morrison, 90.

their ability to advance the intelligibility of the world, which is dependent of the observer. As he sees it, the difference between his own thinking and Kant's is on just this point: Einstein understands the categories as *free inventions* rather than as *unalterable* (conditioned by the nature of the understanding).<sup>11</sup> It is by this method that one can penetrate the inner rationality of the reality by discovery, imagination, and insight in order to construct forms of thought and knowledge through which the rationality of the object may be discerned.<sup>12</sup> Einstein's *free invention* is quite synonymous with *discovery* in the sense that the consequent conclusion (knowledge) is not inferred or entailed from a fixed categorical antecedent (i.e. Kant).

Principles of method are closely related to empirical observations. As Einstein put it, "the scientist has to worm these general principles out of nature by perceiving in comprehensive complexes of empirical facts certain general features which permit of precise formulation."<sup>13</sup> These principles, not "isolated general laws abstracted from experience" or "separate results from empirical research," provide the basis of deductive reasoning.<sup>14</sup>

#### WHAT ABOUT *A PRIORI* AND NON-EMPIRICAL KNOWLEDGE?

The onto-relationships as described above concerning the intricate web and connection between reality and its entailment of knowledge does not seem to have such effect on *a priori* and non-empirical knowledge.<sup>15</sup> Such methodology inevitably turns all such knowledge into scientific knowledge—so what about ethical and religious knowledge?<sup>16</sup> Kant argued that such *synthetic a priori* knowledge was logically prior to any *a posteriori* knowledge. Such knowledge would be excluded from inferential knowledge but not necessarily excluded from the onto-relationship with reality. This knowledge may serve as an intuitive apprehension into the actual intrinsic relations in reality (physical and metaphysical). This intuitive knowledge is rational but non-logical and non-inferential. This could be said that it

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<sup>11</sup> Donna Teevan, "Albert Einstein and Bernard Lonergan on Empirical Method," *Zygon* 37 no. 4 (2002): 875-876.

<sup>12</sup> Morrison, 105.

<sup>13</sup> Albert Einstein, *Ideas and Opinions*, Trans. and rev. Sonja Bargmann (New York: Three Rivers, 1982), 221.

<sup>14</sup> Teevan, 877.

<sup>15</sup> To claim that such inferential reasons are not good reasons for belief one might deny the legitimacy of such forms of abductive reasoning as described above. The most common objection to such reasoning is when the conclusion of the argument involves unobservables (physically or metaphysically). Stephen Leeds, "Correspondence Truth and Scientific Realism," *Synthese* 159 (2007): 3. Bas van Fraassen takes the stronger objection to this inferential reasoning no matter what the context is: even if it is empirical *a posteriori*. For more on addressing van Fraassen's objection see Igor Douven's "Inference to the Best Explanation Made Coherent," *Philosophy of Science* 66 (1999): S424-S435.

<sup>16</sup> For the role of moral knowledge in non-inferential reasoning see Bart Streumer, "Inferential and Non-Inferential Reasoning," *Philosophy and Phenomenological Research* 74 (2007): 4-5.

is the knowledge that serves as the foundations, which arise in the mind's assent under the impress of objective structures in reality.<sup>17</sup> There is no reason to limit such intuitive apprehension of reality to the physical world only, which would serve as a defeater for any further entailments for positivism or strict empiricism. Such structures of reality may be purely metaphysical such as minds, abstract objects, or God. However, there must be some type of causal capacity for the onto-relations to have effect, which would exclude abstract objects since they do not seem to stand in causal relations. Thus, minds and God may serve as plausible ontological origins for non-empirical knowledge.

This methodology is not so far astray from the epistemological realist's empiricism, such a methodology I have assumed thus far, since the onto-relationship has still been preserved. This form of method has replaced *a posteriori* knowledge with *a priori* but the apprehension of such knowledge is still preserved by the onto-relationship of reality. Moral intuition may serve as an *a priori* conception, which can be expressed either doxastically or in a self-evident or incorrigible way. I do not see any good reason for why moral judgments should not function as evidence for a belief. These judgments are not empirically based but intuitively based. These intuitions are objective and are grounded in an objective reality, just as is any other criterion for evidence by empirical standards. The only differentiation between moral intuitions and empirical judgments is whether they are *a priori* or *a posteriori* but are still harmonious with epistemological realism and the onto-relationship between reality and knowledge. This causal relationship may simply be impressed upon us logically prior to our experience.<sup>18</sup>

#### INFERENCEAL JUSTIFICATION IN FOUNDATIONALISM AND COHERENTISM

Logically prior to such inferential reasoning is intuition for reasons previously discussed. These intuitions may be basic beliefs. The belief that this glass of water in front of me will quench my thirst if I drink it is not inferred back from previous experiences coupled with an application of a synthetic *a priori* principle of induction. Though this example is not how we form our beliefs psychologically or historically, it can be formed via instances of past experience and induction in the logical sense. However, when it does come to inferential reasoning R.A. Fumerton provides two definitions for what it means to say that one has inferential justification.<sup>19</sup>

D1 *S* has an inferentially justified belief in *P* on the basis of *E*. = Df.

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<sup>17</sup> Morrison, 91.

<sup>18</sup> If the epistemological realist's need for empiricism must be appeased by some experiential medium then it may certainly follow that the knowledge of certain ethical and religious truths may certainly come about *a posteriori* as well, though this is not the typical approach or 'category' for such knowledge.

<sup>19</sup> R.A. Fumerton, "Inferential Justification and Empiricism," *The Journal of Philosophy* 73 (1976): 564-65.

- (1) *S* believes *P*.
- (2) *S* justifiably believes both *E* and the proposition that *E* confirms *P*.
- (3) *S* believes *P* because he believes both *E* and the proposition that *E* confirms *P*.
- (4) There is no proposition *X* such that *S* is justified in believing *X* and that *E*&*X* does not confirm *P*.

D2 *S* has an inferentially justified belief in *P* on the basis of *E*. = Df.

- (1) *S* believes *P*.
- (2) *E* confirms *P*.
- (3) The fact that *E* causes *S* to believe *P*.
- (4) There is no proposition *X* such that *S* is justified in believing *X* and that *E*&*X* does not confirm *P*.

Given the explications of such definitions, both D1 and D2, there seems to be good grounds for believing that *P* must be inferentially justified. It is most certainly that case that D2 is more amenable to having scientific knowledge in the sense that both (2) and (3) are confirmatory. D2-(3) is certainly difficult to substantiate without begging the question. Having *E* cause *S* to believe *P* is difficult to distance from some form of transitive relation. Inferential justification may also be expressed probabilistically or determined probabilistically.<sup>20</sup>

I have little contention with such definitions of inferential justification; my concern is whether this is most amicable within a foundationalist's or coherentist's noetic structure.

Both D1 and D2 offer, I believe, to be successful accounts of inferential justification. However, I do find both definitions to be problematic for the empiricist on the bases of foundationalism, of which I will argue that such inferential justification and non-epistemological direct realism is more amicable to the coherentist and that a non-epistemological realist who adheres to foundationalism cannot successfully account for *new* beliefs.

Such inferential justification is certainly compatible with foundationalism but making all empirical claims to be inferential seems to be over-committing to inferential reasoning. Suppose I am walking in the field and on the next hill over I see an object. For all purposes, my phenomenological faculties indicate to me that there is *something* on the next hill. This belief is held for a reason, primarily that my phenomenological faculties inform me that *something* is on the next hill over, but this is not a reasoned belief. I may certainly infer certain properties consistent

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<sup>20</sup> This may be expressed by Thomas Bayes' theorem for conditional probability:

$$p(H|E) = \frac{p(H) \times p(E|H)}{p(E)} \text{ or by his rule for belief change: } P_E(H) = p(H|E). \text{ If my belief } p \text{ is going to}$$

be justified probabilistically then it must be  $0 < p \leq 1$  where  $p$  is  $> .5$ . Suppose that after all the evidence that is available is possessed and I have come to a value of precisely .5 for  $p$ . If I reject  $p$  as being true then I have just as much of a chance of being wrong about that as I do as being right. When  $p$  has a value of .5, all things considered, then I believe it would be acceptable to believe  $p$ ,  $\sim p$ , or to be agnostic. For more on the role of probability in inferential reasoning see Igor Douven's "Inference to the Best Explanation Made Coherent."

with D1 and D2 such as the belief that the object has a particular color or that it omits a certain sound or that it has a particular smell. My belief that an object is on the next hill over from me seems to be quite basic. I am not inferring its existence from other object-likenesses. I am completely unaware as to the identity of this object, or better yet, whether this object is unique or unknown. Suppose that this object has never been known before I experienced it. This makes the situation quite different from Fumerton's glass of water and is not a future tensed proposition nor is it a subjunctive conditional.

Inferential reasoning as described by D1 and D2 are certainly kind to empiricism when it comes to scientific knowledge. Certain unknown entities may become known by inferential means. We can infer the existence of protons, quarks, and other elementary particles by predicting what effects such entities may have in certain situations. This may be causal in nature and may be confirmed by inference. However, it is not the case that we directly experience the existence of these particles (for all intents and purposes, it certainly is the case that we experience particles when we run in to a wall and even then we experience the strong nuclear force over the particles). Nevertheless, epistemological direct realism and new belief formation can be non-inferentially justified.<sup>21</sup>

With such a methodology for inferential reasoning it may be argued that the foundationalist framework requires a presupposing of coherentism. This would bring inference to the best explanation into close contact with the holistic view of explanation.<sup>22</sup> Philip Kitcher argued that this holistic view of inferential reasoning:

[holds] that [scientific] understanding increases as we decrease the number of independent assumptions that are required to explain what goes on in the world... Explanations serve to organize and systematize our knowledge in the most efficient and coherent possible fashion. Understanding, on this view, involves having a world-picture—a scientific *Weltanschauung*—and seeing how various aspects of the world and our experience of it fit into that picture.<sup>23</sup>

Inferentially justified empirical beliefs are more in sync with a coherentist noetic structure. When making inferential claims the proposition being inferred from must cohere to a proposition already accepted as truth. Inferential reasoning is not necessarily non-foundational, but if empirical claims are strictly inferential then coherentism is best suited. No matter what the belief in question is to be it must be

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<sup>21</sup> This is not to ignore other experiential data such as spiritual or religious experience. Other propositional beliefs may be basic but non-empirical such as mathematical truths. My concern is oriented towards empirical basic beliefs. Additionally, suppose that today is Friday. I cannot change my belief to believe that it is now Sunday or Monday. Some beliefs are non-inferentially justified and involuntary. Richard Swinburne, *Faith and Reason* (Oxford: Oxford University Press, 1981), 25.

<sup>22</sup> Philip Clayton, "Inference to the Best Explanation," *Zygon* 32 no. 3 (1997): 387.

<sup>23</sup> Philip Kitcher, "Scientific Explanation," *Minnesota Studies in the Philosophy of Science* 13 (1989): 182.

inferentially referred back to another experientially valid belief (within the scope of empirical discussion).

David Hume brought to our attention a problem with inferential reasoning, which is especially important to the present task given his empiricism.

[As] to past *experience*, it can be allowed to give *direct* and *certain* information of those precise objects only and that precise period of time which fell under it cognizance. But why this experience should be extended to future times, and to other objects, which for all we know, may be similar in appearance...This, I must confess, seems to be the same difficulty...The question still recurs: on what process of argument this *inference* is founded? Where is the medium, the interposing ideas which join propositions so very wide of each other?<sup>24</sup>

Hume is right, it does not follow. There are plenty of possible worlds that match the actual world up to the present time, but then diverge wildly, so that inductive inferences would mostly fail in those other worlds. It is by no means inevitable that inductive reasoning should be successful; its success is one more example of the fit between our cognitive faculties and the world.<sup>25</sup> The criteria for the best inference are simplicity, beauty, and consilience (fit with other favored or established hypotheses).<sup>26</sup> Inferentially justified new beliefs create less dissonance with coherentism than with foundationalism. What is needed logically prior to the acceptance or justification of new belief is an evidence base. This is the set of beliefs used, or appealed to, in conducting an inquiry.<sup>27</sup> Recall Torrance's onto-relations. This onto-relation allows for inference to be a bridge between the ontological-epistemological divide. It is the onto-relationship that serves as Hume's missing medium. It is this "web" of onto-relations and consilience that function best with coherentism. Thus, to think rightly and in terms of inference and *a posteriori* reasoning means to connect things up with other things, thinking their constituent interrelations, and thus it is important for thinking to determine what kind of relation that exists between the realities contemplated.<sup>28</sup>

#### EXCURSUS: CONSIDERING VAN FRAASSEN'S CONSTRUCTIVE EMPIRICISM

Constructive empiricism (CE), primarily developed by Bas van Fraassen, regards theoretical identities rather than realistically. CE allows an empiricist

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<sup>24</sup> David Hume, *An Enquiry Concerning Human Understanding*, sect. IV, 2, in *Philosophical Inquiry* Eds. Jonathan E. Adler and Catherine Z. Elgin (Indianapolis, IN: Hackett, 2007), 181-82.

<sup>25</sup> Plantinga, 295, 297.

<sup>26</sup> These criteria may certainly be unnecessary in the case of paradigm shift with warranted evidence (preservation of consilience). Additionally, beauty and simplicity are certainly preferred but as long as the inference is in relation to reality then these two criterions may be inapplicable. Consilience is the most important criterion.

<sup>27</sup> Plantinga, 167.

<sup>28</sup> Morrison, 107.

approach to science without requiring the language and formulation of theory that the positivist uses. When one affirms accepts CE one must believe what the theory says about observables, that is, one must believe that the theory is empirically adequate; but one does not have to believe the whole theory, including what it says about unobservables. Van Fraassen argues that science can be understood without the strong realist approach. Science's aim becomes set on empirical adequacy rather than the full-blown truth.<sup>29</sup>

Van Fraassen defines an 'observable' as:

X is observable if there are circumstances such that, if X is present to us under those circumstances then we observe it.<sup>30</sup>

That which serves as an observation is not necessarily in the scope of philosophy. The limits of observation are a subject for empirical science, and not for philosophical analysis.<sup>31</sup> Thus, a theory is empirically adequate if and only if what it says about the observable things and events in this world is true.

Empiricism set limits on what one is rationally obligated to believe. Van Fraassen makes the distinction between acceptance and belief. There is no commitment, under CE, to believe the truth of the theory but one can accept the empirical data. This is very modest in its commitment to the informative power of a theory. If one chooses an informative theory over a less committal counterpart then it can only be for pragmatic reasons and not because these theories are more likely to be true. According to CE, scientists need never accept the need to postpone theories [due to the need of more evidence] or use inferential methods such as abduction as forcing them to go beyond the limits of observation.<sup>32</sup> This certainly seems to have an attraction over realism since CE never goes *beyond* the evidence akin to deduction (though completely different). However, this can have weak explanatory power in that explanations can never go beyond the data. It's twofold. On the one hand CE is very modest in its claims and keeps explanations within the scope of the immediate evidence while on the other hand the explanation of the data can never have a legitimate inference to the best explanation outside of the evidence. This is why van Fraassen has always been in opposition to abduction. If positing the real existence of electrons would explain some observable phenomenon, this is not in itself a reason to take the step of believe that the unobservable electrons exist. The CE proponent would simply respond to this and say that one may rationally stick to the more modest position that all observable phenomena are *as they would be if* the electron theory were true.<sup>33</sup>

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<sup>29</sup> Jennifer Nagel, "Empiricism," in *The Philosophy of Science*, eds. Sahorta Sarkar and Jessica Pfeifer (New York: Routledge, 2006), 240.

<sup>30</sup> Bas van Fraassen, *The Scientific Image* (Oxford: Oxford University Press, 1980), 16.

<sup>31</sup> *Ibid.*, 56.

<sup>32</sup> Nagel, 240.

<sup>33</sup> *Ibid.*

I certainly see scientific and epistemic benefits to realism while anti-realism and CE fall short of acceptance. Theories are often claimed to have suffered the death by a thousand objections. This obviously does not entail the defeat of the theory or explanation it just means this theory must be defended. However, CE and anti-realism really may suffer the deaths by a thousand *cuts*. Let this be analogous to the problem of reduction. Reduction requires that the laws of the reduced theory be derived from that of the reducing theory. If explanation is a form of derivation, then the reduction of one theory to another explains the reduced theory; in effect it shows that the axioms of the less basic theory are theorems of the more basic one.<sup>34</sup> Realism proficiently accounts for reductionism while CE and anti-realism suffer the progressive epistemic aspect of science. Prior to the development of the advanced microscopic imaging of an early microscope cells were not even posited as have a role in medicine and biology. The ancient medical advisor to Caesar named Galen thought that the only elements to life and health were a balance of the four humours. During the mid 1800's the living cell was thought to be very simplistic and there were very few components to the cell. Contemporary biology has moved on from an understanding of the humours being composed of the cells, which were once unobserved, and the cells are now composed of smaller mechanisms, which are composed of proteins, which were once unobserved as well. These proteins are composed of amino acid folds, which were once unobserved.<sup>35</sup> These amino acids are composed of molecular bonds and these molecules are composed of elementary elements such as carbon, hydrogen, and oxygen. There has been a progressive reduction of axioms in scientific explanations, which were once considered useful fictions but have now been observed as having a real ontic status. Realism allows for reductionism. Whenever future advances of science allow for the observation of current unobservable realism has been reaffirmed while CE and anti-realism suffer scientific blows.

The primary difference between realism, CE, and anti-realism is where these approaches rest on the spectrum of ontology and explanation. Realism takes theoretical commitments of science to be real, and not just [disguised] abbreviations for observational claims, or useful fictions we create to organize observations.<sup>36</sup> Anti-realism is contrary to realism. Instead of 'X is an unobservable and X is real', *a la* realism, anti-realism purports, 'X is an unobservable and X is non-real.' Both schools will recognize that, yes, X is an unobservable but they disagree on the ontic category. The category of ontology becomes muddled, if not superfluous, when referring to unobservable entities. An electron is a useful fiction. Thus, whatever X, if X is commonly referred to what is considered to be an electron, then X is a useful fiction for understanding the consequent state of affairs. CE rests in between these two ideas. As previously noted, CE makes no commitment to the ontic status of the unobservable and can sway the ontic pendulum either way. Because CE

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<sup>34</sup> Alex Rosenberg, *Philosophy of Science* (New York: Routledge, 2012), 137.

<sup>35</sup> Protein folds may be observed via an electron microscope. (If 'electron' has any real meaning here).

<sup>36</sup> Rosenberg, 150.

takes the middle ground here that certainly allows for it to be modest in the ontic category but because of this modesty I believe it suffers a stunt in explanatory power and a less-than-robust conclusion it may offer. The realist and anti-realist thoughts suffer the converse. The ontic pendulum swings in favor of them make clear demarcations in ontology where CE does not and offers explanations that may go *beyond* the evidence. The empirical positivists would have sided with the anti-realists for the sake of convenience and consistency. Because certain evidences are unobservable there *cannot* be any epistemic commitment to the data or conclusions from the data because it is unobservable. However, the positivist can still be a CE because the demarcation of ontology is muddled and the explanation stays within the data.

CE makes no *prima facie* contribution to counterfactual claims. However, if the role of counterfactuals in scientific theory is a desirable then CE is perfectly consistent with modal claims. Unlike the regularist and necessitarian approaches to natural laws and scientific explanations CE can go either way concerning the role of counterfactuals in a theory. Realism certainly seems to account for counterfactual claims but anti-realism seems to be moot on counterfactuals (though one could still be a consistent modal anti-realist). According to van Fraassen, the law of excluded middle does not apply to counterfactual claims—they are neither objectively true nor objectively false.<sup>37</sup>

The most direct way to defeat CE would be to identify a properly epistemic, opposed to merely pragmatic, reason to believe in the claims that science makes about entities that lie below the threshold of observation.<sup>38</sup> This would include the rationality of abduction. Abduction allows for a powerful predictive capability. Abductive reasoning allows for the positing of the best explanation, which may lie beyond, external to, the data. The conclusion does not rest in any of the premises. CE doesn't have a robust ability to predict. Prediction in a CE model merely reiterates the present data and this prediction would make no claim as to what the ontic status of the claim actually is. The realist, for instance, would need to establish not just that belief in quarks is rationally permissible but that it is rationally required.<sup>39</sup> Additionally, CE's epistemology does not allow for any knowledge concerning normative statements. All *a posteriori* claims inevitably become scientific unless the CE proponent alters their scientific knowledge to an arbitrary non-empirical knowledge.<sup>40</sup>

## CONCLUSION

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<sup>37</sup> Ibid., 13. Bradley Monton, "Constructive Empiricism and Modal Nominalism," *British Journal of the Philosophy of Science* 54 (2003): 409.

<sup>38</sup> Nagel, 241.

<sup>39</sup> CE models permit the belief in unobservables as *rationally permissible* but not *rationally required*.

<sup>40</sup> This is required since abduction is dismissed and, thus, the CE proponents is left only with the empirical data and *cannot* go beyond the data whereas a realist and anti-realist can.

There is a long historical development of onto-relations and inferential reasoning with primary influence by the contemporary science of the twentieth century and philosophers. Inferential reasoning is a widely practiced methodology in the contemporary spheres of science, the philosophy of religion, and the philosophy of science. Bas van Fraassen, as an antirealist, is one of the leading opponents of such inferential reasoning and its use of the probability calculus. Despite Alvin Plantinga's reliabilism he has made recent contributions to the onto-relations and scientific knowledge.<sup>41</sup> As Robert Audi put it, the contemporary task is discerning whether inferential and scientific knowledge is best suited for foundationalism or coherentism.<sup>42</sup>

This *a posteriori* methodology inevitably turns all such knowledge into scientific knowledge. Despite all *a posteriori* knowledge being scientific in nature the onto-relations are preserved in *a priori* non-empirical knowledge. Intuitions and basic beliefs may serve as antecedents for further inductive reasoning from which to use as the evidence base for the "web" of consilience and onto-relations.<sup>43</sup> Such methodological and inferential reasoning is not necessarily restricted to foundationalism, as Fumerton had argued since there are legitimate onto-relational basic beliefs. If these onto-relational beliefs serve as antecedents from which further inductive or abductive reasoning is used then inferential reasoning becomes better understood when it is justified by other doxastic elements in the onto-relational "web".

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<sup>41</sup> Plantinga's reliabilism would serve as an antecedent to scientific knowledge just like foundationalism would as previously discussed. However, it is difficult to separate the external element from the internalist nature of the task.

<sup>42</sup> Robert Audi, *Epistemology* ed. 3, (New York: Routledge, 2011), 300-1.

<sup>43</sup> This goes to show that one belief would require the logically antecedent justification of one or more other beliefs. This raises the problem of regress but if a basic belief serves as the unjustified justifier for that belief then it may be a justified antecedent. Lawrence Bonjour, "The Coherence Theory of Empirical Knowledge," in Paul Moser, *Empirical Knowledge* (Totowa, NJ: Rowman & Littlefield, 1986), 117.

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