On Neo-Humean Accounts for Natural Laws

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Abstract

Humeanism about laws is a metaphysical doctrine that claims that the complete scope of the world is comprised of the *mosaic*—a vast collection of particular, localized facts about the world, and everything else supervenes on this arrangement of facts. Reductionism about laws, the claim that laws of nature reduce to, and thereby supervene on, the Humean mosaic, follows from this view. The first part of the thesis explores Humeanism about laws and the evolving landscape of pragmatic approaches within this domain. Building upon the insights gained from this analysis, the second part of the thesis proposes a novel response to the problem of Humean circularity. By combining a comprehensive overview of Humeanism about laws with a novel response to the problem of circularity, this thesis deepens our understanding of Humeanism, its strengths, weaknesses, and the potential solutions to its problems. Moreover, the proposed response presented in this thesis not only addresses a significant stalemate issue between Humeans and non-Humeans but also offers new avenues for further exploration.

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Epigraph

The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom.

—Isaac Asimov, 1988

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Chapter 1: An Introduction to Humeanism About Laws

Humeanism[1] as a contemporary metaphysical doctrine is best described by David Lewis in the following quote, which expresses it in terms of a supervenience thesis:[2]

> Humean supervenience is named in honor of the great denier of necessary connections. It is the doctrine that all there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another. . . . We have. . . a system of external relations of spatiotemporal distances between points. . . . And at those points we have local qualities: perfectly natural intrinsic properties which need nothing bigger than a point at which to be instantiated. For short: we have an arrangement of qualities. And that is all. There is no difference without difference in the arrangement of qualities. All else supervenes on that (Lewis, 1987, p. ix).

Reductionism about laws, the claim that laws of nature reduce to, and thereby supervene on, the Humean *mosaic* of particular, localized facts about the world, naturally follows from this view.

This is in opposition to the non-Humean view which holds that the laws are metaphysically separate from all other things in the world as separate entities, rather than descriptions of regularities. It is often considered intuitive to view laws in this way, particularly among classical non-Humeans who consider laws to ground or hold together universal scientific properties. This articulation can be found in Armstrong (1978), who is a particularly strong denier of Humeanism, but it is mirrored elsewhere in the non-Humean literature such as in Carroll, (1994) and Maudlin, (2007).

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[1] It is important to note that the connection between Contemporary Humeanism and Hume's views is indirect.

[2] The supervenience thesis can be formulated the following way: A-facts supervene on B-facts if there cannot be an A-difference without B-difference (McLaughlin & Bennett, 2018).

Chris Dorst characterizes Lewis' brand of reductionism in two parts: (1) the Humean base, which is the mosaic of particularized facts about the universe, and (2) "a certain formula that gets applied to the Humean base in order to generate the laws" (2019b, p. 878). For Lewis, this formula is the *Best Systems Account.*[3] The Best Systems Account claims that there are innumerable systems—deductively closed axiomatizations that describe the fundamental regularities in the world in the most coherent and comprehensive way possible—and of these systems, some are described as *strong*, meaning they are highly informative, while some are described as *simple*. Strength and simplicity often conflict, so the best system is the system that best balances the two. The generalizations within the best system are the laws (Lewis, 1973, p. 319).[4] A Lewisian best system is characterized by strength and simplicity because any ideal systemization of the laws must be simple enough for us to comprehend and make use of them, while also capturing sufficient information so that we are able to use it to explain the world around us.

This thesis has two aims: The first is to present a comprehensive overview of the evolutionary trajectory from traditional Humeanism to the *neo-Humean*, or *Pragmatic Humean* perspective. The second aim of this thesis is to contribute an original response to one of the main

[3] The Best System Account has sparked its own promising literature too vast to describe here, for one introduction to this material, and how it is seated in Humeanism about laws see: "A Better Best System Account of Lawhood" (Cohen & Callender, 2009).

[4] This explored in depth in Harjit Bhogal's Paper Humeanism About Laws of Nature, which I outline in Section IV. The basic idea that Bhogal presents is that questions regarding the nature of explanation itself are at the heart of the literature about the BSA. Many attempts, from both Humeans and non-Humeans to define an explanation have fallen short in that they only assert some virtue which might be part of a good explanation. The issue here is that whatever desiderata are chosen whether it is strength and simplicity—as Lewis asserts—or something else entirely, that explanatory virtue can be easily replaced with practically any other virtue that suits the intuitions of the evaluator of an explanation without ever providing any substantial clarity.

objections posed against Humeanism about laws by providing a novel approach to the problem of Humean circularity.

I will begin by examining the traditional objections to Humeanism about laws, and then present a review of selected Neo-Humean literature. This body of work represents a collective effort by a group of philosophers to offer alternative accounts of Humeanism about laws. Their main goals are to embrace the Humean standpoint while also addressing the criticisms that have been raised in response to Lewis' initial formulation of his theory. Additionally, they seek to refine Humeanism in order to more effectively fulfill the practical requirements of scientific inquiry.

I take it as implicit that that if any of these accounts fare better in addressing these concerns than Lewis' original account, then that account can be regarded as a significant advancement over his original theory. By evaluating their effectiveness in overcoming the identified challenges, this thesis aims to shed light on the advancements and potential of the evolving Neo-Humean perspectives on laws of nature.

Through my analysis of these works, I hope to show that while certain Neo-Humean accounts have made good strides towards addressing issues for Humeanism about laws, major theories within the literature neglect the traditional objections to Humeanism by the issue. In all, I argue that Humeanism has a long way to go, but it remains a doctrine worth defending.

Chapter 2: Objections to Humeanism about Laws

Humeanism about laws has faced numerous classical objections from non-Humeans. In this chapter, I will outline some of these objections and explain how they challenge the Humean view of laws. As previously mentioned, I will also employ these objections as a template for assessing the extent to which the neo-Humean views presented later in the chapter fair as viable alternatives to or improvements on Lewis' original formulation of Humeanism.

The Problem of Induction

The original problem of induction was raised by David Hume. The crux of this issue is that "instances of which we have had no experience resemble those of which we have had experience" (*A Treatise of Human Nature*, 1739/2002). Simply put, everyone makes general predictive claims about the world—we require them in order to make not only scientific inferences, but also to reason about daily tasks. However, we lack a method of justifying those claims about the world in a deductively valid way. Justification for inductive reasoning cannot be supported through further inductive reasoning, without creating a circular, question-begging argument (Henderson et al., 2022).

It is important to note that almost all philosophers, Humean and non-Humean alike do not align themselves with inductive skepticism.[5] However, non-Humeans have raised concerns that Humeans embrace inductive skepticism. The line of reasoning goes something like this: Humeans claim that there are no necessary connections between distinct events. Non-Humeans assert that this denial of necessary connections makes it seem as if the world is only orderly by

[5] A notable exception to this is Karl Popper and his followers. However, Popper's acceptance of inductive skepticism is widely seen as a significant drawback in his broader philosophy of science.

coincidence (Strawson, 1989/2014, p. 24). The argument is then made that the Humean metaphysic cannot support any rational procedure for drawing inferences from past to future events, while the non-Humean metaphysic can (Armstrong, 1983, p. 104), principally because the non-Humean stance allows for laws to function as the cement that holds these otherwise seemingly disparate events together.

For the non-Humean, solutions to the problem of induction tend to rely on uncovering the underlying laws which govern necessary connections in the world as some way to justify their reasoning. Armstrong (1983) suggests what is now the standard non-Humean work-around for the inductive problem: Our best explanation of observed regularities is that there are necessary connections between them, and in order to overcome our skepticism, all that must be done is uncover those underlying laws. Then, through some method of Inference to the Best Explanation (IBE) we can make justified inferences about future events.[6] Nevertheless, both Humeans and non-Humeans maintain a certain level of skepticism about the efficacy of IBE as a reliable method of navigating skeptical doubts.[7]

[6] It is important to note that not every formulation of IBE requires that the Humean reject it. Both Humeanism and IBE encompass broad areas of research that include various specific perspectives within their scope.

[7] For non-Humeans, skeptical criticisms of IBE largely fall into two camps: (1) Those who claim that Best Explanation is a mere slogan with no real definition, and (2) those who raise epistemological concerns with the framework as a method of tracking the truth.

The strongest of these objections comes from Bas van Frassen (1989, pp. 142–143). van Frassen argues that scientists will never have a collection of every potential hypothesis available to them. The value of any hypothesis accepted by IBE is ultimately determined by the strength of the overall lot of hypotheses. If that lot is not particularly strong, or if all available explanations of a phenomenon are faulty or inadequate, then IBE could lead us down the fraught path of accepting false beliefs. The scientist could choose the best of a bad lot. It, therefore, appears that IBE may not be reliable as a method for generating scientific knowledge. The history of scientific paradigms and revolutions is often cited to provide evidence for this claim.

It is important to note that Humeans do not actually believe that their views endorse inductive skepticism, but they do feel it necessary to respond to this criticism to avoid giving up ground. The countermove from Humeans is typically to dismiss these concerns, and the non-Humeans proposed solution by reiterating Hume's position: If there is no non-question-begging justification for induction, then the non-Humean is mistaken in thinking they have some explanatory leg-up over the Humean when it comes to inferring from past to future events. It simply does not matter whether or not you accept or deny necessary connections, because the Humean and the non-Humean are in the same boat. However, as Loewer (1996) points out, the Humean perspective on rational induction keeps Hume's original argument in mind. Instead of attempting to justify inductive inferences, Humeans concentrate on discerning the reasonableness or unreasonableness of our inferences.[8] In doing so, Humeans are equally competent, if not better than non-Humeans when it comes to explaining rational induction.

Although this is the typical approach, that does not mean that it is unilaterally accepted. Helen Beebee (2011) contributes to the Humean response by claiming that even for an anti-Humean who accepts necessary connections between events, there are still difficulties justifying inferences from past to future. True inductive skeptics are not going to accept that a proposed necessitation relation between two events always holds, rather than merely acknowledging that it has held up thus far.

Harjit Bhogal (2021) has recently made efforts to address this issue more thoroughly, since he believes that Humeans have a unique problem with induction. Bhogal acknowledges

[8] This project is in line with the predominant trends in the past century of philosophy of science, encompassing a wide range of scholars including Logical Positivists to Carl Hempel and Bas van Frassen, just to name a few. In a broad sense, the majority of philosophers, apart from Karl Popper, have adopted this approach to inductive skepticism, and this has continued to be the case.

that both Humeans and non-Humean are vulnerable to the issues created by the problem of induction but claims that Humeans must deal with a unique issue specific to their view: (1) that Humeanism leads to an implicit acceptance of inductive skepticism, and (2) that it lacks its own theory to assess the results of inductive reasoning. Bhogal also believes that Beebee's (2011) concern is rooted in the assumption that the anti-Humean solution is not strong enough to convince the skeptic. Instead, he offers a tentative revision of Humeanism "If we think that there is no explanation of an observed pattern then we shouldn't believe that this pattern will continue to further, unobserved, cases, unless we have some special information that the observed pattern will continue" (pp. 13–14) Even still, Humeans do not have access to this special information about patterns in the world.

Humean or non-Humean loyalties aside, I'm doubtful that any approach truly eliminates the problem of induction. The best response here, it seems, is that induction remains a persistent challenge for any philosophical accounts of knowledge or belief. Humeans have no special difficulty here, they merely frame it in the broader context of their views of laws of nature and causation. This is not going to be satisfying to someone who holds stronger, foundationalist views of knowledge.

In response, I have only the following to say: whether one is a Humean or a non-Humean, we are going to make inductive inferences. We do it everyday when we assume the sun will rise in the morning as it has every day before. The fact remains that we all live with some degree of uncertainty, but it would be irrational to think the sun will suddenly not rise without some evidence to alter our beliefs to the contrary. Thus, we can either continue an ongoing debate on the problem of induction, and continue to search for answers within our respective philosophical

frameworks, or we can all take a deep breath, and move on. Most Humeans, myself included, should probably opt for the latter.

The Problem of Scientific Practice

The laws of nature play an important role in the sciences because they provide a foundation for making predictions about the natural world. This allows scientists to rely on their understanding of how things in the world will behave when placed under experimental conditions, and utilize the data gained in these experiments to test scientific hypotheses. Much of the longstanding debate between Humeans and non-Humeans revolves around their respective views' compatibility with scientific practice.

A key concern of this debate is whether the BSA is useful to scientists who have limited knowledge of the world.[9] Beyond its intertwinement with Humeanism about laws, the BSA possesses several good-making properties that make some unwilling to abandon it, such as its ability to describe the difference between laws and accidents, and how closely it lines up with scientific practice, while keeping to a relatively stark metaphysical picture that Humeans desire (Hildebrand, 2022, p. 2).

Yet for its perceived merits, the BSA has several shortcomings that are still unaccounted for—agents with limited epistemic access (such as us mere mortals) may not know how to locate the best system. Further, there is general disagreement about what virtues should be sought out, and to what extent each virtue should be prioritized when locating the best system. While the

[9] There are several related concerns that come up from this larger line of questioning. For instance, some laws of physics do not even remotely resemble collections of regularity (such as Newton's 2nd law). Relatedly, several of our accepted laws of physics seem to specify counterfactual conditions of what would have happened under alternative histories of the mosaic (Loew and Jaag, 2018, pp. 6–10). These cases seem to highlight a limitation for Humeans, because the laws appear to require something beyond just recognition of a pattern within the mosaic.

traditional formulation of the BSA suggests a balance between strength and simplicity, the precise application of these virtues seems inadequately described to many.

To elaborate, varied interpretations of terms like 'simple' and 'strong'[10] raise concerns about the theory's dependence on language, and there is a lack of consensus on how these virtues should be balanced. Lewis preempted this issue by proposing that naturalness plays a role in the BSA, but most find that addition to be an overcomplication of the BSA because of the extra metaphysical structure required to account for it (Hildebrand, p. 3). Beyond this, the addition of naturalness to the BSA does little to alleviate concerns regarding how simplicity should be interpreted and applied.

In recent years Neo-Humeans have attempted to address the concerns over the BSA by focusing on how the laws can be used in the sciences, rather than attempting to pinpoint an overarching theory for describing laws. In chapter 3, I will paint a picture, in broad strokes, of the views of major players in this field. At this point, just note that these approaches emphasize the importance of sensitivity to the scientific community's interests and goals and strive to reformulate Humeanism accordingly.

[10] The language-dependence concerns tend to come from a similar place as Nelson Goodman's New Riddle of Induction. They compare simplicity to predicates like 'grue' or 'bleen,' and claim that like 'grue,' 'simple' can be arbitrarily applied, or distorted to fit the whims of the person applying the predicate.

The Problem of Explanatory Circularity

One recent objection, the problem of explanatory circularity, has proven difficult for Humeans to circumvent. It is claimed that reductionist accounts of laws of nature lead to a circular explanation: Humeans claim that laws are explained by the totality of patterns in the mosaic, yet the particular facts which comprise the mosaic are explained by the laws. Consequently, scientific explanations that rely on the laws to explain particular facts or regularities about the world appear to be circular (Armstrong, 1983, p. 30; Bird, 2007, p. 86; Maudlin, 2007, p. 172).

A recent response from Barry Loewer (2012) defends Humean explanation from this objection by distinguishing scientific explanation from metaphysical explanation. Under Loewer's account, scientific explanation deals with how things occur in terms of laws and past occurrences. By contrast, a metaphysical explanation cannot appeal to laws, but rather describes how an event, fact, or process is grounded in facts about the universe. Scientific explanations sometimes appeal to metaphysical facts, and metaphysical explanations can invoke scientific explanations, but they remain distinct enterprises. For Loewer, the Humean employs metaphysical explanation when they characterize laws in terms of the mosaic, which allows the Humean to bypass any objectionable circularity:

> On Lewis' account the Humean mosaic *metaphysically* determines the L-laws. It metaphysically explains (or is part of the explanation together with the characterization of a Best Theory) why specific propositions are laws. This metaphysical explanation doesn't preclude L-laws playing the usual role of laws in scientific explanations. . . . Given the distinction between metaphysical and scientific explanation the argument that L-laws

> cannot be involved in scientific explanations of one part of the mosaic by another falls apart. (p. 131)

With this distinction in place, the explanation for the events in the world, provided in terms of the laws, is a different type of explanation than the explanation provided by those events to account for the laws. Thus, the Humean may escape the explanatory circle.

In recent years Loewer's paper has sparked extensive discussion. One notable objection comes from Marc Lange (2013). Lange argues that metaphysical and scientific explanations are connected by a *transitivity* principle. Central to his argument is the following claim:

> [W]hen E helps to scientifically explain F, then that explaining is being done by whatever D makes E the case. If D is what it is in virtue of which E holds, then D must play whatever roles in scientific explanations E is playing. If D does not help to scientifically explain F, then D cannot constitute E if E helps to scientifically explain F. (p. 256)

Lange concludes that because of this transitivity relation, the metaphysical explanation of some explanandum will scientifically explain that same explanandum. He uses two examples to illustrate his point. Both examples are meant to show that scientific and metaphysical explanations run parallel to one another. When metaphysical and scientific explanations are inextricably tied together, there is a change in our explanatory intuition that disallows treating a metaphysical explanation within a scientific explanation as an appeal to some other kind of information. Thus, Loewer's original claim is rendered as a distinction without a difference (Hicks & Van Elswyk, 2015, p. 433). While there have been some attempts at working to a resolution, this issue, which I will elaborate further on in Chapter 4, has remained largely unresolved.

The Problem of Supervenience

Non-Humeans raise a separate issue regarding Humean supervenience: It seems that there are multiple possible worlds where the mosaic is the same, but the laws are different (Tooley, 1977, p. 669; Carroll, 1994, pp. 57–67; Maudlin, 2007, 67–68). The following simplified version of Carroll's (1994, p. 60—68) "mirror world" objection illustrates this problem: There are two possible worlds, which I will call W1 and W2, they are identical in their arrangement of properties and facts, and both contain X-particles and Y-fields. In W1 (and not in W2), it is a law that X-particles that enter Y-fields have spin-up. In both W1 and W2, X-particles follow a linear path that leads them through exactly one Y-field.

Consider now, that there are two more worlds, W3 and W4. In both W3 and W4, however there is a mirror placed in a specific position in space in both worlds, and just before the X-particle enters the Y-field in both worlds, it is deflected. Thus, in both W3 and W4, the behavior of particles near the mirror is the same, and the presence or absence of the law regarding spin-up of X-particles within Y-fields does not impact the actual behavior of x-particles interacting with the mirror. This implies that two different worlds can possess the exact same set of fundamental properties, but different laws. But if under the Humean conception, the laws are only collections of regularities of these fundamental properties, then how can the same exact mosaic of events be characterized by two uniquely distinct laws of nature?

There are several responses to this issue that move along multiple different lines of thought. John T. Roberts (2008) employs context sensitivity to respond to this question, and essentially claims that two worlds with differing laws, but with the same mosaic, are the same world. Loewer (1996) claims that there are two distinct responses that one might make to the supervenience objection: (1) One can claim there are no nomic facts, and only projections of the mind onto the mosaic, as Hume believed, and take on some anti-realist sentiments to propose

that nomic facts are merely misunderstood science. Many consider this view indefensible because of how deeply seated the tools of laws and probability are within science, and (2) Claiming that laws used in science must be compatible with Humean Supervenience, and despite all appearances, laws do indeed supervene on properties of the mosaic. Broadly, the point of attack in his understanding is to find any weakness in the view that laws govern events.

Several others respond to the supervenience objection by claiming that the non-Humean is begging the question (Beebee 2001; Zynda 1996), though they have been met with pushback by Barry Ward (2007), who claims that both Humeans and non-Humeans alike have left unconsidered the idea that laws may explain by producing descriptions of possibilities. Harjit Bhogal (2021) responds to this issue by drawing from Barry Loewer's (1996) distinction between metaphysical explanation and scientific explanation. Bhogal claims that this is really a distinction between metaphysical and scientific possibility, where spacetime possibility contains impossible metaphysical worlds, thus providing a counter-response to the mirror world argument. Yet this seems somewhat unsatisfactory, because he essentially helps himself to this distinction. In all, the many divided intuitions on the issue of supervenience have largely resulted in a stalemate between Humeans and non-Humeans.

Chapter 3: Neo-Humeanism About Laws and Humean Pragmatism

For decades, Humeanism about laws has been a popular topic of discourse, particularly in the realms of philosophy of science and metaphysics. However, this idea has received criticism on multiple fronts, particularly for its explanatory limitations when it comes to certain phenomena such as causation and probability.

Lewis' original theory has since been improved to better accommodate the practical demands of science by a new generation of philosophers known as Neo-Humeans. This chapter provides an overview of some of the recent attempts at revising and improving Humeanism about laws. However, it is important to note that the following papers only represent a sample of the work being done by Neo-Humeans, and that this field is rapidly evolving. Therefore, this review should not be regarded as an exhaustive survey of the literature, but rather a mere starting point.

Ned Hall, "Humean Reductionism About Laws"

A comprehensive understanding of the current trajectory of Humeanism necessitates a thorough examination of Ned Hall's contributions to the field. Hall has not only solidified a prominent position within the literature but has also served as a foundational reference point for subsequent neo-Humean investigations. This trend seems only to continue as new publications from Humeans emerge.

As such, there are important links between Hall's work and the other papers I have selected for review. It can be said that Hall's paper marks the beginning of the turn towards pragmatism within the discussion of Humeanism about laws. Because of this, it is important to view Hall's account not solely as an attempt to address the customary objections raised against

traditional Humeanism, although he does engage with them. Instead, his work embodies a continual process of honing the focus within theories about laws—refocusing the Humean perspective to emphasize practical application.

In the broad view, Ned Hall's paper revolves around investigating critiques of Humean reductionism about laws. He thinks that by investigating attempts to refute Humeanism, Humeans have an opportunity to sharpen their focus and clarify their ideas. As such he does not only describe the main arguments made against the Humean position, but also introduces some of his own which he takes to be in some ways stronger than the classically formulated anti-Humean arguments. I will not pretend to provide a full description of each argument he makes in his paper, but I do want to give a thorough account of three main points that he makes, that I take as pivotal in building towards the pragmatic Humean position.

Hall and the Limited Oracular Perfect Physicist

Hall first narrows his scope by clarifying that his concerns are about the fundamental physical laws rather than laws of the special sciences (Hall, 2015, p. 2). This distinction should be clear; a physical law is something that fundamentally describes the behavior of the world, such as Newton's third law of motion, while a law of a special science describes behavior within a specific domain and while they might be and while some may consider them to be grounded in laws of nature they are not universally applicable, take for instance Mendel's first law of inheritance in biology.

Hall, like Lewis, restricts his definition of laws of nature to things that fix the distinction between both nomologically and metaphysically possible worlds in a manner which is relative to our own. Thus, if something is considered a law it means that it holds in all nomologically, but

not metaphysically possible worlds. In turn these laws combine with true facts about the world to help us generalize counterfactual and causal relationships in our world. As Hall describes it, this gives us vital information about what the initial conditions of our world were like and how that state of affairs has evolved.

Hall briefly describes the make-up of Humean reductionism about laws, and outlines both naive reductionism and the best system account. The key points about Humeanism at-large as he sees it are as follows: The Humean draws a distinction between modal and nonmodal facts, and nomic facts supervene on all non-modal facts. He also sticks to a strong Humean position, where if you posit a fundamental nature of the universe, it naturally follows that the laws should supervene on it (Hall, 2015, p. 7).[11] This raises some issues in itself. Humeans require a better distinction between nomic and non-nomic facts, and to many people the laws simply do not seem to supervene (Hall, 2015, p. 4), Hall seems particularly concerned here about a non-Humean position where laws appear to constrain the measurement of non-nomic facts by dictating what is possible and thus measurements of natural properties, like mass, velocity, or spacio-temporal locations seem to supervene on the laws (Hall, 2015, p. 6).

Because of the issues faced by the traditional Humean, Hall wants to take a different approach to describing the doctrine. Thus, he tweaks the view to the following: "facts about the laws reduce to facts about the distribution of perfectly natural properties and relations" (Hall, 2015, p. 6). He takes this to be a marked improvement because the facts about the laws do not reduce to all non-nomic facts, but instead to only some subset of those non-nomic facts. Better

[11] This issue is discussed at length by Lewis and is the basis for his discussion of objective chance. Hall essentially ignores these concerns and claims that Humeans need not accommodate the non-Humean by entertaining the existence of possible worlds which differ in their laws from our world but share the same collection of facts about the world.

describing the nature of non-nomic things is meant to assuage the concerns of the non-Humean. To further accommodate this position, he also proposes that a theory of magnitudes, where magnitudes sidestep the subveniance that properties might have on collections of laws of nature, by entirely replacing them (Hall, 2015, p. 6).

Hall then draws a distinction between the *official* and *unofficial* Humean accounts. The official account of Humeanism is effectively Lewis's description, including the BSA.[12] In contrast, the unofficial account is primarily concerned with the development of the best scientific standards for determining what the laws of physics are based on what physicists observe.[13] This shift towards scientific standards and practical application marks a departure from the traditional Humean views, and a new version of Humeanism, now known as pragmatic Humeanism. Hall takes it that focusing on the unofficial idea of Humeanism provides a way for Humeans to align their ideas more closely with the concerns of physics, while also escaping some of the criticisms against it.

Hall introduces this idea by way of a thought-experiment, the *Limited Oracular Perfect Physicist* (LOPP). The LOPP is described as such because:

> . . .given as evidence any information about the world, she is perfectly able to judge what hypotheses about the fundamental physical laws are most strongly supported by that evidence. What makes her oracular is that she has, as evidence, quite a lot of information

[12] Hall makes some comments on how this formulation could be updated, namely that: (1) The BSA should be a theory about the possibility of laws, and not a theory of laws themselves, and (2), that Lewis was misguided in making laws out as regularities, and (3) that Lewis' idea of the language of representation misconstrues how physics is conveyed, as physics describes everything in magnitudes (Hall, 2015, pp.13–14).

[13] This can be understood as a continuation of Lewis' BSA, but with a renewed emphasis on identifying clearer criteria that can be practically applied by scientists in their work.

> about the world. But not, of course, all information. . . Specifically, we will suppose that what she has available to her as evidence are all the facts about the distribution of perfectly natural magnitudes. In the case of our Newtonian particle world, her evidence consists in perfect information about the motions, masses, and charges of every particle, together with the further information that the world contains nothing else. The second guiding idea, then, is roughly that the laws are whatever she says they are. . . .The assumption here is that there is some evidential standard for figuring out what the laws are, implicit in the practice of physics, evidential standards for determining what the fundamental physical laws are that induce a mapping from possible worlds to something like a probability distribution . . .over propositions about the fundamental laws of nature. It is nothing more than a useful heuristic to imagine a creature who holds that mapping in her head. (Hall, 2015, p. 15)

The LOPP closely mirrors Lewis' BSA. She is informed by the complete history of particle motions, masses, and charges, allowing her to form an opinion about the laws and nomological possibilities for each world. In turn, this comprehensive access to the mosaic enables the LOPP to consider a greater variety of information and make more informed decisions.

According to Hall, there are two considerations about epistemic standards implicit in physics, for the Humean. These arise from acknowledging that the epistemic standards for accepting laws through scientific discovery should not be assumed to have a built-in bias towards the Humean metaphysical position (Hall, 2015, p. 16). To illustrate these two points, an example is presented where the reductionist interviews the LOPP, and she, based on her access to the entire history of particle motion, masses and charges, makes a decision about the laws. However,

when asked to identify which worlds are nomologically possible, the LOPP's response contains information about metaphysically irreducible laws, which the reductionist finds objectionable since her answer includes information that they do not believe exists.

To circumvent this problem, the reductionist must refine their question to only ask the LOPP to identify nomologically possible worlds described exclusively in terms of those worlds' non-modal features.[14] This avoids assuming irreducible laws, while also allowing the Humean to consider epistemic standards, our criteria for evaluating knowledge or beliefs, for determining the nomological possibilities for nonmodal facts; standards accepted by both reductionists and antireductionists alike. The Humean may then elevate them to constitute possibilities about laws, and assert that these standards, along with all nonmodal facts, encompass all the facts about the world. Thus, in order to address the issue of metaphysically irreducible laws, the reductionist needs only to take a cautious approach by refraining from assuming the existence of such laws.

The Ratbag Idealist

Ned Hall's hypothetical LOPP, and his approach to the ratbag idealist problem are closely intertwined and contribute to the shift towards pragmatic Humeanism. The LOPP serves as a means to investigate the implicit standards employed in evaluating lawhood within Humeanism about laws. On the other hand, Hall's response to the r*atbag idealist* problem addresses criticisms raised by non-Humean proponents who argue that Humean Reductionism fails to objectively account for the necessary features of reality. The general idea, as is often the case in this literature, is first described by David Lewis:

[14] The section also mentions a second way in which the reductionist must compensate for antireductionist elements in the LOPP's standards, but I take it that this nuance, while interesting, does not tie in enough to the rest of the literature to warrant a full exposition.

> The worst problem about the best-system analysis is that when we ask where the standards of simplicity and strength and balance come from, the answer may seem to be that they come from us. Now, some ratbag idealist might say that if we don't like the misfortunes that the laws of nature visit upon us, we can change the laws—in fact, we can make them always have been different—just by changing the way we think! (Talk about the power of positive thinking.) It would be very bad if my analysis endorsed such lunacy. (Lewis, 1994, p. 476)

The ratbag idealist poses a significant problem because Humeanism is supposed to be a realist position. It raises concerns about Humeanism laws being able to be altered by merely changing how we see the world. If this is the case, then our observations of regularities are not reliable indicators of the nature of our world. This casts doubt onto the base epistemic and practical ideas of Humeanism and creates the impression that the Humean position is entirely subjective (Hicks, 2021a).

Ned Hall thinks reductionists have missed an opportunity, however, in addressing this concern.[15] Effectively, the issue at hand is that the standards for the BSA appear subjective. Thus, the ratbag idealist (or, rather, the non-Humean, wearing their best ratbag idealist costume) will want to claim that the standards for judging the best system should be the epistemic standards employed by the non-Humean. This puts particular strain on the Humean notion of simplicity, as it can be argued, just like the laws might be changed by the ratbag idealist, they could similarly change their mind about what counts as simple.

[15] Or, in his words the Humean has an opportunity to preform "a nifty judo move on their opponents" (Hall, 2015, p. 38)

But even if simplicity is subjective, it does not imply a problem with the BSA itself, rather, with how it is put into action. Conversely, if everyone agrees on simplicity as a major part of deciding on what the laws are, antirealists about laws are going to insist the standards by which we judge candidate laws are only epistemic standards.

Hall believes that this move shifts the burden of the ratbag idealist problem onto the non-Humean because the same criticism that can be raised against simplicity can be extended to facts of normative epistemology, such as what one should believe to be laws with empirical evidence (Hall, 2015, p. 38). This, in turn, would call into question the epistemic standards that non-Humeans typically appeal to when discussing what makes something a law.

Why is this an issue? Well, if a non-Humean about laws opted to endorse the ratbag idealist challenge, they must implicitly commit to the existence of facts about the world that should be prioritized above the kind of facts that are evidentially useful to us, while also committing the notion that there are good reasons to trust the truth of these facts so long as we can employ them to create theories that meet our standards, some component of which will be simplicity. This ends in circularity: Because of their commitment to trusting the truth of laws as long as they meet our epistemic and scientific standards, they must be committed to treating simplicity as some guide to our knowledge (Hall, 2015, pp. 38–39).

But Humeans are not required to consider laws as having some epistemic property that attracts us to them in the same way that non-Humeans are. Humeans believe that the world is composed of nonmodal facts which the laws supervene on. Hall argues that rather than attempting to explain the laws beyond these nonmodal facts, Humeans should only argue that the laws can be reduced to these facts. Everything else should be left to the scientific community,

meaning, candidates for laws should be judged pragmatically according to their utility for scientific inquiry (Hall, 2015, p. 40).

From here, a stark contrast is drawn. Non-Humeans must think of laws as the ultimate goal of science, while Humeans consider anything that is agreed upon by the scientific community to play a pragmatic role in inquiry to be a law Humeans, therefore, do not need to worry about whether the standards for judging laws originate from us or outside of us—scientific standards should dictate what is useful to the sciences (Hall, 2015, p. 40).

By contrast, Humeanism about laws seems more consistent than its non-Humean counterpart, and as such, Lewis' concern over the ratbag idealist is misplaced. In short, he is making a point about the fit of the theory with scientific practice and emphasizing that Humeans can focus on finding specific criteria (along the lines of simplicity or strength, but not necessarily restricted to it), that would be useful to the LOPP, and by extension, useful to physicists.

Pragmatic Humeanism aims to address the challenges faced by traditional Humean Reductionism by focusing on the practical aspects and goals of science. It seeks to provide a revised version of Humeanism that aligns more effectively with scientific practice and methodology. In this context, Hall's treatment of the LOPP and the ratbag idealist problem has contributed to this broader objective by serving as a catalyst for other pragmatic approaches. As such, it is important to view Hall's account not solely as an attempt to address the customary objections raised against traditional Humeanism, although he does engage with them. Instead, his work embodies a continual process of honing the focus within theories about laws—refocusing the Humean perspective to emphasize practical application. Consequently, Hall's ideas have received widespread citation in recent literature.

Hall's work is consistently referenced by the authors I have selected for this literature review, and this trend continues as new publications from Humeans emerge. The bottom line is this: Hall's ideas, such as the LOPP, and his response to Lewis' ratbag idealist problem, are incorporated into neo-Humean literature as a foundational framework that allows them to share a common commitment. Their commitment involves an endeavor to provide a recipe for the laws that reflects the practical concerns of the scientific community. Though I will outline the details of these views over the next few sections, here is a brief overview of how each uses Hall's original paper as a point of departure.

Diverging from Hall's point about Humeans not needing laws to have some epistemically attractive quality, Chris Dorst sets out to describe the nomic formula in terms of epistemic standards. To do so, he employs the same distinction Hall makes between the official and unofficial Humean accounts and does so with a thorough discussion of Hall's notion o*f the Limited* Oracular Perfect Physicist. The unofficial account of Humeanism is concerned, primarily, with finding the best scientific standards for judging what the laws are as they are observed by physicists.[14] This shift towards scientific standards and practical application aligns with the pragmatic concerns of the Humean account of laws.

In "Making Best Systems Best for us" Siegfried Jaag and Christian Loew first direct their attention primarily towards the problem of scientific practice. Broadly, the early focus of their paper aligns with Hall's question of whether the laws are "distinctively appropriate targets for scientific inquiry?" (Hall, 2015, p. 40, as cited in Jaag & Loew, 2018). As a point of departure, they consider Hall's (2015, p. 45) observation that the simplest and most informative systemization of the mosaic leaves room for the inclusion of a "phony fundamental constant" as a law. This idea can be summarized with a brief quote:

> The phony constant is a single real number that encodes the entire physical state of the universe at an instant. . . . A system that combines the phony constant with two-way deterministic dynamical laws encodes every truth about the universe in a very simple form. The phony constant specifies the complete state of the universe at one time, the laws then determine its state at all other times. The phony constant, however, is clearly not a law of nature. Physicists might be very interested in knowing the total state of the universe at a time that the constant encodes. But they would still treat it as a mere accidental fact. . . . (Jaag & Loew, 2018, pp. 4–5)

According to Lewis' BSA, only generalizations in the best systems make up the laws, but Hall takes it that the *phony fundamental constant*, which is not a generalization, raises a major concern about non-laws being erroneously classified as laws within the Humean framework. The phony fundamental constant is not a law itself, but a system that combines this constant with dynamical, universal laws, would encompass every truth about the world in a maximally simple way.

Further, even if someone were to object that the phony fundamental constant is not actually simple, on the basis of its syntactic complexity—how many digits it is made up of—it is difficult to argue that it is not simple because any criteria for ruling it out would also exclude constants that we currently employ (Hall, 2015, p. 8). Thus, the idea of the phony constant challenges the assumption that facts which are compatible with the mosaic should be considered laws. Considering this realization, Humeans may have to accept facts such as the phony constant as part of the best system without necessarily seeing them as laws (Jaag & Loew, 2018, p. 5).

This gives way to four problems for Lewis' original formulation of the BSA: (1) aspects of the BSA contradict scientific intuitions since science recognizes laws that are not regularities,

(2) merely labelling something as a regularity does nothing to explain why those regularities should be important to scientific practice, (3) physics does not classify certain regularities as laws, despite the fact that they should be included in the best system, and (4) the facts that science considers as potential laws often do not align with Humean metaphysics (Jaag & Loew, 2018, p. 6–7)

Recognizing these issues, Jaag and Loew take up the challenge and attempt to develop a new, revised version of the BSA. Their primary aim is twofold: to address the significance of laws for physicists and to provide a Humean framework for how physics can effectively differentiate between laws and non-laws. By doing so, they seek to mitigate the concerns surrounding the misidentification of non-laws as laws, thus ensuring a more accurate and robust understanding of the Humean perspective on laws that fits within the pragmatic Humean project.

In "Dynamic Humeanism" by Michael T. Hicks we encounter a similar focus as that of Jaag and Loew: to align Humeanism with scientific practice, Pragmatic Humeans must address the concern about misclassifying non-laws as laws that is exemplified by Hall's "phony fundamental constant" scenario. Hicks departs from the prevailing views of Humeanism by challenging the reliance on simplicity as a boundary condition for setting apart laws from non-laws (2017, p. 7). Hicks then proposes an alternative criterion for the demarcation of laws—accessibility. This notion aligns with the pragmatic approach Humeanism by taking into account the practical considerations of scientific practice and offering a fresh perspective on resolving this issue.

In closing, Hall's paper has undeniably steered the ship of Neo-Humeanism about laws into exciting and uncharted territory, shaping its trajectory and serving as a crucial reference point. The renewed emphasis on scientific fit introduces new goals and challenges that hold

promise for the future of theories about laws. At the same time, it should be clear that Hall's work does not offer an all-encompassing solution to these new challenges, nor to the longstanding issues that have plagued Humeanism about laws, such as supervenience, induction, and circularity. Instead, it can be viewed as a sidestep or a turning point; Humeans about laws are still navigating treacherous waters.[16] As I further explore the views outlined above, I will provide a comprehensive assessment of their merits based on how well they address these problems.

Chris Dorst, "Towards a Best Predictive System Account of Laws of Nature"

In *Towards a Best Predictive System Account of Laws of Nature*, Chris Dorst argues for a revised version of David Lewis' Best System Account (BSA) of laws of nature. Just as Hall does, Dorst characterizes the BSA as a combination of two components: The Humean Base, the sort of party line view about the laws where laws reduce to isolated, true facts about the world, and the less-official views attached to the Humean Base, called the *Nomic Formula*. The Nomic Formula is defined by Dorst as "a particular operation that gets applied to the Humean base in order to output the laws of nature" (2019b, Abstract). For Humeans about laws, this unofficial position, posited by Lewis, has been that the laws are a balancing act of simplicity and strength performed by some suitably placed observer. Traditionally, Humeans have been concerned with making expositions of what the Humean mosaic is and how it works. Dorst takes this focus to be misplaced, and instead makes the focus of his paper the Nomic Formula.

Dorst thinks that the BSA account is meritorious in that laws are accessible in a systematic way, and because the theory is in line with the way scientists think about laws without appealing to anti-Humeanism, but that Lewis' description of Humeanism is open to a broad

[16] Okay, starting now: no more sailing-related analogies.

range of attacks from philosophers with quantum mechanics and epistemology in mind. Dorst's positive contribution here is an ambitious proposal for a new Nomic Formula which he calls the *Best Predictive System Account.* The basic formulation is "conceived as a collection of desiderata designed to generate principles that are predictively useful to creatures like us . . . it also gives rise to laws with the sorts of features that we find in actual scientific practice." (Abstract)

Dorst wants his Best Predictive System to maximize predictive power. He appeals Ned Hall's problem of the Limited Oracular Perfect Physicist (LOPP) to try to reframe our thinking about the Nomic formula in a way that employs "LOPP-style Humeanism" to resolve some of the issues with Lewis' original Nomic Formula. Dorst takes a sentiment from Lange (2009), and claims that Lewis' laws are *God's-eye-efficient-summaries.* This is to say that uncovering the laws is not likely an achievement physicists can make on their own–they are only mere humans, after all. Further, even if physicists did have these God's-eye efficient summaries at their disposal, these would be unhelpful to them, as they would be unpragmatic, and unhelpful to us humans simply trying to navigate the universe.

Dorst next entertains a placeholder answer to the Nomic formula. Roughly speaking, the laws are whatever the perfect physicist arrives at in a systematic way. If you have a physicist with a perfect ability to judge what hypothesis about the laws is best supported by the available evidence, we should suppose that all the evidence available to them are particularized matters of fact. Thus, Hall and Dorst seem to agree that the placeholder answer to the nomic formula, that Lewis originally suggested, and others such as Ned Hall (2015) refined, is that roughly, the laws are whatever the perfect physicist says they are. Dorst takes this thesis to be largely uncontroversial.

Dorst suggests that when seeking out pragmatic aspects of the nomic formula, our initial inquiry should revolve around how we comprehend the laws—what we make of them. There are many possible ways to respond to this prompt, but Dorst settles on the following perspective to guide his focus: Our understanding of the laws lies in their conceptual roles—their capacity to underpin counterfactuals, their efficacy in facilitating scientific explanations, and their ability to safeguard us against bad inductive inferences.

He then discusses how laws of nature need to imply the *dynamics* for systems. They must have predictive power that "specifies the trajectory of any given system though phase space." (Dorst, 2019b, p. 11) A system of laws also must be applicable to a wide range. The laws need to have lots of informative content and allow systems to evolve, they should be simple, and systems of those laws should be as permissive as possible regarding their initial states.

In like fashion to Hall, Dorst abandons the sort of Gods-eye perspective that characterized Lewis' views, instead embracing a spatio-temporally localized system. In other words, the best system can only be determined when one restricts its purview to a specific space and a specific time. Relatedly, Dorst's best system is exclusively concerned with making predictions. Lewis' style of Humeanism does not demand this–instead, his 'laws' are more like strokes of luck or chances. Principles carried out through all of time and space cannot be known to us because we do not have a top-down view that lets us see the full collection of non-nomic facts about the world. Spatio-temporality conflicts with the informative dynamics of a best system because it puts limits on the variables we might look at when constructing dynamics in the first place, and thus we need a Nomic Formula that is focused on only making predictions about future law-like occurrences, and which is sensitive to dynamics, systems, positions in space, and in time

Christian Loew & Siegfried Jaag, "Making Best Systems Best for us"

The original formulation of the BSA proposes a different approach to identifying laws of nature when compared to traditional regularity-theories, which focus on identifying the laws in isolation (Hempel, 1965). Under it, the laws of nature are regularities that make up the best system for summarizing and predicting the behavior of the world in the strongest and simplest manner available. One of the biggest appeals of the BSA for Humeans is that it requires only the Humean mosaic and an appeal to the virtues of physics, with no extra metaphysical construction, to make law claims and to differentiate between laws and non-laws (Lewis, 1983, p. 367; Loewer 2007, p. 320; Earman, 1986, p. 88).

In "Making Best Systems Best for us," Christian Loew and Siegfried Jaag attempt to provide a new description of the BSA that is motivated by the laws' usefulness to scientists. Loew and Jaag hope to address a challenge posed often to Humeans about laws: Even if the Humean account does manage to accurately distinguish laws from non-laws, the Humean metaphysic cannot entirely explain why physics can make this distinction. Although Lewis' criteria of strength and simplicity do provide us with a reasonable starting point, it is not always clear how to apply these criteria, and beyond this, there may be additional factors, complexities, or epistemic considerations that need to be considered in order to effectively distinguish between laws and non-laws.

Furthermore, the Humean lacks an account of why physicists seek laws that carry over to non-actual circumstances. Essentially the concern here is why the laws under the Humean picture are relevant to physics, and why physicists should make them their goal of inquiry, when these laws are not the fundamental entities holding the world together (Hall, 2015, p. 268).

Under the Humean view, it is largely unclear what makes certain arrangements of properties more important to the goals of science than others, when the Humean so clearly does not want to posit any additional metaphysical entities. There is a distinct point of conflict here. Science does not treat the most efficient summary under the BSA as the laws, and while Lewis tries to account for this by restricting his claim to making only regularities in the best system to be laws, this comes off as an ad hoc explanation at worst, and implausible at best to skeptics of Humeanism.[17]

Their solution is to underline *cognitive usefulness* (CU) and incorporate this into the BSA. CU explicitly picks out how laws of nature, as cognitive tools, help us to understand the world, and thus make predictions about how things in the world will behave.[18] The laws are meant to help us navigate and make predictions with limited information by making systematic sense of true facts about the world. In their words, CU is the assertion that "[l]aws of nature encode information in a way that maximizes their cognitive usefulness for creatures like us" (2018, p. 12). Their revised BSA allows for the laws to be applied to imperfect systems and reframes the laws of nature as things specifically set out by scientists to provide a method for scientists to make predictions about the future. They provide a quote from Ernst Mach to summarize their views, which seems quite aptly used, so I will help myself to it as well:

> In our view, laws of nature are a product of our mental need to find our way about in nature. . . . If individual findings later accumulate, there arises a powerful urge to

[17] This point is first argued in Hall (2015). He claims the Humean does not have a good way to explain why the laws hold some special status over other arrangements of properties.
[18] Loew and Jaag admit that it is reasonable to posit that laws have other cognitive functions in addition to usefulness, such as action-guidance and explanation. They merely consider cognitive usefulness to be the *primary* function of laws as they find it the most central to physics (2018, p.12).

> minimize mental effort, to attain economy. . . . The progressive refinement of laws of nature. . . . corresponds to a more precise adaption of thought to fact. It is of course not possible to achieve perfect adaptation to every individual and incalculable future fact. It requires abstraction, simplification, schematizing and idealization of the facts, if the laws of nature are to become applicable. . . to actual concrete cases. (Mach 1976, pp. 354–355, as cited in Loew & Jaag, 2018)

In all, their views seem to align with a noted pragmatic shift among Neo-Humeans—other revisionist attempts to the BSA—such as Jonathan Cohen and Craig Callender's (2009) view that each distinct area of science has its own domain-specific standards, as well as M.T. Hicks' (2017) account of epistemic roles in Humeanism, and Dorst's (2019b) LOPP-inspired view outlined above. Loew and Jagg however, take it that their revision better addresses Hall's (2015, pp. 263–272) challenge for Humeans that there is no explanation for why the laws stand out as significant targets for scientists.

While they take Hicks' view as a starting point for their own, Loew and Jaag's view differs in that Hicks argues that the laws must be able to be discovered and confirmed by humans, and that we should be able to consider individual systems in our universe, which he calls *subsystems,* as independent and closed, and under those considerations whatever we consider to be the laws should describe that closed system accurately. Relatedly, confirmation is a matter of applicability and predictive power within a large number of these subsystems. He is primarily concerned with the problem of demarcating the laws from within the Humean viewpoint.

David Lewis' original BSA suggests that the predicates used in the best system must refer only to natural properties. Cohen and Callender's (2009) account takes a similar approach

but removes this restriction. They push for a system under which various sets of predicates which compete in individual best-system-like competitions based on predicate choice. In doing this, Cohen and Callender bring in a pragmatic consideration, concerned more with the goals of day-to-day explanation over unearthing the metaphysical structure of the universe. However, Loew and Jaag think that their argument appeals better to these sorts of practical considerations, as Cohen and Callender's account is more concerned with predicates, and thus raised a concern about restricting the sort of language the best system is presented in, and for Loew and Jaag, these considerations "play no role for explaining the criteria that decide, relative to any choice of predicates, which system is best" (p. 31).

There are two concerns that Loew and Jaag anticipate in their paper: (1) That CU is anthropocentric, and (2) that introducing CU seems to exclude certain candidates for laws. The concern that the BSA in general may be anthropocentric goes back to Lewis. This is, effectively, the "problem of the ratbag idealist" discussed in Hall's paper. They begin by arguing that this anthropocentricity is a non-issue. CU merely entails that our cognitive abilities partially determine what facts in the Humean mosaic are considered laws. The laws are tools to serve our needs, and if there were other cognitive agents out there with more knowledge of the world than we possess, they would have no interest in these laws. This does not mean that the laws and how they interact with the world are altered by our understanding of them.

The secondary concern is that certain laws do not seem to be actually cognitively useful to us. There are certain laws, like those in quantum mechanics, that are notoriously difficult to interpret. The worry here is that the application of CU to the BSA might discount these well accepted laws as not really being laws at all. However, quantum mechanics is the best available theory for how the world works and the best way for us to make accurate predictions about

future events. Loew and Jaag contend that just because our aim in delineating the laws should be towards those that are useful to us, does not mean that they will always be ideal for our purposes. In their words:

> "[n]ature, after all, needs to cooperate too. We can imagine candidates for the fundamental physical laws that would be more useful for limited creatures than the laws of quantum mechanics. However, it is then not clear that scientists should accommodate this structure when discovering laws." (Loew & Jaag, 2018, p. 20)

Michael T. Hicks, "Dynamic Humeanism"

Michael T. Hicks claims that the traditional formulation of the BSA, which "holds that being a part of the simplest, strongest system couched in perfectly natural terms is necessary and sufficient for being a law of nature" is false (2017, p. 5). He endeavors to provide two arguments against the BSA. His motivation is to show that Lewis' BSA does not accurately distinguish between what are laws and what the boundary conditions are. Motivated by similar intuitions as Christ Dorst, he endeavors to highlight the issues with the BSA so Humeans can turn their attention to *dynamic laws*, which better fall in line with the virtues of science and are more useful to human agents.

The first argument Hicks presents deals with boundary conditions. He hopes to show that the BSA cannot differentiate between the laws and boundary conditions. As a first claim, he asserts that there are some statements that are part of the Lewisian best system of the world, but that they are not laws. Some of these statements may be viewed as boundary conditions resembling laws, while others may be viewed as contingent truths. He first considers Ned Hall's thought experiment:

> Suppose, for example, that there is some moment of time such that [...] there is some relatively simple, compact way to say exactly what that state [of the world] is. Let this state be S. Then, if a candidate system includes the Newtonian dynamical principles, one buys an enormous increase in the informativeness by adding a statement to the effect that at some time, the complete physical state of the world is S. For doing so will shrink the set of nomological possibilities to one. (Here I am taking advantage of the fact that Newtonian dynamics are two–way deterministic). But that is a disaster. (Hall 2015, p. 44, as cited in Hicks 2015)

Hicks claims that if Hall's example does not convince the reader, then other similar examples can be constructed. Hall provides several examples here; one is drawn from the history of science. There is an issue in early cosmology known as the horizon problem. It describes the fact that in the early universe, isotropy was observed in the cosmic microwave background (CMB)—the background radiation present in all space—even though distinct regions of space are causally discontinuous from one another, without any known way of establishing equilibrium (Strobel, 2020, pp. 531–538).

Under Lewis' BSA, the scientific community might have taken this CMB behavior to be a law of nature, carried through all of time. Instead, it was seen as a major problem, in need of resolution. It was treated dynamically, and accounted for by the ultra-fast expansion of the universe that took place immediately following the Big Bang, known as inflation. Models of inflation point to these disconnected points in the universe having been in contact with each other and coming to equilibrium before universal expansion.

His suggestion is that if we had taken it as a fundamental law that distance between points in space remains constant, it would have hindered the development of inflation theories,

which were proposed to address the horizon problem. If this were the case, not only would our understanding have been limited, but we would also have been cut off from related scientific explanations that have come out of this solution, such as the origins of galaxy seeds—ripples in the microwave background.[19] This is, of course, a bad outcome. However, there is a larger point to be drawn out here, and to make it Hicks provides a quote from James Woodward, who he takes to be making a similar point:

> [N]onlawful generalizations can be deduced from uncontroversial candidates for laws [...] in conjunction with appropriate information about initial conditions in [our system] S, and because we can hardly drop these uncontroversial laws from the best balancing systematization S*, our only alternative seems to be to exclude any information about initial conditions that might permit such derivations [...] the resulting system will not be strong. (Woodward, 2013, p. 8, as cited in Hicks 2015)

Woodwards' dilemma here is that laws do not give us information without some information about the initial boundary conditions. If you consider these initial conditions when describing the laws, then the set of accepted laws will be very strong, but not at all simple. If you do not consider initial conditions, the set will be very simple, but weak (Hicks, 2015, pp. 6–7).[20] Woodward, and Hicks by extension then, are against strength as a feature of the best system of laws. Hicks next moves on to show that "no non-ad *hoc* notion of simplicity can be found to save the BSA" (2015, p.7).

[19] I have attempted here to make Hicks' point clearer by adding relevant background information. Without this background, it is difficult to pin down the point of this example.
[20] Hicks mentions that other philosophers have made related points regarding the deduction of unlawful generalizations from candidates for laws, and particularly has in mind here John Roberts, '*The Law Governed Universe* (2008).

Hicks' second argument looks to scientific practice to show that strength and simplicity are not the virtues that scientists look for. His argument here comes from another counterexample, this time it takes place in a possible world where there is no best system, but instead a set of generalizations that plays the same role that the laws do in our world. His intentions here are twofold: (1) to show that the virtues of strength and simplicity go against our interests as scientists, and (2) these virtues do not track the laws.

The possible world that Hicks presents can be summarized in the following way: there is possible world, T, "which can be modelled by F = ma together with some force laws" (2015, p. 9). However, in this world "there is a true, informative statement about force which cannot be finitely stated" (2015, p. 9). Thus, instead of specifying the law, research programs are devoted to approximating it and developing the scientific community's ability to better predict the outcome of experiments. Because the statement cannot be finitely expressed, the system containing it will be no simpler than a mere list of facts. Therefore, there would not be a "unique simplest, strongest systematization: the system containing [the nonfinitely expressed statement] will be tied with other equally strong infinitary lists" (2015, p. 10). In other words, in the possible world that Hicks discusses, there could be multiple ways to systemize the laws that are all equally strong and equally simple, rather than a single best system.

According to Hicks the problem with the BSA is that we do not have the kind of list of truths about the world that it idealistically demands that we have. We need some way to make sense of empirical knowledge and come to the laws from those observations of the world. Although this world is orderly and systematizable, under the BSA, this would seem to be a world with no laws. Using this example, one can see how the BSA is unable to distinguish between collections of laws—lawbooks—that possess free parameters. Further, the BSA ignores aspects

of lawbooks that enable scientific practice. It views a perfect scientist as a person who has all of the facts about the world, then is tasked with organizing them into laws (2015, p.10). Because of this, Hicks argues that for Humeans, the BSA should be replaced with a new criterion for identifying the laws, the *Epistemic Role Account* (ERA), which he defines in the following quote: "The laws of nature are those true statements which, as a group, are best suited to produce predictions and explanations and to be inferred from repeated observation and controlled experiments" (2015, p. 13). The ERA prioritizes several virtues for picking out candidates for the laws, instead of merely strength and simplicity, though they are still part of the balancing act of the ERA. The laws, under Hicks' view, must be true generalizations that balance breadth, strength, simplicity and modularity. These virtues are in a balancing relationship with each other, breadth and strength conflict, as do simplicity and modularity. They are applied in groups, breadth and strength first, the latter second.

Hicks introduces the idea of *quasi-isolated subsystem* (QIS) to redescribe strength and simplicity and to define the new virtues that play a role in the ERA for lawbooks:

> A subsystem is a QIS of the laws if and only if the laws are true of that subsystem; a lawbook is true of a subsystem if and only if the laws are true when any free parameters of that lawbook are filled by all and only those objects within the subsystem.
>
> A QIS of the laws is a subsystem described by the laws; it behaves in accordance with the laws in the same way that the universe as a whole does. We can also appeal to an approximate QIS of the laws—this is a subsystem that the laws are almost true of. (2015, p. 14)

For a lawbook to be broader than a competing lawbook, it must have more QIS and approximate QIS than its competitor. A broader lawbook allows us to observe the laws in action in more situations. Strength is considered as local strength. A locally strong lawbook eliminates the counterparts of its QIS. These virtues balance each other. When the breadth of a lawbook increases, the laws must be made compatible with more subsystems, thus making them less strong (2015, p. 16).

Simplicity and modularity similarly balance each other. The fewer free the parameters there are within a lawbook, the simpler it is. Modularity is more difficult to define. In Hicks' terms:

> The more free parameters a lawbook has, the more reductions it admits, and so the more QISs of reductions it can have. In order to explicitly define modularity I'll need a notion of a portion of the lawbook. . . . A lawbook l is a reduction of lawbook L if and only if (a) l contains a subset of the laws of L, or (b) some of the free parameters of L are constants of l. . . . Lawbook L is more modular than lawbook L* if and only if there are more QISs of reductions of L than of reductions of L*. (2015, p. 17)

Hicks concludes that the ERA best meets the criticisms raised against the BSA, but, as he acknowledges, his account has several drawbacks, primarily that modality and simplicity are tied directly to variables and as such rely on syntactic and linguistic factors. The upshot here is that modality and simplicity only come into play after the other virtues have been applied to narrow down the lot of theories and as these virtues are oriented toward the needs of the user, they could be more sensitive to predicates useful in the sciences (2015, p. 21).

Chapter 4: A Brief Rejoinder to the Problem of Humean Circularity

Some pragmatic Humeans tend to navigate around addressing the circularity objection by prioritizing the practical aspects and applications of Humeanism for the sciences. However, these moves fail to address ways that the official idea of Humeanism, mosaic intact, could withstand its objectors, and be used to similar effect. To me, the traditional issues raised against Humeanism seem worthy of a serious response. Thus, after delving into the historical background and ongoing developments in Humeanism about laws, it seems prudent to revisit the persistent and often neglected issue of Humean circularity.

Despite the considerable attention given to other challenges faced by Humeanism over the years, the problem of explanatory circularity remains largely unresolved, and though work has been done to address it, I believe there is a simple response that has been overlooked in previous discussions of the issue.

As previously mentioned in Chapter 2, the impasse between Humeans and non-Humeans on this matter go back to Marc Lange's (2013) argument that metaphysical and scientific explanations are connected through transitivity, this move is intended to effectively undermine Barry Loewer's (2012) distinction between scientific and metaphysical explanations. Consequently, this argument casts serious doubt on the viability of Humeanism about laws and risks rendering the view untenable.

Lange’s paper rests on two examples used to illustrate transitivity. It is my contention that the metaphysical explanations Lange appeals to in these examples are, in principle, replaceable by scientific explanations. This highlights a dissimilarity with the Humean's entirely metaphysical explanation of laws in terms of the mosaic.

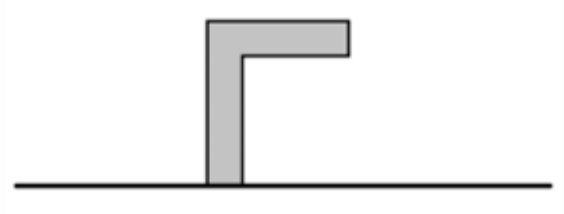
Example 1

Lange's first example deals with the center of mass of an individual object. He describes a case where an object's center of mass is not directly over the base, which causes the object to tip over. Lange's transitivity principle implies that the center of mass is an integral component of the scientific explanation. By his account, the event of the object tipping over is grounded in the individual locations and masses of the distinct parts of the object.

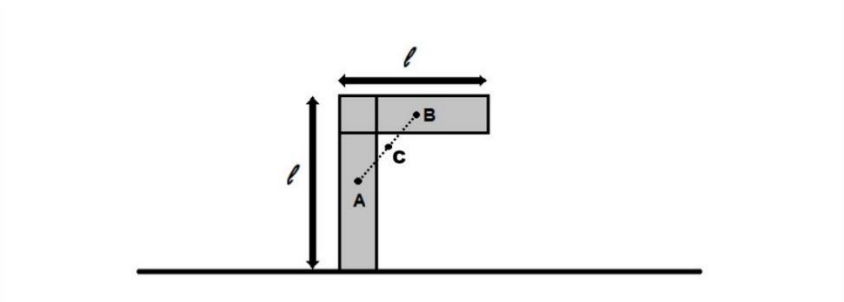
Before I discuss Lange's first example, it is important to define center of mass. The center of mass refers to a point in any object or system within a uniform field of gravity. It is a mathematical concept used in applications which require describing motion of objects or systems of particles. It is derived by weighting each part of the object by its mass, and then taking the average position. For objects under a uniform gravitational field, like those on earth, this point will coincide with the object's center of gravity, the point at which the object is evenly balanced in all directions. For simple geometric forms, the center of mass falls at the center of the object, on a perpendicular line from the base. For more complex forms, the point can be inside or outside of the object.

Let us think about Lange's ambiguous tipping object as something tangible: an L-shaped carbon-steel bar located here on earth. As a rigid, contiguous body of uniform mass distribution, the object's density is the same at every point within its boundaries. Let us also acknowledge that, for the sake of explanation, we can work with a 2D shape to represent this object. Of course, a full consideration of any object in space would require us to consider the object on an x, y, and z-axis.

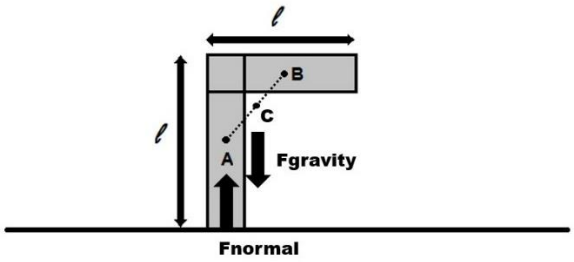
Assume that this L-shaped bar is placed on a table on its end:



To find the center of mass of this simple object all that must be done is treat each side of the L shaped bar, as its own individual straight bar. The center of each bar will be the center of mass for each of our created pieces. The average between each of these point masses will be the center of mass for the total object:



This object is going to topple over. And we might say that the object's toppling is caused by the center of mass being located outside of the base of the object. Gravitational force, G, pulls downwards at the center of mass which unbalances the normal force, N, at the base of the object (Shankar, 2019, pp. 119–127).



Lange's primary claim is that distinguishing metaphysical from scientific explanation does not allow the Humean to escape from criticisms of explanatory circularity. In this example,

he tries to show a case where metaphysical explanation is imported into a scientific explanation.

However, this object's tipping over can be explained entirely in causal terms, by directly computing the force exerted on each component of an object or system. The center of mass only acts as tool used to simplify our analysis of an object or system—it is a concept we employ to make doing science easier. Rather than completing a massive series of calculations necessary for a full causal account, we can talk about that object *as if it were* a single point and allow it to stand-in for those calculations.[21]

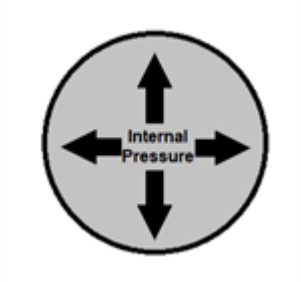
The takeaway here is this: Loewer attempts to defend Humean explanation by severing metaphysical and scientific explanations. For Lange, when we link metaphysical and scientific explanations with transitivity, we should see a serious flaw with Loewer's position. However, the example Lange uses here is not a clear case where metaphysical factors aid in explaining scientific events, but rather, cases wherein a clear and distinct scientific explanation lies. This example does not adequately support Lange's argument because it includes a specific type of metaphysical explanation. The scientist appeals to the center of mass here to streamline the discussion, but she may only legitimately invoke metaphysical explanation here because it is backed by a corresponding non-metaphysical explanation. We would never use the center of mass in scientific explanations if the motion that it predicted significantly differed from the motion predicted by directly calculating the forces acting upon each constituent part's mass—such use would be incorrect.

[21] You might think of this stand-in relationship in the following way: in stenography, shorthand acts as a stand-in for long-form words, while in physics, a concept like the center of mass acts as a stand-in for a large series of calculations.

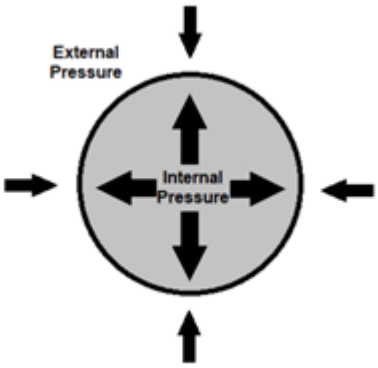
Example 2

Lange's second example deals with an expanding balloon. Let us assume that this object is a circular latex balloon and that the temperature of the air we blow into the balloon remains constant with the temperature of the air inside of the balloon:

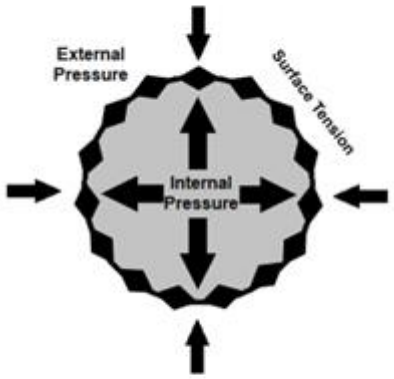
The pressure inside the balloon increases, which causes the balloon to expand.



The material of the balloon expands when the interior pressure is greater than the external pressure.



Finally, the balloon stops expanding when the expanding force is balanced by the inward pull of surface tension (LibreTexts, 2016).



Lange appeals to transitivity in this example as well. He claims that the scientific explanation for the expansion of the balloon appeals to a metaphysical component—pressure—the average force imparted by the air molecules inside of and around the balloon on the balloon's surface per unit area. When one describes the inflation of a balloon, they will, of course, employ pressure as a tool. For considering pressure, they will look to Boyle's law. Then, perhaps appeal to relevant properties such as surface tension by appealing to Laplace's Law, while Young's modulus or Gent models might be used to characterize the elasticity of the balloon material.[22]

Like his first example, Lange is pointing to a bit of metaphysical explanation being used as a stand-in for the whole causal picture. But it is not that that causal, scientific explanation does not exist. A scientific explanation of this phenomenon could dispense with the talk of pressure, and instead describe the balloon's inflation with a direct appeal to properties and behaviors of

[22] This description remains vague because describing this sort of inflation is still an area of active inquiry, that would take its own thesis to really describe the state of. This is generally how it goes with non-linear mechanics, and it is unlikely to change soon. There is a lot of material regarding the mechanics of rubber, so I will spare the reader here and recommend one particularly salient paper: Gent Models for the Inflation of Spherical Balloons (Mangan & Destrade, 2015).

molecules. Lange's second example exhibits similar defects to his first example. Both share a characteristic that the laws explained by the Humean mosaic do not: the metaphysical components imported in each explanation is a stand-in for a full causal account.

Both of Lange's examples present little issue for the Humean because they do not model the sort of explanatory appeal that Humeans make—they are just not doing what Humean explanation does. Therefore, what seems to point to a transitivity principle in these examples may not be applicable to the Humean position, which incorporates a wholly metaphysical component, one that is not backed by a corresponding scientific explanation, into a scientific, explanatory story. This metaphysical component does not function as a stand-in for any other causal account in the same way it does in Lange's examples. Thus, this stand-in relationship in his example does not admit to a principle of transitivity that applies to Humean explanation, only that both metaphysical and scientific explanations are both doing a decent job of characterizing the world in scientific applications.

Other Humean Responses to Lange

In recent years there have been numerous efforts made by Humeans to remedy the issue of explanatory circularity. These responses have primarily focused on taking down the principle of transitivity. To provide a clearer picture of the current literature and show how my claim contributes to this debate, I will give a brief overview of some of these responses.

Out of other Humean responses, Hicks and van Elswyk's core views are most in line with Loewer's original answer to the circularity problem. They agree that Humeans posit the existence of two types of explanations: metaphysical and scientific. They diverge in their assertion that there may be numerous types of explanation (2015, p. 438), as opposed to just

scientific and metaphysical explanations, and that the different explanations are related to their respective explanandums through a backing relation.[23]

> The formal features of explanations vary according to their backing relation. An explanation is asymmetric when its backing relation is asymmetric. A different explanation could be symmetric were it to be backed by a symmetric relation. In this way, explanations mirror the relevant relation in the world. . . . When one backing relation connects D and E, and a distinct backing relation connects E and F there is no reason to think that either backing relation somehow connects D to F. (pp. 438–439)

Relatedly, Hicks and van Elswyk claim that transitivity is implausible because it is ambiguous and that a transitivity requirement creates two big problems: (1) An interaction problem between metaphysical and scientific explanation. And (2) the levels problem, which states that science is built up into multiple levels, such as physics, which props up chemistry, which is fundamental to biology, and so on. Metaphysical explanations are concerned with how these levels are built up; scientific explanations focus on a specific field of science. When considering this distinction, the backing relation of the laws appears to be different from the mosaic's relation to truth (p. 440). They conclude that transitivity poorly handles scientific reduction and emergence. Hicks and Van Elswyk's argument seems promising, but it has been criticized for not giving a compelling reason to accept the backing relation itself (Marshall, 2015, p. 3150n11).

Hicks and van Elswyk's response is similar to my own. However, they do not focus on Lange's examples, and instead focus on making several arguments targeted against the principle of transitivity. I do not weigh in on transitivity here, but instead claim that these examples share

[23] For more information on metaphysical backing, see Ruben, D.H. (1990). *Explaining Explanation.* Routledge.

some explanatory commonalities that Humean explanations of laws in terms of the mosaic do not have.

Elizabeth Miller (2015) presents a novel response to Lange's paper. She outlines three potential versions of Humeanism which might withstand Lange's criticism and makes some moves towards undermining Lange's examples. Her paper appeals to metaphysical grounding directly, effectively playing Lange at his own game. However, the classical Humean might argue that if grounding is taken to be the language of metaphysical explanation, it is still unclear that facts do indeed ground laws. Relatedly, introducing grounding seems to obscure what many Humeans really think about facts and laws. Despite this potential criticism Miller's central assertion remains relevant: Lange's argument is built upon premises that fundamentally contradict Humean intuitions, and as a result, he fails to present a compelling rationale for Humeans to abandon their views. Overall, her stance is in line with Hicks and van Elswyk's in claiming that the principle of transitivity faces numerous counterexamples.

Chris Dorst's (2019a) response goes against Lange's view by claiming that Humeans should focus on the differing goals of scientific explanation and not metaphysical explanation. Because these types of explanations have distinct goals, he claims that there is significant reason to doubt that transitivity obtains. While this response has strengths, it seems open to a criticism similar to what has been raised against Lewis' Best Systems account—that choosing some explanatory virtue to be held above all others can lead to neglecting other aspects that make a good explanation.

Lange (2018) responds to some of these criticisms. He reasons that transitivity should be accepted because there is significant philosophical support for it, and because it is a big part of scientific practice. He also redoubles his assertion that Humean explanation is circular. However,

he finds that these criticisms can be easily met with a modest refinement of his theory. Yet the issue has remained unsettled, and subject to further evaluation by Humeans. This response seems to miss possible objections, such as the one I am making in this paper, since I am not arguing against transitivity, rather, claiming that Lange has not provided an example of transitivity that resembles Humean explanations of laws in terms of the mosaic.

In summary, Barry Loewer distinguishes scientific explanation from metaphysical explanation to defend Humeanism from arguments that claim it is committed to a circular explanation. According to Marc Lange, a transitivity principle connects metaphysical and scientific explanations and so it appears that Humeans who turn to scientific explanations when they lack metaphysical explanations are nonetheless committed to an overtly circular line of reasoning. However, as I have argued, both of the examples Lange employs to illustrate his point contain metaphysical tools which act as a stand-in for a full causal account. This calls into question Lange's response to Loewer.

Chapter 5: Conclusion

Throughout the previous chapters, I have provided a comprehensive overview of Humeanism about laws and its evolving landscape, shedding light on the motivations and arguments behind the adoption of pragmatic approaches along the way. As I approach the end of this thesis however, it is essential to acknowledge the significance of traditional objections that have been raised against Humeanism. While I have only attempted to remedy one of these objections in detail, it is important to not overlook the broader set of challenges Humeanism about laws face. A good approach must address, or at least circumvent, these challenges in order to avoid the pitfalls of the past.

With this in mind, I would like to make some brief comments about the pragmatic Humean papers I have presented. I aim to highlight both the strengths and weaknesses of the approaches made in each, providing a balanced analysis that acknowledges the progress made while remaining attentive to the potential shortcomings. By critically evaluating pragmatic Humeanism, we can gain a deeper understanding of its implications.

Closing Comments and Criticisms

There are several criticisms of varying degrees of severity that can be raised against the views presented in the papers under examination. One surface-level criticism is that Dorst's description of why his theory should prevail seems to be incredibly vague. He says that his overall theory elevates the epistemic standards of physicists in a way that is affirmative to science since it produces many of the same principles as laws of nature. But he does not quite show that.

He also claims that it is sometimes impossible to reach principles which display every desideratum at once, so again, he goes back to Lewis' idea of balancing these features. The best

system is thus the system with the best balance of desideratum. How is this balance really measured, though? Graver here, is the fact that Dorst's theory seems to suffer from some of the under-definition that Lewis' original theory does. Dorst wants to appeal to 'dynamics' and 'systems' but does not provide much in the way of adequate description of what these terms really mean. The surface-level flaws of Dorst's work tend to come down to quick-moving arguments, with not necessarily mistaken, but underqualified points. These are not fatal flaws on their own, but rather undesirable traits.

Setting aside this criticism, how do the three papers I discuss withstand the traditional arguments raised against the Humean? In this respect the pragmatic stance is a bit of a mixed bag. Different authors address different objections, but none of them presents an account that wholly considers all of the problems for Humeanism. Furthermore, many of the more fleshed-out elements of their accounts draw from Hall's arguments, rather than offering distinct contributions of their own.

The problem of induction challenges our ability to justify our predictions about the world in any way which is non-question begging. Although this problem is often considered a deadlock in philosophical discussions, Dorst proposes a framework that offers some way to provide support for inductive inferences.

Do Humeans have a special problem with induction? I mentioned earlier that I find this implausible for several reasons. However, Hicks seems not to share this intuition, and goes to great lengths to address it. For him, the BSA had significant issues with inductive inference, and he wants his Epistemic Role Account to better meet the challenge, and, of course, to outperform non-Humean accounts. In his words:

> Science seeks to extend our knowledge from those contexts wherein we gain evidence to those in which we make predictions. Scientific laws have a central role to play in this extension: they occupy a place between induction (where we gain evidence) and deduction (where we apply it). Consequently, our scientific system should allow us to identify quasi-enclosed systems where it can be applied, and tell us which features of these systems we should expect to be different between systems and which features we should expect to be the same. The former are the boundary conditions, the latter the laws. (2015, p.14)

To accomplish this, Hicks suggests a view of laws which incorporates the *input role* of laws, which he defines as "suited to be inferred by observation and experimentation" (2015, p. 14). The sensitivity to this input role, he argues, is accomplished by paying attention to boundary conditions. Laws need to be independently observable in QIS of the universe, and they must be independently observable in a given subsystem. While this does not entirely circumvent the problem of induction, it does imply that "our scientific system should allow us to identify quasi-enclosed systems where it can be applied, tell us what features of these systems we should expect to be different between systems, and which features we should expect to be the same" (Hicks, 2015 p. 14). Thus, he allows us to recognize that specific features may vary across subsystems instead of requiring all features to remain consistent.

By contrast, Dorst does not, even by a charitable stretch, address the problem of induction. Depending on one's perspective regarding the importance of addressing the issue of induction for Humeans, this omission may or may not be significant, but personally, I do not consider it to be a major mark against his view.

Loew and Jaag similarly do not offer any novel solutions or considerations for the problem of induction. While the concept of cognitive usefulness (CU) might help us in identifying the laws, I see no reason to think that it would boost our confidence in the application of these laws. It certainly does not furnish a logically deductive justification for the belief that cognitively useful laws will apply in the future**.** Whether this can be seen as a true mark against their account ultimately comes down to if one believes that the Humean faces a special problem of induction that the non-Humean does not. Given that I do not find this proposition likely, I am inclined to overlook it as they do.

Generally speaking, any pragmatic approach to Humeanism will be more closely aligned with scientific fit than traditional Humeanism about laws. While traditional Humeanism considers scientific fit, it does not always seem to do justice to the concerns of scientists.

In terms of scientific fit, it seems that Dorst's view has a big merit. Sure, he aims at Humean pragmatism, and tries to align his view with helping scientists make useful predictions, but beyond that, his focus on dynamics very directly aligns with what physics does. For instance, our understanding of quantum mechanics[24] requires an intricate way to deal with complex temporal systems and to understand the significance of how those systems evolve over time.

What comes to mind here is the Schrödinger equation, which describes the temporal evolution of quantum states based on the total energy of a closed system (Shankar,1994, pp. 143–150). But of course, other quantum phenomena, such as superposition and interference, also depend on an understanding of temporal evolution. It seems to me that when we acknowledge that there is a dynamic factor to understanding these systems, it seems only natural that our

[24] What little we do understand of it, that is.

predictive system should, in turn, highlight dynamics. This seems to show that Dorst includes this desideratum, and others, with the intention to fit his theory directly into scientific practice.

Loew and Jaag, on the other hand, directly acknowledge the issue Humeanism about laws faces regarding scientific fit (2018, pp. 6–10) and then respecify the nomic formula in terms of the epistemic standards that physicists must employ to find the laws. What is particularly nice about this description is that they also dismiss the deep skepticism Lewis had towards quantum mechanics. This demonstrates a willingness on their part to engage with complex, contemporary scientific ideas, even when those ideas may not perfectly match up to our practical goals or expectations.

Hicks' notion of QIS also seems to make some steps towards addressing the problem of scientific fit. He directly considers how considering subsystems of the universe allows us to more easily conduct experiments, make predictions, and make local explanations. This is most clear in the following example:

> When introducing a notion that will play a central role in a theory, it's worthwhile providing some examples: Our solar system is a close approximate QIS of general relativity; if the variables of GR are filled just with all and only the objects of the solar system, the result is a true—or nearly true—sentence. The solar system is a less close QIS of Newtonian gravity. A particle accelerator is a QIS of high energy quantum field theory (Hicks, 2015, p. 15).

As previously mentioned in Chapter 2, traditional Humeans grapple with the problem of circularity. They want the laws to be explained by patterns in the mosaic, but the facts in the mosaic are explained by the laws. Since Humean circularity has been seen as a stalemate topic,

pragmatic Humeans are more focused on the practical applications of Humeanism, rather than its theoretical underpinnings.

Dorst's paper never actually mentions the Humean mosaic, so he avoids addressing any concerns of circularity on this front and instead concentrates on the conceptual roles that laws play. This departure is somewhat jarring. Hall, who he draws a significant amount of influence from, makes note of the distinction between a the Humean base and the unofficial idea behind Humeanism, and then he merely opts to focus on the unofficial idea, making references to other aspects of the literature along the way. In contrast, Dorst emphasizes exclusively the practicality and usefulness of his predictive account, but it appears that he has abandoned the Humean base in order to advance his theory, rather than advancing the field more broadly.

In a similar vein, Loew and Jaag's (2018) approach also does not directly tackle the problem of circularity, but they do make some noteworthy moves to circumvent it. By offering a modification to the nomic formula by incorporating cognitive usefulness (CU), they attempt to move beyond a description of the lawbook as mere collections of systemizations of facts.

Additionally, rather than treating laws as metaphysical entities, Loew and Jaag view them as "partially prepared solutions to frequently encountered problems" (Ismael, 2015, p. 197, as cited in Loew & Jaag, 2018). This perspective seemingly allows them to sidestep the issue of circularity, even though they do not explicitly address it. Although this approach seems to me somewhat unsatisfying, I take it is fair play in their attempt to grapple with the problem.

Hicks's view is the most successful in grappling with the problem of circularity. According to him, the QIS should not presuppose any global laws, merely statements about observables which hold true under certain parameters within a subsystem. While the isolation of QIS might appear, on the surface, to depend on the laws, Hicks allows for subsystems that

behave in accordance with the laws in a way *similar to* the universe as a whole to be characterized by how closely they abide by a QIS subsystem, but never actually assumes that these laws will hold globally. In other words, instead of explaining laws in terms of a global mosaic of isolated facts about the universe, the laws are restricted to subsystems. In making this claim he avoids the assumption that there are any global laws by which to explain the mosaic, and the potential issue where individual QIS lawbooks would explain universal laws.

As a quick reminder, the problem of supervenience deals with the objection that there could be other possible worlds or perhaps scientific applications where the mosaic, in many cases taken as the physical arrangement of particles in a closed system, remains the same, but the laws governing them differ.

As far as I can tell, neither Dorst's account nor Loew and Jaag's account address the problem of supervenience. Loew and Jaag are primarily focused on distinguishing laws from non-laws, while Dorst is focused on revising the nomic formula. Their views might provide some potential for circumventing the issue through a shift towards pragmatic Humeanism and a departure from the strict Lewisian standard, but significant further clarification is needed on their part if this is the case.

On the other hand, Hicks does seem to at least have supervenience in the back of his mind. Hicks discusses the regularity theory of laws by contrast with what he calls the *modalist* view of laws. Essentially, the modalist view of laws is the non-Humean view about laws. In Hick's words, "[m]odalist views are less metaphysically perspicuous than the regularity theory because they claim that to be laws, a generalization must be backed, made true, or associated with a relation between properties... the essences of properties... or irreducible counterfactuals" (2015, p.2).

By endorsing the idea that instances of regularities in the world make up the laws, the Humean can turn their attention from metaphysical properties or facts about laws, to how the laws can serve our epistemic needs (Hicks, 2015, p. 1). What sets Hicks' view apart from Dorst or Jaag and Loew's views, is that by shifting the focus to epistemic relevance of laws for scientific practice, he can dodge criticisms of Humeanism about laws based on intuitive violations of Humean supervenience, such as Carroll's (1994) mirror world argument. Even if there are possible worlds with the same mosaic as ours but different laws, the laws of those worlds are not relevant to us epistemically, nor do we have access to them. Our primary concern lies in describing how our world behaves, and Hicks firmly believes that Humeanism is the right tool for the job.

As a second prong to his claim, he references a recent work by Heather Demarest (2017). Demarest argues that one can endorse regularity theory without necessarily committing to supervenience, and that the best philosophical account of science combines a non-Humean ontology that emphasizes fundamental dispositional properties, with Humean laws (Demarest, 2017, p.1). While Hicks buries this endorsement in a footnote, it seems clear that he finds her view plausible (Hicks, 2015, p. 1). Thus, while he does not directly argue that his view is entirely safe from supervenience objections, he makes some strong moves towards justifying why he should not need to address them**.**

Although Hicks incorporates parts of Humeanism to meet his pragmatic goals, he does intentionally distance himself from fundamental Humean principles. By making concessions and downplaying significant parts of the Humean metaphysic, the question arises as to whether Hicks' version of neo-Humeanism can still be regarded as genuinely Humean. His decision seems to have been made as an attempt to circumvent the issue at hand, but is he giving up

ground for no good reason? For what it is worth, his move seems reasonable to me, but I can see it being challenged by more traditional Humeans than myself along these lines.

Among the various proponents of pragmatic Humeanism discussed in this thesis, Hicks stands out to me as the best equipped for addressing the traditional challenges raised by critics of Humeanism. However, it is worth noting that, perhaps more than other pragmatic Humean positions, Hicks's views may be seen as pushing the boundaries of Humeanism by displaying a greater willingness to depart from its core metaphysical assumptions. While his departure from strict Humeanism may raise concerns for some, it is undeniable that Hicks's view provides the most robust response to the challenges posed.

Putting Down the Pen

In this thesis I have attempted to provide a sketch of what Humeanism about laws is and its current, contemporary trajectory, as well as to emphasize the issues that Humeans need to address in order to improve the theory. I have done this by starting with the orthodox views about Humeanism, and then moving to describe the recent shift among Humeans by broadly outlining the recent papers in this area. Overall, these papers demonstrate the diverse range of contributions made by Neo-Humeans in recent years. By addressing the limitations of Humeanism and revising it to meet the demands of contemporary science, these philosophers have attempted to craft a pragmatic Humeanism. I remain cautiously optimistic about the possibility of achieving this large goal.

There is a prevailing feeling that Humeans admit to—Humeanism has a long way to go. Nonetheless, many philosophers, including myself, believe that Humeanism is worth defending and building upon. In my attempt to rise to this call to action, I have offered a potential solution

to the problem of circularity; admittedly, this contribution is a small one. There are still significant challenges that must be addressed for the Humean position to withstand its competitors. That, however, is work for another time, so, in closing, I would like to take a page from Michel-Townsen Hicks and state that "[n]ow I intend to have a beer" (2021b, p. 555), and do exactly that, leaving these other problems for another time in the not-too-distant future.

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