

A Practitioner's Guide to Pragmatic Humeanism

Abstract

All Humeans hold, roughly, that laws are informative summaries of non-lawful matters of fact. Pragmatic Humeans go further: for them, what makes these summaries the laws is their usefulness to agents like us. By adding elements of our specific epistemic interests and constraints, pragmatists contend, we can arrive at satisfying explanations of otherwise surprising features of our actual laws and our actual scientific practice.

But the pragmatic shift is not without problems. The more elements of our particular psychology we add to our nomic formula, the more susceptible we are to idealistic ratbagery. Intuitively, what can or must happen does not depend on our particular cognitive architecture: we cannot change the laws by changing us. But if laws are distinguished from accidents by features of our psychology or the language our society contingently speaks, then changes in our psychology or culture might lead to differences in what the laws of nature allow. My aim here is to clarify the role of pragmatic constraints, and thereby respond to this challenge from creeping idealism.

My strategy has three parts. First, I argue that pragmatic constraints determine the laws only indirectly, by generating a nomic formula that itself makes no reference to agents. Second, I discuss what sorts of agents are *agents like us*. I argue that pragmatists should appeal to a particular sort of idealized agent, one whose specific limitations and interests have been idealized away.

I conclude with an attempt to draw together two strains of pragmatic Humeanism. A number of recent Humeans, including Loewer (2007), Loew and Jaag (2020), Schrenk (2006), Cohen and Callender (2009), have argued that the properties that feature in the laws is not determined by the world's metaphysical structure, but is instead chosen based on often arbitrary pragmatic considerations. I argue that, even if these concepts are chosen pragmatically, they are robustly objective and determined by the same sorts of universal features of agents as the lawmaking desiderata.

Introduction

I find it will be more convenient to sink this question in the following, *Why we conclude, that such particular causes must necessarily*

have such particular effects, and why we form an inference from one to another? we shall make that the subject of our future enquiry. (David Hume, *A Treatise of Human Nature*, Book 1 Part III section iii; Hume's emphasis).

Some things have to happen. That which goes up *must* come down. If supply decreases and demand doesn't, prices *have to* increase. Like charges *necessarily* repel. This form of necessity — that associated with the laws of nature or scientific theories — is called "nomic necessity".

Where does nomic necessity come from? Humeans follow David Hume in holding that it arises in some way or another from our inferential practices. When we see a match struck, we infer that it will light. Thus we believe that a match, if struck, must light. The "must"—the necessary connection — between striking and lighting arises from our inference rather than vice versa.

But this general guiding principle leaves a lot of philosophical work undone. For we can hold that necessity depends on inference in a number of importantly distinct ways. We could be expressivists, and hold (as Ayer (1936), Ward (2002), and Thomasson (2020) do) that when we say a connection is necessary we are merely expressing our own tendency to make certain inferences. On this view, statements of necessity are not really true or false—they don't represent or describe the world at all. This is a firmly *anti-realist* position about nomic necessity.

But we need not be anti-realists. We could instead be reductionists of some stripe, and hold that there are truths about what's nomically necessary, but that these truths are explained by or depend on our inferential practices. The easiest way to do this is to be a naïve relativist, and hold that, for any (cultural? scientific?) community, for *P* to be necessary is for it to be guaranteed by the inferential practices of that community.

Relativism is, I think, a bit too naïve. In this paper I will be exploring the prospects of non-relativist reductionism. On the forms of Humeanism I'll discuss here, there are facts about what's nomically necessary. These facts depend on what inferences we can or should make. But the facts about what inferences are good are, on my view, objective facts, not relative to a cultural or scientific group. So the facts about nomic necessity are also objective.

In this paper I will discuss and contrast two forms of realist, objectivist reductionism. The first form is due to David Lewis, and makes the relevant inferences objective by (a) tying them to objective metaphysical structure, and (b) stipulating that the formula for reducing nomic facts to non-nomic facts is metaphysically *rigid*. I take this to be a form of brutalist primitivism about the world's property structure paired with a sort of naïve constructivism about scientific practice. The second form of objectivist reductionism, which I favor, is pragmatic, and makes the inferences objective by tying them to features universal to scientific agents.

The paper is structured as follows. In §1 I will describe Lewis's view and the anti-metaphysical objections which have led many Humeans to pragmatism. Then, in §2, I will present a worry for pragmatic views: they lend themselves too

easily to *ratbaggery* — a form of relativism. In §3 I will present a view which is distinctively pragmatic and agent-centred, but escapes the relativist ratbag. In §4 I will argue that the view can be extended to remove Lewis’s reliance on the brutalist metaphysics of natural properties. I then close with a brief discussion of what sort of uniformity science requires of nature.

1 Humeanism and its Discontents

1.1 Humeanism

Humeanism, as a contemporary theory of nomic modality, is the brainchild of David Lewis. Lewis held that the world is just a collection of particular matters of fact. These matters of fact are modally disconnected; there are, as Hume said, no “necessary connexions between distinct existences” (see, for example, the *Treatise*, Book I, part III, section VI).

But this denial of necessary connections is not the whole story. For Humeans are also realists about nomic modality: the sort of modality that’s expressed by statements like “everything that goes up must come down.” If going up and coming down are distinct and there are no necessary connections between distinct existences, wherefrom comes this “must”?

Lewis held that this form of modality was determined by laws of nature; rather than being independent parts of reality, laws for Lewis (explicitly following Ramsey (1928)) are summaries of the fundamental particular goings on:

“A contingent generalization is a *law of nature* if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves a best combination of simplicity and strength [i.e. informational content]” (Lewis; 1973, p. 73).

In explaining how we best balance strength and simplicity, Lewis appeals to both an idealized version of scientific practice, and to a metaphorical omniscient deity:

“In science we have standards—vague ones, to be sure—for assessing the combinations of strength and simplicity offered by deductive systems. We trade off these virtues against one another and against probability of truth on availability of evidence. If we knew everything the probability of truth would no longer be a consideration. [...] (Imagine that God has decided to provide man with a *Concise Encyclopaedia of Unified Science*, chosen according to His standards of truthfulness and our standards of simplicity and strength.) (Lewis; 1973, pp. 73-4).

Lewis’s view of laws, expressed here in *Counterfactuals*, was largely un-

changed throughout his career¹. However, he made one important addendum in *New Work for a Theory of Universals* which will concern us in §4. According to this addendum, we do not merely require the Encyclopaedia be up to God's standards of truthfulness. We also require it to be written in Her own language:

“We face an obvious problem. Different ways to express the same content, using different vocabulary, will differ in simplicity. [...] In fact, the content of any system whatever may be formulated very simply indeed. Given system *S*, let *F* be a predicate that applies to all and only things at worlds where *S* holds. Take *F* as primitive, and axiomatise *S* (or an equivalent thereof) by the single axiom $\forall xFx$. If utter simplicity is so easily attained, the ideal theory may as well be as strong as possible. Simplicity and strength needn't be traded off. [...] The remedy, of course, is not to tolerate such a perverse choice of primitive vocabulary. [...] [L]et the primitive vocabulary that appears in the axioms refer only to perfectly natural properties” (Lewis; 1983, pp. 367-8).

On Lewis's view, we should take the notion of natural properties as a primitive. Natural properties are those that make for objective similarity: two objects that share natural properties are similar, those that don't, aren't. Naturalness is now taken to be a commitment to a certain objective property structure to the world (see e.g. Sider (2011)). Presumably, when God spoke the world into existence, this is the language She used.

Lewisian Humeanism, then, marries a denial of fundamental necessary connections with a realist, reductionist view of natural modality — one not to be confused with nonreductive realist accounts like Armstrong (1983)², Maudlin (2007)³ or Bird (2007)⁴, which take some form of natural modality (though not always laws) as fundamental. Lewis's realist view takes laws to be the deductive system which best balances simplicity and informational content. Although the balance is in some way determined by our scientific values, the language in which simplicity is measured is not: it depends on an objective, mind-external property structure.

¹One significant change involved his account of chance (Lewis (1980), Lewis (1994)). Lewis added an additional virtue, *fit*, which measures the match between the world and the chance theory. Good revisionary discussions of fit and Humean chance can be found in Loewer (2004) and Hicks (2017b).

²Armstrong (1983), Tooley (1977), and Dretske (1977) take laws to be necessitation relations amongst universals or properties; this universalist account reduces laws to property structure, but as the necessitation relation is irreducibly modal, I take it to be a nonreductionist realist account of modality. For a recent discussion of views of this stripe, see Hildebrand (2013) and Hildebrand (2020) (discussing Tooley's and Armstrong's views, respectively).

³Maudlin (2007), like Chen and Goldstein (2022), Adlam (2022), and Emery (forthcoming) hold that laws are fundamental bits of ontology.

⁴Bird (2007), like Mumford (1998), Ellis (2001), Vetter (2016), Demarest (2017), Williams (2019), and Kimpton-Nye (forthcoming), take laws to be summaries of or descriptions of the irreducible dispositions or powers in the world. Although these views take laws to reduce to something else, their reduction base — dispositions or powers — is irreducibly modal.

1.2 Its Discontents

Recently, a number of authors sympathetic to Lewis' (and Hume's) denial of necessary connections have dissented from his specific views about how laws reduce and what sort of reality they reduce to. Philosophers who disagree with Lewis about how laws reduce think that Lewis's formula, which involves balancing simplicity and strength, is too simple and not strong enough. These philosophers think we need to connect the desiderata that determine which generalizations are laws at a world more directly to scientific practice and the needs of agents embedded in the world. Here is Ned Hall expressing this sort of sentiment:

"The unofficial position is a kind of 'ideal observer' view, according to which the fundamental laws are whatever a suitably placed observer, implementing the best scientific standards for judging what laws are, would take them to be. (Hall 2015: 264)

Following Hall, Hicks (2018), Jaag and Loew (2018), and Dorst (2019) have defended more pragmatic versions of Humeanism, which use features of our epistemic position as limited agents embedded in a complicated world to explain the fact that we expect laws to be local, symmetric, dynamic, continuous equations with well-formulated initial boundary problems. Although these authors differ as to precisely which features laws ought to have, they agree that Lewis's account does not predict some features of our actual laws and the practice of scientific investigation that leads to them. These papers also hold that we can explain these features of scientific practice, and so these features of the actual laws of nature, by looking closely at the epistemic needs and interests of agents like us:

"Best systems need to be best for us, that is, contain information that is useful for solving the kinds of 'prediction problems' that limited beings face." (Jaag and Loew; 2018, 2534)⁵.

Similarly, many authors (going back to van Fraassen (1989) and including Earman and Roberts (2005), Schrenk (2006), Loewer (2007) and Cohen and Callender (2009)) have worried that Lewis's posit of natural properties makes laws epistemically and practically inaccessible to agents like us. They argue that there is no part of scientific practice which is sensitive to this metaphysical structure, and so empiricists and scientifically minded Humeans should dispense with it. These Humeans have replaced Lewis's primitive posit with a stricter adherence to scientific methodology, and tend to define property structure in terms of successful scientific theories rather than vice versa.

Worries about Lewis's desiderata for lawhood and his primitive metaphysics are connected; both have lead to revisionary views which permit *rat-baggery*: a problematic form of idealism or agent-relativism. In the next section

⁵Jaag and Loew's sketch of what makes an agent "like us" is remarkably similar to the more detailed account I give in §3. See footnote 10.

(§2) I'll argue that this relativism is especially problematic for naïve pragmatic views. I'll then discuss how sophisticated pragmatic views of the desiderata can avoid these problems in §3, and how sophisticated pragmatic views of property structure can avoid these problems in §4.

2 Pragmatism and Ratbags

The pragmatic moves made by contemporary Humeans aim to tie their accounts more closely to the practice of science. They thereby gain resources to explain features of scientific theory choice that look mysterious or lucky from the perspective of non-Humean views. They also dispense with some of the more mysterious, and objectionable, metaphysical structure that Lewis relied on—natural properties have long been a bit of an eyesore on the Humean's desert landscape⁶.

But this explanatory power and svelte metaphysics comes at a cost. By building agents more directly into their account of laws, pragmatic Humeans risk becoming *ratbags*⁷: anarchic idealists, who reason using whatever laws they please. This is what Lewis Lewis (1994) called them, anyway. Lewis's terminology has recently been refined by Gordon Belot:

[A] ratbag idealist is someone who takes some pretheoretically fundamental aspect of the world—its causal structure, or its laws, or its spatiotemporal geometry—to depend on human cognitive constitution. (Belot; 2022, p. 3)

Some pragmatic Humeans (Hall (2015) is a prime example) embrace ratbagery: rather than being a downside, they claim, this agent-dependence of the laws is a boon: Lewis's "worst problem" is the Humean's strength! Hall says:

For now, I simply wish to note that there is plenty of room for the view that it is in part facts about us – idiosyncratically about us, and our peculiar human psychologies – that play a role in determining the most appropriate way for us to structure our investigation of the world. How could the details of our peculiar human situation not be relevant to this matter?

(Hall; 2015, p. 268).

⁶Though see Friend (2022) and Demarest (Unpublished Manuscript) for doubts that the pragmatists succeed in these goals.

⁷Many readers may have, like myself, only encountered this word in Lewis's writing and so may be wondering what exactly it means. For those readers, the Aussie Slang Dictionary (<https://www.koalanet.com.au/australian-slang.html>) claims that "ratbag" is a "mild insult", and the Oxford English Dictionary defines "ratbag" as "an unpleasant or disliked person", certainly not something the Humean wants to become. On the other hand, the online site Lord of the Rings Wiki (<https://lotr.fandom.com/wiki/Ratbag>) says that "Ratbag was an Uruk who was rescued from punishment by the ranger Talion and began to serve him, as a secret traitor in Sauron's army. Ratbag is non-canonical as he does not appear in the works of J.R.R. Tolkien", which, while slightly more honorable, is still an unattractive position for Humeanism.

I agree with Hall that there is room in the Humean view for us to explain the structure of our investigation about the world in terms of us, and that this is a boon. But on the details I disagree; I think that if the Humean accepts ratbaggery, her theory of laws will be seriously undermined⁸. If we appeal to our peculiar human psychology and the idiosyncrasies of our situation, our view of laws will be problematically relativistic and our explanation problematically circular: the laws will explain what we are and are not able to do, but then these abilities will be asked to explain why the laws are what they are (for a clear expression of a closely related worry, see Hildebrand (forthcoming)).

The Humean view advertises itself as a realist, reductionist program concerning natural modality. Unlike antirealists and expressivists (Ayer (1936), Ward (2002)), the Humean reductionist thinks that claims about what the laws are, modal claims concerning nomic necessity and possibility, counterfactual claims, and causal claims are all *really true*, just as true as claims about tables and chairs. Unlike non-Humeans, the Humean thinks that these claims are made true by more fundamental facts which aren't themselves modal (just as claims about tables and chairs are made true by more fundamental facts about electrons, protons, and other things which aren't themselves tables and chairs).

This combination—a realist, factive view about modal claims combined with the promise of an informative, noncircular analysis of them—is a very attractive philosophical package. If the Humean really is just a ratbag idealist, it seems that what we find when we open this package is just relativism with some bells attached. Relativism is not, strictly speaking, antirealism, at least in the sense that it takes there to be truths about what is and isn't a law. But a relativist reductionism has less claim to recover the realist vision of science as a description of a mind independent world. Pragmatic Humeans should worry that, if they allow relativism or expressivism to crowd out their realism, some of the philosophers who have bought into the view will fill cheated and exchange it for a more fully realist, nonreductionist alternative⁹.

To see why nomic reductionists should aim above relativism, we should think about why we wanted a realist view of nomic modality in the first place. One primary, if subtle, reason is that laws are connected to practical and epistemic normativity. Laws, as Dretske says, “are the *sort* of thing that can become well established prior to an exhaustive enumeration of the instances to which they apply” (Dretske, 1977). They enable us to have knowledge (rather than just guess) about the future and the consequences of our actions. More deeply, externalist accounts of epistemic justification draw on nomically modal relations—causal or counterfactual—between belief and the world. It's not just that laws allow us to make justified predictions; it's also that the laws are what determines which ordinary observational beliefs are justified. If we sow idealism

⁸See (Chen and Goldstein; 2022, p. 56) for a recent version of this complaint.

⁹I'd like to note here that while Humeans are typically scientific realists, the sort of realism I'm talking about here is subtly different: it's realism about scientific or nomic modality, rather than about the representational status or truth of scientific theories. My argument here is that relativism about nomic modality threatens the motivations for Humean reductionism; even though relativism is not anti-realism, a relativist — like an anti-realist — denies that nomic modality is objective.

about laws we will reap relativism about epistemic normativity. Knowledge as a shared resource will be lost, and instead we will retreat to epistemic islands, surrounded by those with similar standards but isolated from those whose norms differ from ours.

Relatedly, laws back counterfactuals, which in turn help us determine which actions are rational. An engineer who designs a bridge has a both a practical and a moral responsibility to make sure the bridge is safe—that the laws of mechanics insure that it can hold its own weight and the weight of people and vehicles that will cross it. This “can” is backed by the laws. So if the laws are up to us, then so is the question of whether an engineer has acted irresponsibly. Nomic relativism has seeped into morality (*cf.* Clifford (1877)).

How deep would this relativism go? One initial thought might be that since even relativistic Humean laws must be true, the relativism will be quite shallow. Differently positioned agents, or agents with different goals and abilities, might choose different generalizations amongst the truths to count as laws. But since they will ultimately all agree that the laws are true, none of them will be making false predictions or building failed bridges.

Unfortunately, it seems to me that the relativism is quite deep, even if we are just figuring out which truths to privilege as laws. The difference between true belief and justified true belief, or true belief and knowledge, is quite significant. Different views on which counterfactuals hold will lead to differences in which true beliefs count as knowledge. While different law-systems will agree about every actual fact, they could easily support contradictory counterfactuals.

This worry is similar to that identified in Meacham (2014), who argues that Better Best Systems accounts will give rise to multiple distinct chance theories which give contradictory advice for our credences. Here, though, the worry is that distinct law-systems, built on different desiderata or different sets of primitive properties, will ground different counterfactuals in cases where the antecedent does not actually occur. In cases where the antecedent does not occur, the fact that the distinct law systems need to be true will do nothing to prevent the different systems from offering conflicting accounts of what would happen if the antecedent did occur.

Since we evaluate actions using counterfactuals — that is, by trying to determine if a different action *would have* resulted in a better outcome — different law systems will lead to different assignments of praise and blame. When a bridge collapses, whether the engineer or the builder is at fault is a substantive question. On a relativist view, there is no objective fact about it.

By connecting the laws directly to the practical and epistemic goals of agents (and to the limitations of agents) pragmatic Humeans have an interesting opportunity: they can explain the fact that laws feature in practical and epistemic normativity, rather than just take it as basic. (Rather than provide that explanation here, I refer my reader to the papers I described in §1.2). But if these explanations are built on the sand of unstated naïve relativism, the whole project runs the risk of collapse, at least from the perspective of philosophers committed to realism about practical, epistemic, and moral normativity [citation removed for anonymity].

Similarly, we typically take our goals, abilities, and limitations to be determined by the causal and nomic structure of the world. I can't fly because, no matter how fast I flap them, my arms cannot generate enough lift to overcome the force of gravity on my body. I can't determine the exact microstate of a box of gas because my eyes don't have sufficient precision to see each individual molecule, and any way of probing the box with enough precision to figure out its microstate will significantly disturb it. These limitations are facts, not just about what *does* happen, but also about what *can* happen. As such, Humeans hold that they are grounded in or made true by the laws.

Hildebrand (forthcoming) has argued that pragmatic Humeans who tie their laws too closely to the particular needs and limitations of human agents run a serious circularity risk: if the ratbag idealist can change the laws by changing herself, then whether she can change herself can't be determined by the laws. Otherwise we get more than relativism: we also get circularity. This circularity arises because the pragmatic Humean is attempting to ground the laws in a set of desiderata which are determined by the limitations of agents, and then trying to ground the limitations of agents in what is allowed by the laws. If our account of the desiderata involve the abilities of agents too closely, in a way which connects directly to their law-determined abilities, this account will be running on a tight explanatory circle.

2.1 The Indirect Redirect

Before describing my own solution to this problem, I'd like to discuss Lewis's solution. This solution is a necessary part of solving the problem. But it is not sufficient to solve it. Understanding why it isn't sufficient to solve the problem will help us understand what exactly the problem is. I plan to accept Lewis's solution and build on it.

Lewis called his strategy "rigidification", but I will call it "the indirect redirect." Lewis took the move to be primarily modal: his account was mostly about what was possible or necessary, and he held that we could simply stipulate that some desiderata held with analytic or conceptual necessity. But I think that the rigidity of the desiderata should be explained rather than stipulated. Fortunately, an explanation is easy to come by: the lawhood of generalizations is explained only *indirectly* with reference to features of agents. What these features *directly* explain is the desiderata. These desiderata then explain which generalizations are laws. It is in virtue of this indirect explanatory structure that the desiderata are modally rigid: features of agents determine what is involved in the concept of laws (these are the desiderata), and this concept is what we use to pick out laws at different possible worlds (and so, the desiderata are held fixed when we examine these worlds).

Although I don't think this strategy is sufficient to solve the problem, I do not think the Humean should ignore it—on the contrary, I think the Humean should employ it! Though it is not sufficient, I think it is a necessary part of our solution. Here is Lewis describing the strategy:

I used to think rigidification came to the rescue: in talking about what the laws would be if we changed our thinking, we use not our hypothetical new standards of simplicity and strength and balance, but rather our actual and present standards. But now I think that is a cosmetic remedy only. It doesn't make the problem go away, it only makes it harder to state. (Lewis; 1994)

A Humean who employs the indirect redirect holds that the laws are grounded in the interests, limitations, and preferences of agents, but only indirectly. We directly ground the laws in certain standards of simplicity and strength. Those standards are completely objective, in the sense that they make no reference to the peculiarities of agents. But we explain those standards in terms of the interests and limitations of actual-world agents. When we give our official account of the desiderata which make for laws, we focus on the standards and not the reason we have those standards rather than others. Since these standards are objective and don't involve agents, our theory conforms to the letter, if not the spirit, of realism. The subjective, agent-dependent standards have been laundered through a shell of agent-independent desiderata to remove any illicit connection to subjectivity.

Employing this strategy is—just barely—enough to save the letter of realism about laws. Consequently, I think the Humean can and should employ it. But if that is all the Humean does, we have not yet overcome the ratbag's challenge. Even if the peculiarities of an agent's interest are laundered through the shell of fully objective desiderata, they challenge the objectivity of the scientific project.

To see why, let's return to our bridge engineer. Suppose that they have different preferences than we do in theory-choice. They like simpler theories more than we do, or maybe have even more wacky preferences: they prefer theories which employ only discrete mathematics, or find that they understand things better if they can be simply written in polar coordinates. As a result, they use a completely different theory when evaluating the stability of the bridge.

Now, we are canny Humeans, and so we recognize that although our psychological preferences determine the standards of theory choice, the *real* laws are those which conform to our own standards, not this alien engineer. They are reasoning using (what else?) schmlaws, not laws, a totally different thing. And presumably they engage in schmausal decision theory and evaluate schmcounterfactuals—they have a whole reasoning structure built in parallel to our own (for a similar discussion, see (Belot; 2022, p. 10)).

How now can we criticize this engineer if the bridge fails (or even if it doesn't?). Of course they reason using schmlaws, rather than laws. But their justification for using schmlaws in their reasoning is exactly parallel to our own justification for using laws. It seems that we have no grounds, neutral or otherwise, on which to criticize them¹⁰. Rigidification has saved realism, but at

¹⁰A reviewer suggests that we could in fact criticize schmlaws users for having unjustified beliefs — after all, their beliefs and actions are schmjustified rather than justified. So we could criticize them for being unjustified. My worry is that they would see no reason to respond to our criticism. Science is a social enterprise, and the standards we employ in science, including the criticisms we

the cost of robbing laws of their importance in governing reasoning, decision making, and practical action. Schmlaws are just as good.

I don't think schmlaws are as good. Or, anyway, I think that there are laws, and standards for laws, that are shared by anything that's governed by norms on reasoning and practical action. But I also think that the particular standards of the laws are determined by features of us: embedded and limited agents. I aim to thread this needle by motivating lawmaking desiderata with reference to features that are universal to all agents, or anyway, anything that would count as an agent. I will illustrate this by appealing to a *minimally idealized* agent; but what's doing the work is the characterization of agenthood, not the idealized agent themself.

3 The Nomic IGUS

“...[O]n the one hand, reality is independent, not necessarily of thought in general, but only of what you or I or any other finite number of men may think about it; and that, on the other hand, though the object of the final opinion depends on what that opinion is, does not depend on what you or I or any man thinks [...] and if, after the extinction of our race, another should arise with faculties and disposition for investigation, that true opinion must be the one which they would ultimately come to.” (Peirce; 1878, p. 39)

The dilemma for pragmatic Humeans is this. On the one hand, we want to explain the features which make some generalizations laws (and others mere accidents) with reference to the epistemic needs and practical interests of agents embedded in the world. On the other hand, any introduction of too specific needs and interests—any focus on the situation of some agents and not others—risks undermining the objectivity of the laws, and so the objectivity of non-nomic evaluative concepts in which they feature. And if we tailor the laws to the nomically underpinned limitations and abilities of agents, we run the risk of circularity.

But when we look at the dilemma this way, a resolution is not so hard to find. Pragmatic Humeans should motivate their laws with reference to the features which every agent has: those features which are essential to being an embedded agent. To do this, Humeans need to say what it takes, in broad strokes, to be an embedded agent; they need to find features constitutive of embedded agenthood, (Jaag and Loew; 2018, 2533) express a similar idea when

make on the basis of them, should be intersubjectively acceptable. “Or,” the reviewer continues, “if we can't criticize them on these grounds, then maybe we regard them as simply outside the domain of criticism, like a rock or a tree. A tree that bridges a gap between two cliffs could be used as a bridge, but we would not criticize it if it fell while someone was walking on it.” I like this example; I argue in §3 that anything which is an agent or makes decisions is subject to the same law-determining norms, and so is subject to and should respond to criticism. However, if something doesn't have the features I describe in §3, I agree that, like a rock or a tree, it is not subject to criticism.

they say “[b]y ‘creatures like us’, we mean creatures with limited cognitive resources [...] We do not mean specifically humans or humans given our current state of technology. We mean creatures that have limitations with regard to their cognitive resources that are general enough to be shared by all embodied agents, including current humans, future humans, and alien scientists (if there are any).”. In this way, our desiderata (as Peirce, Jaag, and Loew suggest) should be tied to “faculties and disposition for investigation”, rather than the vagaries of any particular investigator. By understanding the desiderata in terms of the faculties and disposition for investigation, we can ensure that anything that has those faculties will agree upon them. And we can also find limitations and abilities of agents that don’t rest on any specific set of laws, and are limitations agents would have no matter what laws describe our world.

3.1 Agency and the Nomic IGUS

Here, I’ll suggest two features universal to those with the faculties and disposition for investigation. These arise from the basic idea that investigators are *embedded agents*.

First, investigators are *embedded* in the world: they are a part of it, they are themselves physical systems. So they have to learn about the world, and additionally learn what the laws are, by interacting with other parts of the world. Rather than having access to all of the truths and systematizing them, they must work piecemeal, and make inferences based on isolated parts of the world.

Second, investigators are *agents*. They use the laws to make decisions and predictions. Doing so requires them to be able to represent the world, represent different ways for them to act, and then use those representations as part of the algorithm that determines their action.

To illustrate this idea, I invite you to engage with me in a bit of idealization. Inspired, different ways, by Callender (2017), Ismael (2015), and Hartle (2005), we will consider what a physical system needs to be like to engage in evidence-based decision making. Ismael suggests that Humeans present “a side-on account of the roles that beliefs about laws and chances play in the cognitive and epistemic life of situated agents living in a world constituted wholly by the Humean mosaic.” Hartle introduces the notion of an *IGUS*, or Information Gathering and Utilizing System, to highlight the features that physical systems have which enable them to experience the passage of time, an idea which takes centre stage in Callender (2017).¹¹ Here, we are instead interested in what features physical systems need in order to be situated, decision-making agents.

Figure 1 shows such a system, a *nomic IGUS*. The external state of the world (S) causes some internal state (R , a representation). R together with some other

¹¹I take this to be an example of what (Weisberg; 2007) calls a “minimal idealization”. Minimal idealization involves ignoring or removing features of a system which aren’t relevant for the explanatory task at hand; here, we want to remove any features of agents which aren’t constitutive of agenthood.

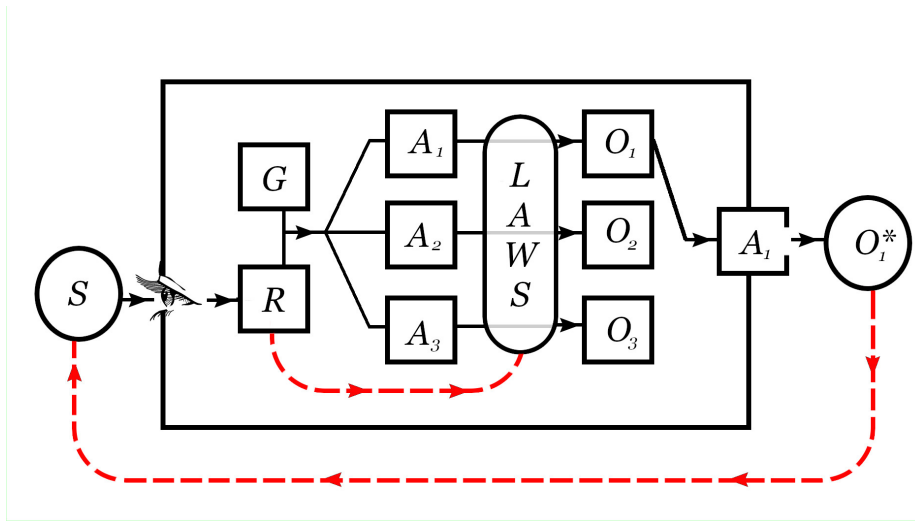


Figure 1: The Nomic IGUS. Solid lines represent the path by which laws are applied in prediction and decision making; dashed lines represent the way agents learn about and modify their beliefs about the laws. The system interacts with an external state S and produces an internal representation of that state R . Together with the system's goals G , that state feeds into a set of possible actions A_n . The system's *LAWS* module then outputs predicted outcomes O_n for each A . The system ranks these and outputs behaviour A , leading to another external state O^* , which it then interacts with.

internal features G (generators) generate an array of represented behaviors for the system ($A_1 - - A_n$, potential actions). The generators need to be able to suggest behaviors that the IGUS can perform in a wide variety of circumstances, compatible with the observed external state of the world.

The system then uses some function (labelled *LAWS*) to predict the results or outcomes of those behaviors ($O_1 - - - O_n$). Another function (something like a desire or utility ranking) ranks the outcomes and then selects and outputs the behavior A which produces the best ranked of the O s¹². This produces an actual action A_n^* and an external outcome O^* .

Many sorts of physical systems match this description; lots of them do not have explicit representations of the laws of nature (and, as I'll discuss below, although I think the *LAWS* module is of central importance in understanding the cognitive role of natural laws, not everything that plugs into the *LAWS* module will turn out to be a law of nature). What is distinctive about the scientific enterprise is that it seeks to tweak the function by which we predict the outcome of our actions on the basis of observation. This feedback is represented in Figure 1 by the dotted lines. After our behavior yields some outcome O^* , we observe that outcome and compare it to the outcome predicted by *LAWS*. We then alter the prediction function *LAWS* in order to minimize the difference between the predicted outcome O_n and the observed outcome O_n^* .

¹²We can generalize this to probabilistic reasoning in the usual way: the function selects that action which produces the best result weighted by probability.

It's worth noting that nothing needs to be said about whether the processes involved here are deterministic. This does not need to be a metaphysically free or nomically undetermined process in order for it to be a decision. Considering alternatives, ranking them, and then acting on the basis of that ranking is a useful way of generating behavior even if the outcome of that process could be deterministically predicted or simulated. What I say here is meant to be neutral with regards to whether decisions are "free" in any sense¹³. However, they do need to be causal: the representations need to be caused by the external world, and the outcome representations need to be produced (causally) by the operation of the *laws* module. This may lead to some circularity worries, but they are distinct from those I discussed in §2. Whatever laws we end up with, they need to support the sorts of causal relations which allow us to exist as agents. I discuss this scryability in §4.3¹⁴.

3.2 The IGUS as a necessary condition

In order for the nomic IGUS to provide a solution to pragmatic Humeanism's ratbag problem, it needs to motivate a set of desiderata that can cleave the laws from the accidental generalizations. And it needs to do so with reference to features that are universal to all agents that might engage with anything like laws of nature.

The goal here is to identify features that are truly universal to recognizable agents, and so will apply to any being which is subject to the sorts of practical and epistemic normativity to which laws apply. I've aimed to be safe in my characterization: there may be other features which are essential to being an agent, which are not captured by this bare-bones model. If so, they could plausibly underlie other constraints on laws. I am here not arguing that these are the *only* pragmatic constraints on laws; rather, I'm arguing that they are pragmatic constraints, and that any such constraints can be both pragmatic (in the sense that they are derived from features of embedded agents) and objective (in the sense that they don't vary based on the specific physical makeup, preferences, or history of the agents).

The nomic IGUS does represent features which are universal or essential to agenthood. Anything, I believe, which cannot be represented as a nomic IGUS is not an agent, or at least, not one that possesses or uses a concept at all like laws of nature. This is because I take decision-making to be a crucial part of being an agent, and I think that decision-making essentially involves these two sorts of representations—of acts and outcomes—and a weighing function, as depicted in figure 1. Agents may differ in the function they employ to make predictions, the way in which their representational states are realized, and the degree and method by which their LAWS function is susceptible to a feedback mechanism. But they are united in the fact that they engage in decision making

¹³Although, cards on the table, I am not neutral. Like Hume, I am a compatibilist.

¹⁴I think that this worry touches on deeper and distinct issues; for an argument that Humeans have a particular problem with causal-functional accounts of mental states and agents, see Friend (2021).

(which involves representations of options and outcomes) and in the fact that they revise their expectations on the basis of their experience.

Suppose a physical system lacks one of the two central features of the nomic IGUS. First, imagine a physical system which takes in information and outputs behavior, but does not do so via any system which constructs and compares outcomes. Such a system does not make decisions. Many organisms are like this: for example, oysters take in information about the chemical composition and salinity of the water around them and on the basis of that information open or close their shells, but they do not have anything corresponding to an internal representation of their actions or ranked outcomes¹⁵. Nonorganic systems, like thermometers, do this as well. (Here I take internal representations to be, at least, internal biological or chemical states which reliably vary with the target of representation. For oysters to have states representing their action, they would need a physical implementation of some predictive algorithm, which outputs states which track their behavior.) While this sort of behavior is clearly a response to stimuli, it is not a decision.

Perhaps you disagree, and think that the sort of stimulus response does count as a decision, or that these sorts of systems are agents. Or maybe you are worried that my argument rests on what we choose to refer to with “agent”, and not on the substantive questions involving decision-making and prediction I alluded to in §2. Worry not. Since these systems don’t have any internal function from representations (A_1, \dots, A_n) to outcome representations (O_1, \dots, O_n) , they won’t engage in anything like the sorts of conditional reasoning that makes laws so useful to us. Consequently, we should not be concerned that these stimulus-response systems will employ close alternative “schmlaw” systems, since they don’t engage in the kinds of cognition that are connected to the substantive questions I alluded to in §2. Praise and blame, epistemic and practical normativity, and other normative notions are all concerned with decisions in this sense, and not “shmicisions”. Whether or not we choose to call these systems ‘agents’, they have no use for or concept of nomic modality and so cannot have a competing alternative version of it.

Second, imagine a physical system which has no feedback mechanism; it does form representations of its environment, generate alternative representations, and it has an internal function which generates outcome representations and ranks them. On the basis of this ranking, it performs an action. But if the observed actual outcome of this action doesn’t match the “predicted” one, the system doesn’t change anything about its internal representation.

Without any feedback or regulatory mechanism between observed outcomes and the mechanism making predictions, it is hard to see how the “predicted” outcomes O_1, \dots, O_n count as predictions at all. I could choose which action to perform based on any number of internal causal factors, including

¹⁵For accessible information about the anatomy and nervous systems of oysters, as well as handy information regarding their role in vital coastal ecosystems and tips on farming and eating them, see the webpage of the Massachusetts Oyster Project: <https://massoyster.org/oyster-information/anatomy>. Note that I do think oysters might have some sort of representation of the external state of the water, just no representation of possible actions on their part.

those which involve generating and ranking representations, without those representations playing the role of prediction. For example, I could perform that imagined action which gives me the best feeling, or the one which makes me imagine unicorns, or the one which seems most similar to what I remember doing in the past. These methods for determining action would match the nomic IGUS's internal causal roles, but do not have any feedback mechanism tying the representations O_1, \dots, O_n to observed outcomes. I do not think these methods of determining action involve prediction or laws of nature. In order for an internal representation to count as a *prediction*, it must satisfy something like the functional role of prediction. But if there is no causal pathway ensuring a match between the representation and the result of actions, it does not satisfy that functional role.

I further think that although methods of determining action without prediction may be decision-like, they are not decisions. Since I take decision-making to be central to agenthood, any beings whose behavior is determined by these non-decisions are not agents. Recall that oysters "decide" whether to open or close their shells based on the chemical composition of the water around them. But their mechanism for doing this does not involve representing their environment, adding a representation of their shell as open, and then forming a predictive representation of themselves and their environment with their shell open. Instead, they work more like a thermometer: perceived changes in the environment directly trigger changes in the organism. I am claiming that these are not decisions, and as a result that oysters are not agents.

Now that I have made my central claims, it is time for me to hedge them. It could be that there is no feedback mechanism *within* an organism, but there is one *between* organisms. Perhaps each generation of an organism has some variation in its prediction functions; those which more accurately match actual outcomes predominate after many generations of reproduction. Then there is some feedback mechanism, but it is not within the organism, and it works on the type of mechanism at the species level and not the particular mechanism within each organism. I think that such organisms make decisions, and may even be agents in some minimal sense. It might be that lots of unreflective animals are like this. But such organisms don't do anything like science, and their module is not so similar to our notion of nomic modality. For they see their prediction function as unchangeable (if they can think about it at all), and so their notion of lawhood would completely lack two important features of ours: first, it would be (to them) necessary: they would be unable to form hypotheses which contradict it, whereas we regard the actual laws as, at least in some sense, contingent¹⁶. Second, it would be *a priori*, rather than *a posteriori*:

¹⁶I do not here intend to discuss what sort of contingency laws have. For example, dispositional essentialists hold that laws are metaphysically necessary, in that it is necessary of properties like charge that they are bound by electrodynamic laws. But they also hold that if we had different properties at our world, we would have different laws governing our properties. I think that some form of contingency is a feature of our concept of law, and that it is connected to the way we revise our prediction module. But this can be accommodated by a number of different views about the nature of laws, include those that make them metaphysically necessary but contingent

our notion of laws of nature requires the laws to be susceptible to change when new evidence comes in, but such creatures would not see their laws as being subject to any sort of evidence.

Again, we don't need to rest anything on the label "agent" to see why these sorts of organisms don't have a close competitor to our notion of nomic modality. Our initial concern was that our psychological peculiarities would lead us to choose our laws with a set of theoretical virtues which are not universal to everything with the faculties and disposition for investigation. We were also worried that if the limitations we appealed to were nomically contingent, then our account of laws would be circular. Organisms whose feedback mechanism comes via evolution cannot choose laws using an alternative set of theoretical virtues, because they do not choose their laws at all. Since they don't choose or modify their prediction function, they don't weigh theoretical virtues full stop. Consequently they cannot have a different and competing weighing of theoretical virtues.

You may also be worried that there are many individual organisms which are the type of thing which typically instantiates the functional characterization here, but which themselves do not have these features. Often when we act we cannot see the outcome of our behavior and modify our predictions as a result, because (perhaps) we die or just lack the perceptive ability. Some agents lose the ability to act as a result of an unfortunate accident, but still engage in the sort of processing and internal deliberation we would describe as decision-making. I think that cases like these are problems for any functional account of anything, and responding to them would require getting into the weeds of the debate between role and realizer functionalism, and the question of what counts as a *type* of organism or *type* of internal state. I want to avoid that morass in this paper, and I hope readers plug in their favourite response on behalf of functional accounts. On the other hand if you, dear reader, think these objections are fatal to functional accounts in other areas of philosophy, I must despair; for while I have nothing worse to say than the proponents of those accounts, I likewise have nothing better to say.

3.3 Laws for the nomic IGUS

The nomic IGUS represents a bare-bones idealization of an embedded agent. As such, I think that being a nomic IGUS is a necessary, but not sufficient, condition of agenthood. You may now be worried that such a simplified idealization will be toothless: it will be unable to motivate any constraint or desiderata for lawhood. Here, I will describe some ways in which this idealization motivates some important features of nomic modality. These features will feature as desiderata of lawhood.

It's worth noting what is not involved in the IGUS: the IGUS abstracts away from our particular aims and desires; it abstracts away from the particular

in some weaker sense — for example, epistemically (I have other reasons to doubt the contingency is epistemic, but I do not think that these reasons are directly connected to the proper functioning of an IGUS). Thanks to [redacted] for discussion of this point.

causal pathways between us and the world, and our exact cognitive capacities. Consequently, the desiderata that the IGUS inspires do not depend or vary based on the particular aims and interests, cognitive capacities, sensory apparatus of agents, or even the actual laws and the causal pathways that exist in actual agents.

I would also like to note that I don't think that the IGUS's "LAWS" module needs to contain or correspond to the actual laws of nature, now or in the future. It would be nice if we could eventually make predictions and decisions using the actual laws. But of course we may never gather enough data to learn them, and even if we do, we may lack the processing power to use them without the help of external computational power.

What I am saying is that *our standards* for lawhood are those which enable some proposition or function to fit into the LAWS module. Just as the traditional Humean motivates their desiderata by appeal to an idealized agent in an idealized epistemic situation, I am here trying to get clear on what sort of idealization should be involved explaining the pragmatic desiderata. But these features of the IGUS explain the laws only indirectly: what the laws are is determined directly by these desiderata. These features of agents are meant to explain our standards for lawhood, not the laws themselves. Here is a sketch of some desiderata which this idealized view of agents motivates:

- The IGUS uses its representational inputs and some generating function G to generate a set of options for its actions $A_1 - A_n$. Hence nomic modality must allow for a wide array of possibilities, at least enough for the IGUS to generate multiple options for its behavior compatible with the state of the world it observes. This feature of the laws is sometimes called *modal latitude*: it had better turn out that the laws are compatible with a wide variety of states of the world (c.f. Loew and Jaag (2020)).
- The IGUS then uses the laws to make predictions. This means that the laws should be, in some broad sense, *dynamic*: they should be a function from states of the world to states of the world (or from probabilities of states to probabilities of states).¹⁷
- Taken together, these show us that nomic modality should generate something like the distinction between laws and initial conditions, with initial conditions matching, at least in some cases, the proposed actions, and

¹⁷Some purported laws are not dynamic, for example, Gauss's law for magnetism rules out magnetic monopoles and is arguable nondynamic despite including a time derivative operator. Similarly laws concerning equilibrium behavior don't have an overt dynamic character; and David Albert's Past Hypothesis (Albert (2000)) is purportedly a nomic constraint on initial conditions (it's worth noting, though, that the past hypothesis is posited by Albert to explain the Second Law of Thermodynamics, which is explicitly about the temporal evolution of thermodynamic systems). I believe that these laws can be accommodated by a view on which the role of laws is to provide dynamic information, but I don't have space to argue for this here (see my [redacted for anonymity]).

laws corresponding to the function from proposed actions A_1, \dots, A_n and outcomes O_1, \dots, O_n .¹⁸

- The IGUS has to use the laws to process the information in its representation R and proposed actions A_1, \dots, A_n to output the outcomes O_1, \dots, O_n ; since the IGUS is a physical bounded subsystem of the universe this means that the laws must be some sort of physically implementable algorithm which can deliver a prediction in finite time. In other words, the laws need to be *computationally tractable* in the sense of Wilhelm (2022). However, this does not mean that any IGUS needs to be able to implement the actual laws; it is possible that particular systems (like human brains) may be IGUSes without having the computational power to implement the actual laws (like Quantum Field Theory). Nonetheless the laws must be implementable by *some* systems, and so cannot require a supertask for a solution. So long as they can be implemented by some physical system in finite time, limited agents can use and apply the laws by artificially or externally supplementing their computational power (for example, by working in groups, writing things down, or reserving time on NASA's Pleiades supercomputer).
- The IGUS learns about the laws by comparing its predicted outcomes to the observed outcomes. This tells us a few things as well:
 - First, quite broadly, it tells us that nomic modality, unlike some other forms of modality, is regarded by the system as contingent and empirical: we learn about it at least partially from observing correlations in the world, including — and perhaps primarily — the results of our actions or manipulations.
 - Second, the feedback mechanism tells us that the system prefers laws which deliver more information, and more accurate information, about the result of its interactions with its environment. This regulatory mechanism tells us what sort of information the laws deliver, by showing us what the system which uses them is sensitive to and what, in ideal situations, it aligns with.
- Finally, the laws should be informative about subsystems of the universe; the IGUS makes predictions, applies the laws, and assesses them on the basis of limited information concerning parts of the cosmos, rather than the cosmos as a whole. I've argued elsewhere that this means when assessing laws, we should focus on their informational value in isolated subsystems rather than the world as whole.

I don't think these desiderata are exhaustive. But I do think that they provide a stringent set of constraints on laws; taken together, they provide a principled

¹⁸This doesn't show that the initial conditions will always be the relevant actions, nor does it show that laws will be all and only those things held fixed by the LAWS module. Rather, the idea is that the distinction is an extension of these two distinct cognitive roles.

basis for separating accidental (or nomically contingent) generalizations from nomically necessary generalizations. And they do so in way that connects to the usefulness of laws to agents without allowing any encroachment of the peculiarities of particular agents, species, or cultures.

It's worth noting here that this stripped-down idealization of agents, and connection between agenthood and the desiderata for laws, doesn't seem to generate as extensive a list of desiderata as some pragmatists might like. Not every proposed pragmatic desiderata on laws flows naturally from the nature of agents. For example, Dorst (2019) and Loew and Jaag (2020) have argued that the symmetries the laws exhibit make them particularly useful for making predictions; and Hicks (2018) and Dorst (2019) have argued that the laws need to be local in order for agents to discover and use them. But, as Friend (2022) notes, agents could themselves be nonlocal, or sensitive to nonlocal influences; and agents operate in a coarse-grained world that lacks many of the symmetries of fundamental physics. This makes me think that those are "derivative pragmatics": things that are useful because agents in the actual world are subject to its laws, and so are only able to interact with their environment in ways the laws permit. Derivative pragmatics contrast with constitutive pragmatics, those features or theoretical virtues that make the laws what they are. Figuring out which is which is what Friend calls a "Euthyphro-style question": is this feature useful because the laws have it, or do the laws have this feature because it is useful?¹⁹ Here I aim to answer this question in a principled way. I have argued here that constitutive pragmatics are determined by the necessary conditions for being a scientific agent; this gives me a principled way of distinguishing those desiderata which are constitutive of lawhood from those which are mere byproducts of it.

One might worry that by making this distinction we lose some of the appeal of the pragmatic view. The pragmatic view aimed to bring the Humean desiderata down from heaven, and thereby insure that the laws are useful for beings like us doing the sort of things we do. If many of the pragmatic features of laws are *derivative* rather than *constitutive*, it's not so clear that the laws will be useful to agents like us — agents with our specific brain size and ways of interacting with the world, locally bounded, finite and mortal. This is some risk, but it can be allayed.

If the laws allow for nonlocal interactions, or interactions which we cannot perceive with our capabilities and limitations, this would not render them inaccessible to us simply because we cannot directly perceive them. Just as we could enhance our computational abilities by creating machines to assist us, we can (and do!) create machines that capitalize on those legal ways of interacting which are not directly available to us — machines like neutrino detectors, gravity wave detectors, and particle accelerators²⁰. As I will discuss

¹⁹The discussion here and the terms "derivative" and "constitutive" pragmatics were suggested by an earlier presentation of this material by Friend, although the distinction between derivative and constitutive pragmatics does not appear in his paper.

²⁰See, for example, the fictional ansible of Ursula K. Le Guin's *The Dispossessed* — a very useful nonlocal device used by locally realized agents. For more discussion of this, see [redacted].

in the next section, in order to be out of our ken, the laws would have to involve ways of interacting which are completely decoupled with any interaction we have with the world.

That said, I am confident that other desiderata could be justified in terms of a similarly stripped-down account of scientific reasoning, one which would plausibly be universal to all agents worthy of the name. For example, the temporal directedness of the IGUS's processes likely require some sort of temporal or causal asymmetry, one which matches other epistemic and practical asymmetries which are deeply involved in agency²¹. As I am as yet unsure what specific form these constraints might take I leave exploration these and related desiderata to future work.

Finally, I take the above desiderata to be necessary conditions on lawhood. It's traditional amongst Humeans to, in line with the Best System Account, drum up sufficient conditions as well. The standard way of doing this is by claiming that to be a law of nature is to be a member of that deductive system which jointly maximizes the desiderata. Since some of them weigh against others, this will require us to perform a sort of high-wire balancing act. Lewis, Cohen and Callender (2009), Hildebrand (manuscript), and others have worried that this balancing act will reintroduce ratbag subjectivity into the concept of law. If pragmatic Humeans appeal to this balancing strategy, they will be vulnerable to the same sort of ratbaggy objection that beset Lewis (although, importantly, no *more* subject to it than non-pragmatic Humeans, despite their introduction of a wider array of agent-sensitive features.)

I think Humeans should resist the balancing act. Instead, I think, Humeans should be *ecumenical* about the laws: any generalization which meets the pragmatic desiderata has some degree of nomic necessity. An approach of this sort is advocated by Schrenk (2006), Schrenk (2017), Cohen and Callender (2009), Cohen and Callender (2010). These authors are ecumenical about the language in which the laws are couched, and focus less on the weighing of theoretical virtues (though see Cohen and Callender (2009) for an argument that these are related). I agree with Schrenk, Callender, and Cohen that ecumenicalism enables us to neatly explain the counterfactual robustness of special science generalizations. The laws and counterfactually robust generalizations of the special sciences, I hold, are counterfactually robust not because they are derivable from the laws of physics (though in some broad sense they may be so derivable); instead, they are counterfactually robust for the same reason the laws of physics are: because they meet the desiderata for lawhood, and are thereby well-suited to ground predictions and hypothetical reasoning concerning action and manipulation.

This ecumenicalism should be inclusive. Rather than seeing these different generalizations as featuring in distinct best systematizations, we should regard them as part of a single, unified inferential map which we use to navigate the world. We should embrace a bigger best system rather than a better best system. I discuss how this strategy can avoid the conflicts problem I alluded to in §1.2 in [other work].

²¹Thanks to an anonymous reviewer and [redacted] for insightful discussion of this point.

However, I also disagree with Schrenk, Callender, and Cohen regarding the sort of ecumenicism we should embrace. These authors book no restrictions on the language or predicates in which we can formulate the laws; on their views, there could as easily be both gruesome laws and greensome laws (though see Schrenk (forthcoming) for a discussion of this and other issues for the Better Best System). I think that that pragmatism allows us to be a bit more discerning concerning the predicates in which laws can be phrased. It is to that question that I will now turn.

4 Peircing Pragmatic Pluralism

So the whole coil and ball of truth, as it rolls up, is the product of a double influence. Truths emerge from facts; but they dip forward into facts again and add to them; which facts again create or reveal new truth (the word is indifferent) and so on indefinitely. The “facts” themselves meanwhile are not *true*. They simply *are*. Truth is the function of the beliefs that start and terminate among them.

(James; 1907, p.151)

Worries about the desiderata are not the only pragmatic strains in contemporary Humeanism. Just as pragmatic Humeans doubt Lewis’s overly simplistic, rigidified account of the desiderata, many pragmatic Humeans also doubt Lewis’s posit of natural properties, and their supposed connection to laws. Because this naïve realism about property structure was intended by Lewis to combat linguistic relativism about which theories are simplest—and so about which generalizations are laws—rejecting this posit risks an analogous slide into subjectivism or linguistic or cultural relativism. Just as one might worry that we can change the laws by changing our standards, a philosopher who rejects Lewis’s primitive property structure might worry that we can change the laws by changing our language (see (Belot; 2022, p. 15) for further discussion of this point). Here I will argue that we can avoid the worry concerning language using similar tools to those we used to dodge subjectivism or relativism regarding the nomic desiderata.

My strategy in this section is as follows. In §4.1, I will outline the property problem and discuss extant Humean responses to it. Then, in §4.2, I will argue that while it is not impossible for there to be two theories with different conceptual schemes which both satisfy the lawmaking desiderata of §3, it is very unlikely and not guaranteed by the simple definitional symmetry between ‘green’ and ‘grue’. Then, in §4.3, I will argue that worlds with both greensome and gruesome laws violate the Principle of Uniformity of Nature.

4.1 Naïve Realism and Relativism About Properties

Worries about the ideology of natural properties go back to its inception, when van Fraassen worried that scientists might in fact come up with laws that don’t

refer to only natural properties (van Fraassen; 1989, p. 53)²². Van Fraassen saw Lewis's posited 'special properties' as undetectable and unacceptable to empiricists. Van Fraassen worried that natural properties were disconnected from scientific practice and epistemically inaccessible.

Humeans sympathetic to van Fraassen's worry have developed two responses: the Better Best System Account (of Schrenk (2006), Cohen and Callender (2010), Cohen and Callender (2009), Schrenk (2017)) and the Package Deal Account (of Loewer (2007) and Loewer (forthcoming)) which inherits some of the features of Earman and Roberts (2005). The former view is a pragmatic pluralist view: Schrenk, Cohen, and Callender argue that there are a plethora of best systems, one attached to each way of carving up the world into properties. Rather than seeing this as a downside, they take this to be a boon.

Loewer's view is not so cosmopolitan. Rather, he argues that, when evaluating best systems, each system is allowed to choose its own language. Whether a particular system is best depends not just on how simple and strong it is (or how well it maximizes other, more pragmatic virtues) but also how well its language connects to our ordinary language and practical demands. We start with our macroscopic, human categorization schemes, and then find a set of fundamental laws and language from which we can describe our ordinary macroscopic world.

Lewis introduced natural properties to avoid a troubling collapse for his view. He worried that, without some restriction on the predicates that could feature in the Humean best system, the requirement that the system be simple would be trivial. If any predicate were acceptable, then we could introduce a predicate, F , which applies to all and only actual objects. Then $\forall xFx$ would be a maximally simple and informative system.

Pragmatic Humeans do not have Lewis's problem. For their desiderata already rule out $\forall xFx$ without introducing a restriction on predicates. For example, Jaag and Loewer (2018) argue that, because embedded agents don't have exact knowledge of their environments, the laws need to be *error-tolerant*: they should provide nearly correct predictions based on nearly, but not perfectly, correct information about the environment. And Hicks (2017a) measures the informativeness of law systems in terms of the information they provide about subsystems rather than the universe as a whole. Both of these desiderata can be motivated by the IGUS, and $\forall xFx$ fails to meet either of these desiderata: if we are slightly wrong about the state of our environment, the F theory has nothing to say, as it is only informative about the exact actual state of the world. And it does not apply to subsystems in the way Hicks requires, since $\forall xFx$ is true only of the universe as a whole, and not of mere subsystems of the universe²³.

Nonetheless, pragmatic views about property structure are not without challenges. Dispensing with Lewis's natural properties seems to lead to the same sort of relativism we sought to avoid in §1.2. Even if pragmatic views

²²In fact they have, as Hicks and Schaffer (2017) argues.

²³Hicks (2017a) defines informativeness about subsystems in terms of whether the law would be true if the subsystem were the entire universe; $\forall xFx$ is not true of subsystems in this way.

don't trivialize the laws in the way that Lewis suggested, they may nonetheless have virtues or desiderata that are language dependent. For example, all of these views have some simplicity requirement; and some of them (see e.g. Loewer (forthcoming)) hold that the laws need to be informative for agents like us, in our macroscopic language. Given this, we might worry that agents starting with different languages might consider different generalizations to be laws, and so offer conflicting moral, epistemic, and practical evaluations.

A pragmatist who embraces this sort of relativity is Shamik Dasgupta Dasgupta (2018). Dasgupta argues that Lewis's naturalness assumption cannot do the work it needs to. He claims that metaphysical posits cannot explain why we should prefer one theory to another, if the theories are necessarily equivalent.

For example, suppose one theory says that all emeralds are green and all sapphires are blue, and another says that all emeralds are grue²⁴ and all sapphires are bleen. These theories are equivalent and interdefinable. But the first theory is more natural than the second: its properties are metaphysically elite. But why should this matter? Even granting that the properties in the former theory are metaphysically special, Dasgupta asks, what reason do we have to care, given our primary interest in truth?

I take the view Dasgupta arrives at to be a form of pragmatic pluralism, along the lines of Callendar, Cohen, and Schrenk. But Dasgupta provides a challenge for any Humean view, including both Loewer and Lewis. For Dasgupta, a group that theorizes using gruesome language is no worse epistemically than a group that theorizes using our ordinary language. Like Goodman (1955), Dasgupta seems to think that the distinction is merely conventional. Since Loewer and Lewis hold that we should arrive at only one set of properties (for either pragmatic or metaphysical reasons), Dasgupta's argument presents a challenge for their views.

I do not want to accept Dasgupta's conclusion. It seems to me that the same motivations that mitigate against culturally variable desiderata for laws (in §1.2 and §2.1) inveigh against cultural variability as a result of gruesome property choice. Both result in relativism about epistemic and practical normativity; both result in there being no fact, independent of one's free choice of language, about what one can and ought to do. It seems to me to be bizarre to think that what one ought to do or ought to believe depends on a freely chosen language, or may vary depending only on the basic macroscopic predicates one chooses; furthermore, the fact that scientific collaboration between people with wildly different cultural and linguistic backgrounds works so well suggests that these differences do not underlie differing standards, theories, or laws.

Sider (forthcoming) has responded to Dasgupta by arguing that, whatever epistemology of science we come up with, that epistemology will be focused

²⁴If you are reading this paper and have managed to avoid all mention of grue in your philosophical life, I envy you, but your innocence is now over. An object is grue iff_{def} it is green and first examined before 2050 or blue and first examined after 2050. "Bleen", "emerire", and "sapphirald" have similar definitions in terms of "blue", "green", "emerald", and "sapphire". There are other ways of defining grue; for an overview see Hesse (1969). These differences don't matter for my argument in the main text.

on the search for laws. But laws, on Sider's view, are regularities of natural properties. Sider's case for realism rests on the connection between laws and properties which pragmatic Humeans reject. So this response is not available to pragmatic Humeans.

4.2 Pragmatic Realism About Properties

Here, I will suggest a response to Dasgupta that does not rely on privileged metaphysical structure. My goal is to show that a unified realism about the conceptual structure of laws is tenable even if there are no metaphysically preferred properties. That is, I will develop a view on which the difference between "green" and "grue" is not conventional but also not determined by metaphysically preferred structure. This view echoes Psillos (2014)'s rejection of "similarity enforcers": just as the Humean thinks there are regularities without metaphysically robust laws enforcing them, the Humean should hold that there is similarity without metaphysically robust natural properties enforcing it.

This view takes a page from classical American pragmatism. Charles Sanders Peirce famously held that the truth is what all investigators would agree to at the hypothetical end of inquiry (Peirce (1878)). As a view of truth, I think that Peirce was deeply mistaken. But I think that his account recognizes deep connections between conceptual structure, global regularities, and our interactions with our environment. On my view, the concepts that we should use in our theories depends a great deal on which concepts pick out regularities in the long term – including not just the past but also the future.²⁵

On a Peircean view of conceptual structure, the correct concepts are those which would feature in the theory at the end of inquiry. On this view, then, what makes "green" a privileged property and "grue" not privileged is just the fact that, in 2050, emerald miners will group newly observed emeralds with emeralds observed before 2050, rather than with sapphires observed before 2050. In fact, any physical sorting system (including, but not limited to the sorts of physical systems we are) will react to green things uniformly, but not grue things.

To make this response work, we must build on the sort of global uniformity which is assumed, but not argued for, by all forms of Humeanism. Like Hume, we must accept that scientific investigation rests on an unargued for presupposition that nature is globally uniform. Humeans typically hold that which generalizations are the laws depends not just on what patterns exist in the past and present, but also what patterns exist in the future. I am here claiming that, similarly, which predicates are gruesome depends on what will happen in the future.

Before spelling this view out in more detail, I think I should say what it is not. First, it is not an attempt to solve Goodman's problem. For Goodman's

²⁵It's also worth noting that while Peirce is comfortable building his view on unanalysed counterfactuals — about what investigators would agree to — I aim to build my view on global or holistic features of the world, which I think underlie claims about what investigators would agree to.

problem, like the problem of induction, requires us to provide noncircular reasons for expecting future emeralds to be green rather than grue. At best, this approach only provides circular reasons. The reason that it is better to theorize using “green” is that future emeralds will be green. But Humeans should not expect there to be a metaphysical solution to Goodman’s problem any more than there was a metaphysical solution to Hume’s. The idea that our current concepts apply uniformly to the future is just the same sort of unprovable assumption as the principle of uniformity of nature.

Now to the view. To motivate a pragmatic view of natural properties, consider what could make green an objectively better predicate for theorizing even if there is no metaphysical difference between being green and being grue. One plausible thought is that a theory formulated in terms of “green” will better meet the desiderata which determines lawhood: it will allow the world to be more neatly divided up into initial conditions and predictive principles, and it will have more instances in quasi-isolated subsystems across both the past and the future. These reasons for preferring a green-theory rather than a grue-theory don’t directly involve agents, but do depend on what sort of things happen in the future. If future emeralds are green (rather than grue) then a green-theory will provide a more unified description of the world as a whole, and better meet the inductive and predictive desiderata on theories, than a grue-theory.

These are theory-based reasons for preferring “green” to “grue”, and they depend not just on the way the world has gone so far, but on the way it will go. These theoretical virtues don’t directly involve agents, but they are geared towards building a theory useful to agents. In that way, they are only indirectly agent-involving and obey the letter of the law of objectivity.

On this view, what makes “green” better for theorizing than “grue” is just that greenness can be detected by a single detector, whereas a grue-detector would need to build in both a green detector and a clock, and combine their inputs. Note that this argument doesn’t rely on the sorting mechanism being an agent, or on the specific capabilities of agents. Rather, it has to do with what regularities exist, and what correlations there are between physical systems. There are (and will be) correlations between greenness and a wide variety of other, non-green-involving properties. Not so for grue. It is in virtue of this fact about regularities that agents (and the mechanisms they create) can detect and respond to green and cannot detect and respond to grue²⁶.

I am not claiming that it is impossible, physically or metaphysically, for there to be both green and grue-detectors. Rather, I am claiming that, as a matter of actual fact, every successful grue-detector (past and future) operates by combining two mechanisms, one of which detects greenness and the other of which determines the time. I take this to be a contingent fact which is made true not by the metaphysical nature of properties but instead by the correlations that actually exist in our world—past, present, and future.

Of course, one might worry that just as we can introduce a new kind term –

²⁶Things are complicated by the fact that “green” and “grue” are Lockean secondary qualities. Here as is typical in this discussion I ignore this complication.

“emerire” – to construct non-disjunctive generalizations using “grue”, we could *describe* a combined green-sensor and clock in a non-disjunctive way. The fact that we see the mechanism which detects green as distinct from the mechanism that detects the time is itself theory-dependent. So, why can’t we come up with a gruesome theory which describes the combination of a clock and a camera as a single object?

The problem here is that there are just too many ways to combine a clock and a camera for such a theory to be only a minor deviation from our actual language and theory. Time can be measured by springs and crystals, planets and atoms, lasers and tuning forks. Color can be sensed by chemical reactions in eyes and cameras, but also by the energy levels of bound electrons or via the diffraction patterns of crystals. Even fundamental interactions are sensitive to the wavelength of light. It is hard to imagine a theory that classifies every possible combination of these two distinct mechanisms as one thing, and still yields generalizations that meet the sort of desiderata described in §2, which require the theory to be widely applicable (so it can be learned through observation), permit a classification the world into comprehensible subsystems, and enable us to separate boundary conditions from dynamic principles.

This sort of response to Goodman is spelled out in detail by Hesse (1969), who points out that “it has often been claimed that such a wholesale difference in Grue’s theory as is required to preserve symmetry [in terms of theoretical virtues between the green and grue theory] can always be constructed by *ad hoc* and artificial introduction of more grue-like predicates into Green’s theory. This however is mistaken.” Hesse argues that from the perspective of a Grue-theory, it will be impossible to recover the entirety of a Green theory (with its connections to physical quantities like light and various sort of wavelength detectors) “without substantial modification of other aspects of Green’s theory” (Hesse; 1969, p. 21). Hesse argues that, given the way the green theory connects to a simple, explanatorily powerful, unified physical theory it will be difficult for a gruesome theory to compete in terms of theoretic virtues — at least without substantive differences to the green theory. This sort of consideration is also discussed in great detail in Shoemaker (1975). Although Shoemaker advocates a dispositionalist theory of laws, he argues compellingly that the differences between grue-investigators and green-investigators could not be merely linguistic, subjective, or conventional.

4.3 The Unity of Nature

It is hard to believe that there is any such true gruesome theory which meets the necessary conditions for lawhood I’ve described here. But it is not conceptually impossible, so far as I can see. If there was, the world would be conspiratorial. There would be mechanisms for keeping track of time which, up until 2050, were indistinguishable from mechanisms for detecting only color. Two simple descriptions of the world would be running in parallel. From our perspective, the regularities of the world would have a hidden bifurcated structure, one undetectable until 2050. From the perspective of the grue-theory, our visual

perception system would somehow also be keeping track of time, and (by the hypothesis that their theory meets our desiderata) they would be right. Unbeknownst to us, there would be two quite distinct ways of describing everything from electrons to brains, both of which were supported by correlations between subsystems of the universe.

We cannot prove that the world is not conspiratorial any more than we can prove that the past will resemble the future. But, I think, both assumptions are necessary for us to engage with the world scientifically. So we can hold on to our unified view of the world, and we can rule out gruesome vocabulary without invoking a natural property distinction.

I think that the Principle of the Uniformity of Nature (PUN) allows us to rule out such disunified worlds. The world here described presents a world in which there are two wholly distinct and uncorrelated sets of regularities. Such disconnected sets of regularities would mean that, in a very real sense, regularities we observe in one area would be totally uncorrelated with a broad swath of the universe. This is exactly the sort of hostility to induction that the Principle of Uniformity of Nature is meant to rule out. Uniformity requires unity: a disunified world is one in which ampliative inference cannot function. Since the PUN is that assumption about the world which underlies the success of induction, disunified worlds violate PUN.

Are these worlds possible? I think that they may even be too disunified to count as a single world. For imagine a world with both green-detectors and grue-detectors, which differ holistically in the way I've just described. Recall that grue-speakers will need to reclassify not just emeralds, but also the internal states we use to record and represent the green world. Because of this reclassification, we would not see the way they respond to their environment, and they would not see us as responding to our environment. This sort of environmental feedback is what makes a system an IGUS. So if we were green-agents in such a world, we would be unable to recognize the grue-speakers as agents, and they will be unable to recognize us as agents. If our conceptual schemes were sufficiently different, our causal maps of the world would also differ greatly from one another. And if our causal maps of the world are sufficiently different, we won't recognize one another as functionally realized agents — beings which take in information from their environment, store it as physically realized representations, and then use those representations to make decisions and output further behavior.

Since, long before 2050, grue-speakers would have a holistically different theory—one which not only classifies emeralds differently, but also classifies green-detectors and clocks differently, and classifies those internal brain states which represent color and clocks differently—they would not see the causal relations between us and our environment which would allow them to classify us as agents. They would not see our internal states as representations of the environment or correlated with it. They would not see us as agents. And by the symmetry of the supposition, we would not see them either. We would be ghosts or shadows to one another, passing through each other but blind to the fact that we share the same world.

This point may be hard to believe. Wouldn't the grue-speakers just be strange objects — objects with unusual correlations with the environment, or objects which just start acting differently in 2050? The answer to this, I think, is decidedly not. For if the grue-speakers did have some way of detecting grue, then *if* they only differed minorly from us, then we would be able to detect grue as well. Whatever interaction mechanism or representing states they used could be built into a grue detector. In the worst case, we could build a grue-detector which incorporated one of these agents. If we could do that, on my view, grue would not be gruesome after all—if there were measuring devices which could directly detect it, it would not be problematic to include it in our theory.

This line of thought leads to the following argument. Consider hypothetical beings with a different set of classifications than us.

P1 Either (a) we can causally interact with them, or (b) we cannot.

P2 If (a), then we can communicate with them and thereby incorporate their classification system into our own.

P3 If (b) then the world is disunified and not friendly to induction.

C If the world is friendly to induction, there is a single classification system which meets the lawmaking desiderata.

Can we be certain that the world is friendly to induction, and so rule out these problematic worlds? No Humean worth his back-gammon set²⁷ would say that. We must all make our peace with this uncertainty in different ways, and I think that contemporary Humeans have different responses to the fact that induction doesn't come with any metaphysical guarantee of success. Nonetheless, we must find a way to leave these skeptical worries aside; when we do so, it seems to me, we must also leave behind worries that the world may also be gruesome.

5 Conclusion

Humeanism holds that laws of nature are universal generalizations, not metaphysically different from other universal generalizations. But Humeans don't think that these generalizations are no different at all from other generalizations: they have important features that make them much more useful to us. They are more suited to be discovered, understood, and utilized by agents like us.

Getting clear on what features generalizations need to have to be laws requires us to figure out what exactly agents like us use laws for, and exactly which agents are like us. In this paper, I've argued that we should have the broadest possible understanding of agents. Doing so allows us to provide desiderata for lawhood which, I hold, both situates the necessity of laws in their utility to us

²⁷See the *Treatise*, Book 1, Section VII, part iv.

and is fully objective, such that any agent with anything like a concept of laws of nature would agree, in the long run, on what the laws are.

I would like to close by contrasting my view with a sort of conventionalism I see lurking in the writing of Goodman and Dasgupta (2018). Goodman thinks that the right predicates are those which are embedded in our (or our culture's) theorizing and categorizing practices. Dasgupta similarly thinks that we have no advantage over grue speakers. I am not advocating a conventionalist view. I am arguing for a view on which there is a strict, objective fact about which things are similar to which other things, and which truths are laws. Like Goodman and Dasgupta, I reject a metaphysical account of what makes concepts correct for theorizing. But I do think the world has the resources to make some theory, and its associated set of concepts, objectively laws.

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