Sacrificing Strength in the Best Systems Account

by Toby Friend

forthcoming in *Analysis*

Many Humeans are persuaded by an argument (separately) from Roberts, Lange and Woodward that strength ought not to be sacrificed in the competition for best system because scientific practice does not exhibit such a sacrifice. I here show that Humeans should not be so persuaded. The argument from Roberts, Lange and Woodward misses the fact that scientists can only systematise their experience, whereas the best system must systematise the entire world. However, while my demonstration shows that the argument against sacrificing strength should not have been persuasive in the way it has been, it does raise new and difficult questions for the Humean.

Keywords: Best Systems Analysis, Strength, Scientific Practice, Idlers, Experience.

1 The Argument against Strength

> *It can scarcely be denied that the supreme goal of all theory is to make the irreducible basic elements as simple and as few as possible without having to surrender the adequate representation of a single datum of experience*. (Einstein 1918 [2002])

Woodward (2014) has interpreted this quotation from Einstein as indicative of the general tendency in physics to avoid trading in the strength of a theory, even if that would allow for enormous increases in simplicity. This, Woodward argues, is problematic for the defender of the canonical Best System Account of laws of nature (CBSA), according to which laws are theorems in that deductive system or systems that best balance an ability to predict the world's events—the system's *strength*—with the system's simplicity (Braddon-Mitchell 2001, Cohen and Callender 2009, Friend 2022, Lewis 1973, 1994, Loewer 1996, 2012, Mill 1882, Ramsey 1931, Schrenk 2014).[1] If the CBSA were correct, Woodward reasons, one would expect to find scientists preferring theories that sacrificed predictive success for the sake of simplicity. However, 'at least in many contexts, good scientific methodology does not endorse arguments like this' (ibid. 102).

Roberts (2008) made almost precisely the same point some years earlier. 'We *have no practice* of weighing the competing virtues of simplicity and information content for the purpose of choosing one deductive system over others, where all are presumed to be true' (10); 'scientists just don't ever need to make the kinds of trade-offs that it must be possible to make if the best-system account of laws is correct' (9). A similar complaint also comes from Lange (2009). Science, he remarks, 'appears to presume that the laws are complete' (ibid., 178), i.e., that they are part of a theory that has a maximum of strength. Scientists,

[1] Lewis (1986 [1980]), in fact, added a further desideratum of 'fit' in order to accommodate indeterministic laws. But this should not complicate the current discussion.

especially physicists, seem to be in the practice of trying to bring new phenomena under the jurisdiction of existent laws, and if they can't, they busy themselves trying to think up new laws. More abstractly, Lange supposes that incomplete laws would give rise to a world that runs like buggy software. There would be circumstances which the laws give no rules for how to continue. '[T]he natural laws, as nature's rules, are not supposed to be flawed in this way' (ibid., 179).

Like Woodward, Roberts and Lange take the tendency in science to prefer theories that leave nothing unexplained to be problematic for the idea that the laws might be theorems of a deductive systematisation of the world that sacrifices strength. In a rough and ready slogan: *scientists don't sacrifice strength, so neither do the laws*.

Dorst (2023, 20) raises a 'flat-footed response' to this objection, that the very fact scientists are willing to posit chancy laws shows that they are willing to sacrifice strength. A system that specified for each instant whether some plutonium will radioactively decay would be stronger (rule out more worlds than) a system that only says the radioactive decay over some interval has a certain probability. Nevertheless, physicists have been inclined to opt for laws of the latter sort. But Dorst also admits that such an observation is not sufficient to assuage the concern. The insufficiency is made clear by physicists' efforts to bring all observed phenomena under the jurisdiction of some law or other *even if that law must be indeterministic to do so*. It isn't seen as tolerable by physicists to leave some known phenomena outside the rule of law—something we see played out, e.g., in the extensive efforts to bring dark matter under theoretical comprehension.[2]

In fact, the apparent clash between scientific practice and the CBSA has been widely

[2]Dorst offers a different example: physicists' disinclination to prefer simpler, though less accurate, values for constants. I think many physicists probably don't have this disinclination. Anyway, this would technically involve a trade-off in truth, not strength.

appreciated by those otherwise sympathetic to best-systems type thinking. Here is a sample of indicative quotations.

> The BSA's virtues of simplicity and strength seem incommensurable, and as Woodward ([2013a]) points out, we cannot look to scientific practice for help, as scientists seem never willing to trade in their strength for a gain in simplicity. (Hicks 2018, 1003)
>
> Woodward (2014) [...] argue[s] that Lewis's explication of the nomic formula will deem certain statements to be laws that intuitively are not. I agree with these objections. (Dorst 2019, 881)
>
> As Lange's (2009) and Woodward's (2014) criticisms indicate, Lewis's BSA may fail to correctly delineate the laws from the non-laws. (Jaag and Loew 2020, 2531)
>
> As shown by [...] Roberts (2008) and Woodward (2014), physicists do not value strength and simplicity as Lewis understands these notions, nor do they trade off strength and simplicity in the manner envisioned by Lewis. (Blanchard 2023, 2)

In response, all the quoted best-systems sympathisers argue that we should dispense with the idea that the best system is chosen by balancing strength against other desiderata. As Loew and Jaag put it, 'proponents of the BSA [...] may simply tweak Lewis's criteria for lawhood to ensure it gets the distinction right'. This 'tweaking' results in what Friend (2022) calls 'revisionary' best systems accounts (RBSAs) that introduce alternative desiderata to be traded off against simplicity instead of strength. RBSAs are, therefore, to be contrasted with the CBSA, which *does* admit trade-offs with strength. So, for

example, Dorst (2019) suggests that systems' symmetry, locality and Markovian dynamics be considered alongside their simplicity in order to find the best balance, and Jaag and Loew (2020) suggest the best system be found according to a trade-off which takes into account the error-tolerance of candidate systems and their ability to facilitate predictions with partial models.

Such tweaks are, it is claimed, perfectly permissible for the Humean best systems fan, since theirs is a metaphysics which eschews entirely objective, mind-independent standards for what grounds laws of nature. Laws of nature are the result of *pragmatic* desiderata we have, especially in the sciences, for finding out about the world. So, if it turns out that strength is not in fact sacrificed by scientists, this only tells us that Lewis got the relevant desideratum wrong, not that the best systems approach is altogether flawed (see especially Hall 2015, for putting the point this way). More to the point, by substituting some or other alternative desideratum for strength, Humeans hope that the best systems approach can be set back on the rails after Roberts', Lange's and Woodward's objections.

My aim in what follows is to show that revision of the CBSA is entirely the wrong response, at least in so far as it is motivated by the objection from Roberts, Lange and Woodward.[3] The objection is no good to begin with because the fact scientists don't sacrifice strength is no reason to suppose the laws don't. In fact, I will show that, even if the laws are theorems of a system that does not maximise strength, scientists *must* avoid sacrificing strength if they are to have a hope of uncovering them. The reason has to do with the fact that, in Einstein's terms, theories put forward by scientists are a consequence of their systematisation of *experience*, whereas for the BSA proponent, the laws of nature must be a consequence a systematisation of the whole world, independently of experience.

[3]There may be other objections that motivate revision, though see Friend (2022).

My plan is as follows. §2 introduces the concept of an 'idler' and argues that, if there are such things, then even if the best system does not maximise strength, scientists must not sacrifice strength in their own theory-building if they want to discover all the laws. §3 discusses whether or not idlers are a live possibility and argues that they are. §4 concludes that the specific issue raised by Roberts, Lange and Woodward should not have had the kind of influence it has had on Humean best systems literature. However, I will point out that the reason why this is so raises new and difficult questions for the best systems fans to answer.

2 Idle strength

One way in which the best deductive systematisation of the world would not maximise predictive strength is if there exist what Lewis called 'idlers'. These are, 'fundamental properties [...] that are instantiated within the actual world, but play no active role in the workings of nature' (Lewis 2001, 205). Idlers are not involved in causal explanations nor, as we will see, could they be, given the laws, since there are no laws about them. Lewis thought idlers were not unlikely.

> Surely the laws of nature might have been different in such a way that some of the fundamental properties which actually play an active part in the workings of nature would have been idlers instead. So idlers are possible. At this point, I can say that if there are no idlers in our world, then our world has a special distinction that some other worlds lack. Why should the one world among many that we happen to live in be special in this way? Very likely it isn't. (Lewis 2001, ibid, 213)

Of course, the point only holds given an appropriate view of laws of nature. Someone who believes that the laws are grounded in the essentially dispositional nature of all properties will think that there could *not* be properties that play no active role, or at least do not have clear conditions under which they would play such a role. For these theorists (e.g., Bird 2007, Chakravartty 2003, Swoyer 1982), having the particular causal role it has is constitutive of being a property, so there could be no properties that did not have a well-defined active or potentially active causal role. Furthermore, since the laws are just descriptions of these causal roles, there can be no properties that do not have laws about them either. There can be no idlers.

But Lewis was not a dispositional essentialist, and believed instead in Humean Supervenience, the view that everything supervenes on a 'mosaic' of local matters of fact (see especially Lewis 1986). The (actual or potential) causal role of properties must therefore come somehow from this mosaic. For Lewis, as for many Humeans and in contrast with dispositional essentialists, this is achieved by first establishing the laws as theorems (that are generalisations) in the deductively closed systematisation of the world's history that best balances strength and simplicity. Properties' causal roles are then derived from how they feature in those laws.[4] It can be easily shown that the compromise on strength in settling which deductive system is best leads directly to the possibility of idlers. We have already seen that strength can be compromised by allowing properties to fall under the jurisdiction of chancy laws (see fn.3), but it can also be compromised by allowing that certain properties don't fall under any law at all. A system S might improve enormously over others in simplicity by not including any theorems that make reference to some property that other systems' theorems do. If the gains in simplicity are enough, the resulting

[4]Not all Humeans need be like this. Ducasse (1926) was a causal singularist, and could have consistently made sense of properties that were causally active but not covered by law. It should suffice to say that few Humeans defend such a view today.

loss of strength may be justified and S will be deemed the best system. Its theorems will be the laws that determine which properties have causal roles and which do not.

This feature of CBSA has been noticed (though not in so many words) by fans and critics of Humean supervenience alike. Earman (1978) observed that both in physics and philosophy, 'there is a notable lack of non-question begging justifications for universality requirements' (179), or in Lewis's terminology, a notable lack of non-question begging justifications for why there should be no idlers. For that reason, Earman praises the CBSA, since it 'explains why, in a certain sense, laws tend to be universal,' while also allowing that there is no *a priori guarantee* of universality (ibid., 180; see also Cartwright and Merlussi 2019).

Lange likewise noted that 'although a complete [i.e., idler-free] system would be mighty informative, it need not be simple,' whereas 'an incomplete system would be less informative but could be so much simpler as to make it better than any complete system' (Lange 2009, 181). In such a case, a canonical competition for best system would deem there to be gaps where the laws do not reach. And as we have seen, where there are gaps there are idlers.

In contrast with Lewis and Earman, however, it is this lack of guarantee for universality ('completeness' in Lange's terms or the existence of 'idlers' in Lewis's) that is seen by Roberts, Lange and Woodward to be a failing of the CBSA: science does not sacrifice strength, so neither do the laws. But something none of these critics seem to have taken note of is the fact that idlers *could not* be part of science. Idlers do not appear in the best deductive system. Hence there are no laws about them. And for the Humean best systems fan, this means that idlers cannot enter into causal relationships (at least, not without changing the laws). But causal relationships are essential to detection, since

properties that don't have any causal influence on any nomically possible experimental apparatus will supply us with no reason to believe in their existence. Idlers make no causal contact with any other properties, so they are undetectable, given the laws, and could not come to be known about by any scientific procedure. So, for the Humean best systems fan, it is decidedly *impossible*, given the laws, for scientists to take idlers into account when developing their own proposals for the laws of nature.

This point about our necessary ignorance of idlers is crucial to understanding the difference between what scientists must do in order to discover the laws and what the world must do to determine them. As we've seen, under the framework of a Humean best systems approach, the world could have idlers if the competition for best system—the competition that determines the laws of nature—has strength as a commodity to trade in for gains in other perceived merits. But if scientists are to have a hope of the systems *they* develop mapping onto the best system, which they must if they want to discover what the laws are, they must *not* sacrifice strength. For if they did, they would be not only ignoring the world's idlers, which they cannot detect, but additional properties which they can, because they would be choosing to ignore data that has reached them via causal influences that would otherwise direct them to laws. Sacrificing strength within scientific practice is, therefore, anathema to the discovery of the best system, even if that best system is best because it does itself sacrifice strength.

In sum, the slogan that scientists don't sacrifice strength so neither do the laws, is false. If scientists don't sacrifice strength, that need not entail that the laws do not. Indeed, even if the laws do sacrifice strength, scientists must not if they want to discover all of those laws. The intuition driving Woodward, Roberts and Lange's objections is, therefore, misguided.

3 In praise of idlers

This doesn't yet mean that Humeans are in the clear. The foregoing response to Roberts, Lange and Woodward is motivated under the assumption that idlers are a live possibility. If Humeans think there can be such things, then scientists *must* maximise strength in their systematising of experience. The response requires that we allow scientific practice and the grounds for the metaphysics of laws to come apart. By contrast, if there were no possibility of idlers (even in 'unkind worlds') then Lewis would indeed have been wrong to include strength in his canonical formulation of the best systems competition, and it might anyway turn out that revision of the CBSA is justified. Except for Lewis's brief remarks, I have yet to consider an argument that idlers are possible. But do Humeans have any reason to think otherwise?

One reason is that the harmony between the desiderata employed in scientific practice to find the laws and whatever else is involved in settling the best system is supposed to be a central aspect of what motivates the best systems approach. Lewis himself certainly gave this impression (Lewis 1994). And more recently, Callender has captured what many contemporary Humeans think in light of criticisms of the Lewisian canon.

> We should understand the best system as that theory that optimizes whatever metric science actually employs when judging theoretical goodness and not get too bogged down in Lewis's gesture at this metric [...] When we look at physics, we see this metric hard at work. Quark models were proposed in the early 1970s. Many were empirically adequate. Some were ruled out for not constraining the data enough and others for constraining it too tightly. A delicate balance was sought. We see this balancing act, which is especially

> clear in curve-fitting, operate throughout science. It is behind the criticism that the Ptolemaic model was too complex and today in the complaint that super-string theory is too unconstrained. Science uses a kind of rough implicit standard in picking theories and the generalizations central to these theories. (Callender 2023, 17)

The message seems to be that Humean best systems fans gain support for their idea that the laws are settled by a balancing of desiderata by showing that the very practice of science also involves such a balancing. Hence, if the latter does not sacrifice strength, the best systems fan is under pressure to think the former does not either. And as we have seen, if the best system does not sacrifice strength, then there can be no idlers.

But Humeans should be wary of pushing this parallel between practice and the competition for best system too far. For surely it is not up to scientists, or indeed anybody, to determine what we can and cannot be in causal contact with. Nothing we could do to change what we value in scientific discovery or elsewhere could make it the case that idlers cease to be idle. If there are undetectable parts of the world, that's not on us, it's just the way the world is. For suppose otherwise. Then there should be some behavioural or cognitive change that scientists could engage in that would bring it about that undetectable properties became detectable. Such a possibility is a fantasy.

The Humean should, therefore, be committed to *two* metrics, both of which aim to arrive at the same laws. There is the one used explicitly by scientists to discover the world, which should decidedly *not* sacrifice strength, on pain of potentially ignoring probative data. But there is another metric used, in some sense 'by the world itself', to determine the laws, and which may indeed sacrifice strength. The existence of these two metrics

with the same target may appear odd (see below), but it is not incoherent. And it is better than the alternative, which is to tie the metric for determining the best system so tightly to scientific practice that it ascribes scientists the power to causally interact with whatever they want to.

4 Conclusion

The initial objection from Roberts, Lange and Woodward, should not, in and of itself, undermine the idea that strength is traded-off in the best system competition.[5] Einstein may be right that physicists should not 'surrender the adequate representation of a single datum of experience', while it nevertheless remaining the case that the best system is one which surrenders aspects of the world from dutiful causal work and into idleness.

As we've seen, the foregoing conclusion implies that scientific practice and the competition for best system cannot be so tightly entwined as most Humeans typically think. In closing I'll point to why this raises new worries for the Humean. First, and most obviously, best systems approaches are widely motivated through the close affinity between the metaphysics of laws and scientific practice. If the connection is loosened, so must be this motivation.

Second, if it is not the explicit practice of science that determines the best system, Humeans will have to find its source in something else. Recent emphasis on the importance of pragmatics in deciding the best system may suggest that, wherever the determination comes from, it must still come from *us* somehow (see especially the entries in Loew et al.

[5]Crucially, I don't take the preceding arguments to show that strength *is* a desideratum, only that it has not been shown not to be via attention to scientific practice.

2023). Perhaps, then, what settles the best system comes from more implicit aspects of our behaviour, or features of our evolutionary history. Alternatively, maybe it will be necessary to back off from the emphasis on agents altogether and return to Lewis's original idea that the metric for best system should be, at least to some degree, objective and mind-independent. Currently, it is at least not obvious whether either option can be sufficient to do the job.

Third, if scientists are to have a hope of discovering the actual laws of nature, it had better be the case that their strength-maximising metric, trained on experience, is able to return the same theorems as the potentially strength-sacrificing metric trained on the entire mosaic of the world. A plausible account must therefore be given about how the one constrains the other. But I, for one, cannot see what this might look like.

References

Bird, A.: 2007, *Nature's Metaphysics: Laws and Properties*, Oxford Clarendon Press.

Blanchard, T.: 2023, Best-System Laws, Explanation, and Unification, *in* C. Loew, S. Jaag and M. T. Hicks (eds), *Humean Laws for Human Agents*, Oxford University Press, chapter 10, pp. 215–236.

Braddon-Mitchell, D.: 2001, Lossy Laws, *Noûs* **35**(2), 260–277.

Callender, C.: 2023, Humean Laws of Nature: The End of the Good Old Days, *in* C. Loew, S. Jaag and M. T. Hicks (eds), *Humean Laws for Human Agents*, Oxford University Press, chapter 1, pp. 16–41.

Cartwright, N. and Merlussi, P.: 2019, Are Laws of Nature Consistent with Contingency?, *Nature, the Artful Modeler*, Open Court Publishing, chapter 6, pp. 111–140.

Chakravartty, A.: 2003, The Dispositional Essentialist View of Properties and Laws, *International Journal of Philosophical Studies* **11**(4), 393–413.

Cohen, J. and Callender, C.: 2009, A better best systems account of lawhood, *Philosophical Studies* **145**, 1–34.

Dorst, C.: 2019, Towards a Best Predictive System Account of Laws of Nature, *British Journal of Philosophy of Science* **70**, 877–900.

Dorst, C.: 2023, There is no measurement problem for Humeans, *Noûs* **57**(2), 263–289.

Ducasse, C.: 1926, On the Nature and the Observability of the Causal Relation, *Journal of Philosophy* **23**(3), 57–68.

Earman, J.: 1978, The Universality of Laws, *Philosophy of Science* **45**(2), 173–181.

Einstein, A.: 1918 [2002], Principles of Research: address for Max Planck, *The Collected papers of Albert Einstein*, Vol. 7, Princeton University Press.

Friend, T.: 2022, The Humean pragmatic turn and the case for revisionary best systems accounts, *European Journal for Philosophy of Science* **12**(1), 1–26.

Hall, N.: 2015, Humean Reductionism About Laws Of Nature, *in* B. Loewer and J. Schaffer (eds), *A Companion to David Lewis*, Wiley, chapter 17, pp. 261–277.

Hicks, M. T.: 2018, Dynamic Humeanism, *British Journal of Philosophy of Science* **69**, 983–1007.

Jaag, S. and Loew, C.: 2020, Making best systems best for us, *Synthese* **197**, 2525–2550.

Lange, M.: 2009, *Laws and Lawmakers: Science, Metaphysics, and the laws of Nature*, Oxford University Press, Oxford.

Lewis, D.: 1973, Causation, *Journal of Philosophy* **70**(17), 556–567.

Lewis, D.: 1986, Introduction, *Philosophical Papers II*, Oxford University Press, Oxford, chapter Introduction.

Lewis, D.: 1986 [1980], A Subjectivist's Guide to Objective Chance, *Philosophical Papers II*, Oxford University Press, chapter 19, pp. 83–132.

Lewis, D.: 1994, Humean Supervenience Debugged, *Mind* **103**, 473–490.

Lewis, D.: 2001, Ramseyan humility, *in* D. Braddon-Mitchell and R. Nola (eds), *The Canberra Plan*, Oxford University Press.

Loew, C., Jaag, S. and Hicks, M. T. (eds): 2023, *Humean Laws for Human Agents*, Oxford University Press.

Loewer, B.: 1996, Humean Supervenience, *Philosophical Topics* **24**, 101–127.

Loewer, B.: 2012, Two accounts of laws and time, *Philosophical Studies* **160**(1), 115–137.

Mill, J.: 1882, *A System of Logic*, Harper & Brothers, New York.

Ramsey, F.: 1931, *The Foundations of Mathematics*, Routledge & Kegan Paul.

Roberts, J.: 2008, *The Law-Governed Universe*, Oxford University Press.

Schrenk, M.: 2014, Better Best Systems and the Issue of CP-Laws, *Erkenntnis* **79**, 1787–1799.

Swoyer, C.: 1982, The Nature of Laws of Nature, *Australian Journal of Philosophy* **60**(3), 203–223.

Woodward, J.: 2014, Simplicity in the Best Systems Account of Laws of Nature, *British Journal of Philosophy of Science* **65**, 91–123.