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**Abstract**

Humean best systems accounts face a dilemma: in order to vindicate scientists' ordinary nomological discourse, they must embroil themselves in substantial metaphysics. To those averse to substantial metaphysical posits, this is a significant cost. Here, I develop an expressivist account of laws of nature that avoids this dilemma. My account both (i) vindicates scientists' nomological discourse and (ii) avoids substantial metaphysical commitments. To vindicate this discourse, I preserve the conceptual structure of Marc Lange's account of laws of nature. Lange's account elegantly vindicates the intricate relationships between laws and meta-laws. On a realist construal, Lange's account requires commitment to primitive counterfactuals. To avoid this commitment, I propose an expressivist account of counterfactuals. To judge that a counterfactual is true is to express an attitude of *being for expecting* the consequent to be the case in a hypothetical scenario where the antecedent has occurred. Following Lange's account, this leads to an expressivist construal of laws of nature: to judge that a claim is a law is to express an attitude of being for expecting that claim to remain true in every hypothetical scenario where any logically-consistent counterfactual antecedent obtains.

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**1 Introduction**

Nomological concepts feature prominently throughout many parts of scientific practice. Scientists often structure their approach to experimental and theoretical problems based on the laws or regularities they posit. Given the fruitfulness of nomological concepts,

even constructive empiricists ought to vindicate their use within science. Despite its irrealist tendencies, constructive empiricism still regards science as a “paradigm of epistemic rationality” (van Fraassen 1994, p. 313).

The most straightforward way to vindicate scientists’ nomological concepts is to posit ontological structure that these concepts track. Realist accounts of laws of nature do precisely this, be it through primitive laws (Carroll 1994; Maudlin 2007), primitive counterfactuals that ground governing laws (Lange 2009), or essential dispositions or powers (Bird 2007; Demarest 2017). Owing to this embarrassment of riches, realist accounts face a skeptical challenge: how can we know which of these competing ontological posits exist, given their compatibility with observations? In response, the metaphysically optimistic typically appeal to differences in theoretical virtues between rival ontologies, in the hopes that some such virtues are truth-tracking. For the metaphysically averse, this methodology cuts no ice: theoretical virtues need not be truth-tracking.<sup>1</sup>

Here, I focus on how the metaphysically averse might vindicate scientists’ nomological thought and talk. The challenge is to make sense of the realist-sounding aspects of nomological discourse without substantial metaphysical posits. Recently, Callender (2023) has argued that between two different Humean, ontologically-minimal ways of proceeding, neither is superior. I disagree. I will argue that proceeding in an expressivist (or ‘projectivist’) fashion has distinct advantages over Humean Best Systems Accounts (BSAs). Expressivism is better equipped to vindicate the more metaphysical-seeming aspects of scientists’ nomological concepts, including (i) the ubiquity of graded modal claims, (ii) laws’ purported governing role, and (iii) the judgment that laws are an intrinsic part of the world.<sup>2</sup> Additionally, expressivism provides a clear template for vindicating the seeming objectivity and mind-independence of modal claims, without requiring metaphysical posits like perfectly natural properties or objective similarity.

Section 2 introduces the aim of *internally vindicating* a discourse. I then describe in Section 3 how Humean BSAs struggle to vindicate standard aspects of scientists’ nomological concepts, at least in an ontologically-minimal way. In short, BSAs invariably seem either to make the concept of laws of nature agent-dependent or else they posit substantial ontological structure (like perfectly natural properties).

Subsequent sections motivate and defend an expressivist account of laws of nature that aims to vindicate even the most metaphysical-sounding aspects of scientists’ nomological discourse, while nonetheless avoiding substantial ontological commitments. Lange’s (2009) account of laws and meta-laws provides an attractive template, in virtue of elegantly vindicating graded modal claims (Section 4). Yet Lange’s account requires commitment to primitive counterfactuals, what Demarest (2012) calls ‘counterfacts.’ To avoid commitment to counterfactuals, it suffices to develop an expressivist account of counterfactuals. Section 5 develops one proposal, showing that expressivism about laws of nature is a promising strategy for those averse to metaphysics, with important advantages over best systems accounts (Sections 6 and 7). I thereby agree with the spirit of Ward’s (2002, 2003) arguments for projectivism about laws of nature, although my expressivist account differs in key respects from his. In particular, by beginning with expressivism about counterfactuals, my account is better equipped to vindicate graded modal discourse. Ad-

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<sup>1</sup>As Woodward (2014, p. 92) notes, “naturalistically minded philosophers” may also regard these realist accounts as “metaphysically extravagant.”

<sup>2</sup>For discussions of these three metaphysical aspects and how they pose challenges for Humean best systems accounts, see Emery (forthcoming), Lange (2009), and Shumener (2021), respectively.

ditionally, whereas Ward’s account presupposes a connection between laws of nature and time evolution, my account is compatible with notions of laws that are not tied to time-evolution.<sup>3</sup>

## 2 Internal Vindication

While doing science, scientists across various domains routinely assert, endorse, and reject nomological claims. Such claims concern what the laws are, what they might be, how systems are constrained or governed by laws, which laws are more necessary than others, along with a variety of counterfactuals concerning what would have happened if such-and-such had been the case. Much of scientific problem-solving involves assessing counterfactuals and subjunctives. Without them, it is hard to see how scientists could plan for the outcomes of experiments. We form expectations about not only what will happen but also for what would happen if such-and-such were the case. We arrive at a particular course of action by considering hypothetical alternatives.<sup>4</sup>

Expressivism about laws wholeheartedly endorses scientists’ nomological discourse and aims to vindicate it, at least internally.<sup>5</sup> To internally vindicate a discourse is to show that the claims made *within it* are in good standing. Practitioners ought to continue using the discourse, perhaps even *improving* it relative to the aims of their practice. Internal vindication is equivalent to providing what Gibbard (2003, p. 186) calls *an internally adequate account* of that discourse. Internal vindication is sufficient for what Muller calls “saving the linguistic phenomena” (2005, p. 94). Like scientific realists, even constructive empiricists aim to vindicate ordinary scientific discourse, including modal discourse within science (2005, p. 89). Note that we are not required to vindicate internal claims that we deem genuinely unintelligible.<sup>6</sup>

Although realism about a discourse shares the aim of internal vindication, it hankers after something more, what we might call *external vindication*. Unlike internal claims, external claims involve commentary on a discourse or practice, commentary that takes place outside the practice itself. Most of this essay comprises external claims about scientists’ nomological discourse. Realists also wish to vindicate external claims that laws of nature are objective and mind-independent. Regarding these external claims, expressivists can remain agnostic. Expressivists are satisfied with the aim of vindicating realist-sounding claims made *within* the discourse at hand, e.g. when a scientist—engaged in doing science—says that the laws of nature are objective.

The distinction between internal vs. external claims is familiar from Carnap (1950).<sup>7</sup>

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<sup>3</sup>Both Adlam (2022) and Chen and Goldstein (2022) discuss how contemporary physicists are exploring nomological notions that are not tied to time-evolution. Accommodating such approaches seems important for an account of laws to be compatible with future physical theories.

<sup>4</sup>Indeed, reasoning about subjunctives might be necessary for rational planning (Gibbard 2012, p. 137).

<sup>5</sup>In this respect, expressivism shares an aim with realism. As I discuss below, they diverge on whether internal vindication is enough to satisfy us. Ward similarly motivates his expressivist project on the grounds that it “successfully captures fundamental intuitions regarding nomological possibility” (2002, p. 191) (although he is often primarily concerned with philosophers’ intuitions).

<sup>6</sup>Woodward (2014, p. 93) considers a similar notion of adequacy in assessing Humean best systems accounts. Some defenders of Humean BSAs seem committed to a similar criterion, such as when Loewer notes that reductions of philosophical concepts “should be evaluated in terms of how well they ground and illuminate the practices involving the concepts” (1996, p. 108).

<sup>7</sup>For discussion of Carnap’s distinction, see Flocke (2020), who notes that Carnap’s position has important

To clarify it further, Horgan and Timmons helpfully distinguish between two different kinds of contexts (2015, p. 207). On the one hand, we have *engaged contexts*, wherein practitioners *use* a given discourse, rather than mention it from an outside perspective. Talking about laws of nature while doing science generates a nomologically-engaged context, wherein speakers make nomological claims internal to scientific discourse. On the other hand, we have *detached contexts*, wherein we step outside of one discourse and into another. Paradigmatically, stepping into the “philosopher’s room” generates a detached context relative to the discourse under discussion. Typically, internal claims take place within engaged contexts, while external claims occur within detached contexts.

Some might object that there is no clear sense to be made of these distinctions between internal vs. external claims or engaged vs. detached contexts. Surely, scientists themselves sometimes make external claims about science, and couldn’t this lead to mixed contexts? Nevertheless, it is typically clear whether a context is engaged or detached relative to a given discourse. When a philosophy student asks “how do we *really* know electrons exist?”, it is clear they are not primarily asking for a recounting of historical experiments. Admittedly, it may sometimes be vague whether a given claim is internal or external, or whether a given context is engaged or detached. But the vagueness of a distinction does not prevent it from being serviceable.

### 3 A Dilemma for Best Systems Accounts

Traditionally, those averse to positing a substantial metaphysics for laws of nature have sought refuge in Mill–Ramsey–Lewis best systems accounts (BSAs). BSAs posit that laws are logical consequences of a scientific axiom system that best balances a few privileged epistemic virtues, such as simplicity and strength. In its most ontologically austere forms, a BSA is committed only to the existence of a Humean mosaic of categorical states of affairs: all modal claims are non-fundamental, reducing to this Humean mosaic. Laws are then taken to be epistemically-valuable summaries of physical regularities. Humean laws do not govern, and they do not constrain states of affairs. They describe what has happened and aid the prediction of what may happen in the future.<sup>8</sup>

Existing BSAs fail to simultaneously meet the two desiderata that concern me here, namely to (i) internally vindicate nomological discourse while (ii) avoiding substantial metaphysical commitments. Instead, BSAs face a dilemma: meeting one of these desiderata comes at the cost of violating the other. BSAs that avoid substantial metaphysical commitments struggle to meet the aim of internal adequacy because they make laws of nature depend on aspects of scientists. Through recourse to more substantial metaphysics, BSAs can preserve the objectivity of laws of nature, but at the cost of becoming metaphysically profligate. For instance, a best systems theorist might follow Lewis (1983) in positing perfectly natural properties and an objective notion of simplicity. Yet even so, all extant BSAs struggle to vindicate the kinds of graded modal claims that scientists routinely make. Overall, I take these difficulties to motivate developing an expressivist account of laws of nature based on Lange’s framework, which elegantly accommodates graded modal claims concerning laws, meta-laws, and symmetries.<sup>9</sup>

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similarities with norm-expressivism.

<sup>8</sup>For a clear presentation of Lewis-style best systems accounts, see Loewer (2007).

<sup>9</sup>Woodward (2014) provides further reasons to worry that BSAs will struggle to provide an adequate account

Despite Lewis's commitment to perfectly natural properties, his account does not guarantee the objectivity and mind-independence of laws of nature. Rather, these features depend on whether or not "nature is kind," such that the best system is "*robustly* best—so far ahead of its rivals that it will come out first under any standards of simplicity and strength and balance" (Lewis 1999 [1994], p. 233). Lewis thereby grants that on his account, "lawhood might be a psychological matter," which he admits "would be very peculiar" (1999 [1994], p. 233). One might worry that if it is contingent whether or not laws of nature are objective, then laws of nature are not properly mind-independent after all.<sup>10</sup> For the sake of argument, I grant that an approach like Lewis's could in principle vindicate the objectivity and mind-independence of nomological claims. Doing so may require even more metaphysical commitments than Lewis himself made, such as positing an objectively best balance between simplicity, strength, and other relevant epistemic virtues.

Rather than embrace more metaphysics, various *pragmatic* BSAs have sought to weaken Lewis's ontological commitments, in particular to perfectly natural properties.<sup>11</sup> In doing so, the relevant notion of simplicity becomes even more explicitly agent- or interest-relative. What counts as simple varies based on (i) the ordinary cognitive capacities of scientific agents in a given epistemic community or on (ii) the domain of phenomena under investigation. Since the laws follow from the axioms that best balance simplicity with other privileged epistemic virtues, pragmatic BSAs render laws of nature agent-relative.<sup>12</sup>

I view this feature of pragmatic BSAs as a kind of *grammatical mistake* that interferes with the aim of internal adequacy: pragmatic BSAs run roughshod over key aspects of scientifically-engaged nomological discourse. Crucial to the scientific concept of laws of nature is that they are objective and mind-independent. In scientifically-engaged contexts, it is clear that laws of nature do not depend on features of scientific agents (at least when those laws have nothing to do with people). Insofar as we wish to vindicate this concept as used within these successful practices, we ought to vindicate these judgments that laws of nature are objective and mind-independent. Hence, pragmatic BSAs do not seem to be internally adequate. They deny key features of scientists' nomological concepts. Moreover, by their own lights, many proponents of BSAs wish to respect key features of scientists' nomological discourse.<sup>13</sup>

Those averse to metaphysics might seek an expressivist treatment of the offending posits in Lewis's account, such as perfectly natural properties. Perhaps we can give an expressivist interpretation of judgments of relative simplicity between axiom systems, vindicating the objectivity of these judgments. However, BSAs face a further, independent problem: they struggle to vindicate graded modal claims within science. Such claims are especially common in physics, where physicists routinely wonder whether some laws or symmetries are more necessary than others, thereby constraining less necessary ones.

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of scientists' concept of laws: in practice, scientists seemingly do not arrive at laws by balancing considerations of simplicity and strength, and scientific practice does not provide clear notions of 'simplicity' or 'strength.'

<sup>10</sup>Belot (2022, pp. 9–12) explores ways in which Lewis's account renders laws problematically mind-dependent.

<sup>11</sup>See Cohen and Callender (2009), Hicks (2018), Dorst (2019), and Jaag and Loew (2020). Loewer (2007, 2021) has also sought to modify the BSA to avoid relying on perfectly natural properties.

<sup>12</sup>Dorst argues that the laws depend on what is "predictively useful for creatures like us" (2019, p. 886).

<sup>13</sup>Cohen and Callender remark that many are attracted to BSAs because they hold "out the promise of a theory of laws that is not radically disconnected from science" (2009, p. 10). Dorst explicitly aims at an account that "both agrees with our intuitions about what the laws should be and accords nicely with the laws we find in actual physical practice" (2019, p. 885).

An expressivist interpretation of Lewis's BSA would still face this problem.<sup>14</sup>

Strategically, an expressivist should base their account on a framework that already promises to internally vindicate nomological discourse. Lange's (2009) framework elegantly vindicates the intricate modal connections between force laws, conservation laws, and symmetries. In Section 4, I briefly describe Lange's account and how it vindicates graded modal claims. Section 5 introduces the core of my positive proposal: expressivism about counterfactuals. Rather than interpret counterfactual claims as describing or representing parts of reality (e.g. primitive counterfactuals), I interpret them as expressing pro-attitudes toward expectations. My expressivist vindication utilizes a few standard maneuvers advocated by contemporary expressivists. Section 6 describes these maneuvers, focusing on objectivity and minimalism about truth.

## 4 Lange's account of laws and meta-laws

Lange's framework interprets laws and meta-laws as forming a modal hierarchy, vindicating physicists' routine claims that some laws are more necessary than others. For instance, it is common to view force laws as being less necessary than conservation laws that arise from a symmetry principle. Intuitively, the force law could have been different, while still respecting the symmetry and hence preserving the conservation law. The symmetry principle thereby functions as a meta-law, constraining the form of force laws.

To recover this modal hierarchy, Lange first distinguishes between nomic vs. sub-nomic claims. A claim is *sub-nomic* provided that it does not make a claim about lawhood. Many laws and accidents are sub-nomic, such as the claims "the speed of light is  $2.998 \cdot 10^8$  m/s" and "Mount Everest is the highest mountain on earth" (the former being a law, the latter an accident). In contrast, the truth or falsity of a *nomic* claim depends on what the laws are. Both "it is a law that the speed of light is  $c$ " and "it is an accident that Mount Everest is the highest mountain on earth" are nomic claims.

Lange distinguishes laws from accidents by considering sets with a special counterfactual stability property, known as *sub-nomic stability*. In short, a non-empty set of sub-nomic claims is sub-nomically stable provided that (i) it is closed under sub-nomic logical consequence, and (ii) its statements remain true under all (nested) counterfactual suppositions that are logically consistent with its members. Lange interprets the largest, non-maximal sub-nomically stable set,  $\Lambda$ , as comprising the first-order laws.<sup>15</sup> Sub-nomic stability captures the intuition that the laws are invariant under every counterfactual antecedent that is logically consistent with them: as we vary the accidents, the sub-nomic claims in  $\Lambda$  remain unchanged.

Sub-nomically stable sets have a special property: they form a hierarchy. Given two sub-nomically stable sets, one is necessarily a proper subset of the other (Lange 2009, p. 37). This property helps vindicate the idea that some laws are more necessary than others. At the bottom of this hierarchy is the set of first-order laws  $\Lambda$ . Other sub-nomically stable sets are proper subsets of this one, containing successively fewer laws.

<sup>14</sup>Emery (forthcoming) argues that Humean BSAs that fail to vindicate the governing role of laws seem forced to radically reinterpret ordinary scientific practice. Hicks (2019) has proposed a Humean account of symmetries as 'maxilaws', but it leaves unspecified the relevant notions of simplicity and strength and is much more restrictive than Lange's framework.

<sup>15</sup>The maximal set  $\mathfrak{M}$  contains all sub-nomic truths, including laws and accidents.

We can thereby interpret conservation laws as belonging to a sub-nomically stable subset “ $\Lambda^+$ ” of  $\Lambda$ . The members of  $\Lambda^+$  (including conservation laws) are stable under logically-consistent counterfactual antecedents that alter the members of  $\Lambda$  (such as force laws). It is in this sense that the laws in  $\Lambda^+$  are more necessary than the laws just in  $\Lambda$ . The hierarchical structure of sub-nomic stability vindicates physicists’ discourse that the conservation law would remain true even if the force law were different.

To vindicate claims about meta-laws, Lange relies on a structurally analogous property known as *nomic stability*. The definition of “nomic stability” parallels that of sub-nomic stability: we simply replace each instance of “sub-nomic” with the more inclusive “nomic or sub-nomic.” Nomic stability captures the intuition that meta-laws should be invariant under every counterfactual supposition concerning first-order laws that is logically consistent with the meta-laws (2009, p. 111). Like the sub-nomically stable sets, the nomically stable sets form a hierarchy. Hence, we can interpret symmetry principles—such as the rotational invariance of force laws—as belonging to a special subset  $\Lambda^{meta}$  of the largest non-maximal nomically stable set  $\Lambda_{nomic}$ .<sup>16</sup>

Despite elegantly vindicating scientists’ modal discourse, Lange’s framework comes at a steep cost: it posits primitive counterfactuals as part of the nature of reality. These counterfactuals function as the truth-makers for the stability properties of sub-nomic and nomic sets, and thereby the truth-makers for laws and meta-laws. Interpreted literally, Lange’s account involves commitment to a large class of primitive modal facts, vastly larger than commitment even to primitive laws or meta-laws. Hence, although Lange’s account arguably satisfies the desideratum of internal vindication, it fails to be sufficiently ontologically non-committal.

My aim here is not to defend the ontology of Lange’s account. Rather, I wish to defend its conceptual structure, which does justice to the intricacies of nomological reasoning in scientific practice. Section 5 sidesteps the ontological problems facing Lange’s account by developing an expressivist interpretation of counterfactuals. On the view I defend, we can remain agnostic as to whether or not there are primitive counterfactuals in reality. We can fruitfully interpret nomological discourse as possessing the conceptual structure that Lange’s account describes, while avoiding its ontological commitments.

## 5 Expressivism about Counterfactuals

What distinguishes expressivism from realism and other non-revisionary views is *how* it goes about internally vindicating a discourse. Instead of interpreting the relevant claims as entirely describing or representing worldly states of affairs, expressivism interprets them as performing some kind of non-descriptive functional role. In the first instance then, expressivism belongs to a family of views known as “non-descriptivism” or “non-representationalism.” Expressivism distinguishes itself by positing that the given claims *express* attitudes, sentiments, or other states of mind, such as norms or plans that an agent endorses.

In the moral domain, expressivists interpret morally-engaged claims as expressing pro- or con-attitudes toward various actions. In Schroeder’s (2008) formulation, to judge that ⟨murdering people is wrong⟩ is to express an attitude of *being-for disapproving* of

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<sup>16</sup>Symmetry principles constitute nomic rather than sub-nomic claims because they are *about* the transformation properties of laws.

murder. According to Gibbard's (1990) norm-expressivism, it is to express acceptance of a set of norms that permit blaming people for murder. Alternatively, we can take it to express an attitude of *planning to disapprove of the act of murdering* (Gibbard 2003).

## 5.1 Subjunctives as Being for Expecting

I begin with subjunctive conditionals before considering counterfactuals as a special case. When we judge a subjunctive to be true, we plausibly express a pro-attitude toward *expecting* something to happen. Here, my proposal harkens back to Hume, who relies on an attitude of expectation in his deflationary discussion of causation.<sup>17</sup> Consider a context where I am holding an ordinary coffee mug above my rather ordinary desk. In this context, the following subjunctive is true: *if I were to release my coffee mug, it would fall*. In judging this subjunctive to be true, I plausibly express an attitude of *being for expecting my mug to fall* in the event that it is released. More precisely, I consider a hypothetical scenario where I release my mug, and I express a pro-attitude toward *expecting my mug to fall in this scenario*. The hypothetical nature of this scenario distinguishes the subjunctive conditional from a future tense indicative conditional such as *if I release my mug, it will fall*.<sup>18</sup>

Whether or not we judge a subjunctive to be true depends on what conditions putatively obtain in this hypothetical scenario. Regarding a hypothetical scenario where both my coffee mug and desk contain strong magnets, I may expect my mug to levitate rather than fall. Typically, we assess subjunctives relative to hypothetical scenarios that modify only a few conditions from actuality, holding everything else fixed (Dorst 2022; Lewis 2001 [1973]; Maudlin 2007). What to modify vs. what to hold fixed is often what's in question when we ask whether a particular subjunctive is true. Ultimately, I will argue that subjunctive-reasoning is a norm-governed process. When we judge a subjunctive to be true, we implicitly endorse a set of norms specifying what to hold fixed and what to modify (in a given context).<sup>19</sup> Unlike in traditional approaches to subjunctive conditionals, these constraints on what to hold fixed or modify do not function as truth conditions. Rather, the norms we endorse appear as part of what we express in asserting or denying a subjunctive conditional.

Written as a general schema, my proposal goes as follows:

SUBJUNCTIVES<sub>expecting</sub>: to judge that ⟨If  $\Phi$  were the case, then  $\Psi$  would be the case⟩ is to express an attitude of being for expecting  $\Psi$  to occur in a hypothetical scenario where  $\Phi$  occurs.

<sup>17</sup>According to Hume, humans “acquire, by long habit, such a turn of mind, that upon the appearance of the cause, they immediately expect, with assurance, its usual attendant, and hardly conceive it possible that any other event could result from it” (1748, p. 46). Similarly, Hume later writes that “after a repetition of similar instances, the mind is carried by habit, upon the appearance of one event, to expect its usual attendant, and to believe that it will exist” (1748, p. 50).

<sup>18</sup>In cases where the relevant hypothetical scenario is qualitatively identical to actuality, my account predicts that a subjunctive conditional expresses the same expectation as a corresponding indicative conditional.

<sup>19</sup>For a discussion of the importance of context in evaluating counterfactual conditionals, see Heller (2005, pp. 602, 609–613). On my view, the evaluation of a counterfactual in context is a norm-governed process. Counterfactual judgments are not “anything goes.” Instead, norms govern which hypothetical scenarios and counterpart relations are *relevant*. In saying that a particular counterpart relation is relevant for assessing a given counterfactual, one expresses endorsement of a set of norms of counterfactual reasoning.



This proposal references attitudes that *the speaker* takes toward a hypothetical scenario, rather than attitudes of (hypothetical) agents in these hypothetical scenarios. In some hypothetical scenarios, the speaker (or their hypothetical ‘counterpart’) might be incapable of having any attitudes at all, e.g. due to cognitive impairment.

Rather than invoke an attitude of being-for, we can reformulate the account using an attitude of norm-acceptance: to judge that  $\langle$ if it were that  $\Phi$ , then it would be that  $\Psi$  $\rangle$  is to express acceptance of a set of norms that recommend *expecting*  $\Psi$  in a hypothetical scenario where  $\Phi$  obtains. Focusing on norm-acceptance makes explicit that subjunctive reasoning is a norm-governed process. Below, I illustrate my account using Adams’ well-known JFK conditionals.

Stepping back, one might wonder why I develop my account in terms of expectations, rather than some other doxastic state. Following Mackie and Goodman, Ward (2002) relies on an attitude of inferring. Yet it seems to me that in asserting a subjunctive conditional, I may not be in favor of carrying out any particular inference. There may be many ways for an agent to reason themselves to the expectation I endorse when I assert a subjunctive. Perhaps in some cases I hope the agent does not reason at all but simply trusts me that they should expect the consequent to be the case in a particular hypothetical scenario.

SUBJUNCTIVES<sub>expecting</sub> leaves open the temporal tenses of the antecedent or consequent conditions  $\Phi$  and  $\Psi$ . Consider a subjunctive such as  $\langle$ If it were to rain *tomorrow*, then the sidewalks would get wet $\rangle$ . Following the schema, we can interpret this conditional as expressing an attitude of being for expecting the sidewalks to get wet in a hypothetical scenario where it rains tomorrow. In this way, we can easily accommodate subjunctives dealing with hypothetical future events.

Similarly, I contend, we can accommodate subjunctive conditionals dealing with events in a hypothetical past, leading to an account of counterfactuals. Consider a conditional such as  $\langle$ If it were to have rained yesterday, then the sidewalks would have gotten wet $\rangle$ . Following the schema, this expresses an attitude of *being for expecting it to be the case that the sidewalks got wet*, in a hypothetical scenario where it rained yesterday. In general, I take the counterfactual  $\langle$ If it *had been* the case that  $\Phi$ , then  $\Psi$  would be (or have been) the case $\rangle$  to be equivalent—at least for philosophical purposes—to the following subjunctive:  $\langle$ If it *were to have been* the case that  $\Phi$ , then it would be (or have been) the case that  $\Psi$  $\rangle$ . This leads to the following proposal for interpreting counterfactuals:

COUNTERFACTUALS<sub>expecting</sub>: to judge that  $\langle$ If it had been the case that  $\Phi$ , then  $\Psi$  would be (or have been) the case $\rangle$  is to express an attitude of being for expecting  $\Psi$  to be the case in a hypothetical scenario where  $\Phi$  has occurred.

Alternatively, to judge that  $\langle$ if it had been the case that  $\Phi$ , then  $\Psi$  would be (or have been) the case $\rangle$  is to express acceptance of a set of norms that recommend *expecting*  $\Psi$  to be (or have been) the case in a hypothetical scenario where  $\Phi$  occurred.

To illustrate my account, consider the well-known counterfactual  $\langle$ If Oswald had not shot Kennedy, then someone else would have (on 11-22-1963) $\rangle$ . In a typical non-conspiratorial context, we take this counterfactual to be false. Specifically, we typically assume the following conditions (i) Oswald did in fact shoot Kennedy, (ii) Oswald acted alone, and (iii) no one else was conspiring to assassinate JFK on that day (Ward 2003, p. 216). Hence, when we judge this counterfactual to be false, we express an attitude of *not* being for expecting it to be the case that someone shoots JFK in a hypothetical

scenario where Oswald got cold feet, was acting alone, and no one else was trying to assassinate JFK (at least not on 11-22-1963). In other words, we express acceptance of a set of norms that *forbid* expecting that someone else shoots JFK under these circumstances (i.e. in a salient hypothetical scenario where these background conditions obtain). We may additionally accept the related counterfactual (If Oswald had not shot Kennedy, then *no one else would have* (on 11-22-1963)). Doing so expresses an attitude of being for expecting it to *not* be the case that someone shoots JFK in such a scenario.

One natural worry concerns the status of these hypothetical scenarios: do they implicitly involve commitment to possible worlds or some other primitive modal facts? I claim that they do not: building on remarks by van Fraassen, Muller (2005, p. 90) shows one way to understand models of a scientific theory without recourse to primitive modal notions.<sup>20</sup> In the context of science, what I mean by ‘hypothetical scenarios’ corresponds to what Muller means by ‘scientific models.’ These models at least exist in our imaginations, sometimes on paper, and sometimes as bits on a computer.<sup>21</sup> Using these models, Muller proposes truth-conditions for subjunctive and counterfactual conditionals. However, Muller’s account assumes that context and scientific practice settle which models—along with accessibility relations between models—are *permissible* or *forbidden* (2005, pp. 68, 88). Given the ideological bent of constructive empiricism, it is implausible that either Muller or van Fraassen would wish to endorse a form of normative realism to ground these claims about which models are permissible or forbidden. Constructive empiricism pairs much better with a non-descriptivist approach to rationality or normativity, such as Gibbard’s norm-expressivism. To say that ‘it is permissible to consider a set of models’ is implicitly to express acceptance of a set of norms concerning which models to consider in answering a given scientific question.<sup>22</sup> In this way, my account makes explicit the normative commitments that are implicit in Muller’s account.

Still, one might worry that both the imaginary nature of hypothetical scenarios and this normative dimension raise the specter of relativism. If what occurs in a hypothetical scenario or model is partly a matter of imaginative stipulation, what is to prevent us from constructing these models such that *prima facie* ridiculous counterfactual conditionals come out as true? If we respond by saying that such ridiculous models are forbidden in ordinary scientific contexts, one might wonder what grounds or justifies this normative claim. If it is merely arbitrary or conventional which models are permissible, then calling any particular model forbidden seems *ad hoc*. Section 7 addresses these relativism worries head on. In short, I argue that we can endorse some norms of subjunctive reasoning over others on the grounds that they better facilitate the constitutive aims of science.

<sup>20</sup>Adopting a semantic conception of scientific theories, a set of models constitutes a theory. Hence, in considering these models, we need not appeal to prior nomological commitments of a theory. This conception fits nicely with Lange’s proposal that laws of nature arise from collective properties of subjunctive conditionals. Following Muller, we can understand these subjunctive conditionals as shorthand for claims about models, where I argue such claims have a normative component.

<sup>21</sup>Here, I again draw on Hume, who observed that humans are “mightily governed by the imagination.”

<sup>22</sup>When discussing what constrains accessibility relations between models, Muller appeals to preserving scientific language, an aim I take to be entailed by internal adequacy: “Not anything is possible, however, because the language of scientists in use puts constraints on what we can sensibly define. *That* use of language should be our guide in defining accessibility relations sensibly when we want to make sense of science” (2005, p. 94).

## 5.2 Expressivism about Laws

Combined with Lange’s framework, expressivism about subjunctive conditionals leads immediately to an expressivist account of laws of nature. Consider the sub-nomic claim  $\Psi$ , “the speed of light is  $c$ .” What does it mean to judge that  $\Psi$  is a law? On my account, to judge that  $\Psi$  is a law of nature is to express an attitude of *being for expecting*  $\Psi$  to be the case no matter what logically-consistent (possibly nested) counterfactual or subjunctive antecedents obtain. As on Lange’s account, in judging that  $\Psi$  is a law of nature, I take it to belong at least to the largest non-maximal sub-nomically stable set,  $\Lambda$ . Since claims about sub-nomic stability depend on claims about counterfactuals, my account interprets judgments of sub-nomic stability as expressing pro-attitudes toward a great number of expectations. In judging that this set  $\Lambda$  exists, I express an attitude of *being for expecting its members to be the case*, regardless of which logically-consistent subjunctive (or counterfactual) antecedents were to (have) obtain(ed).

Similarly, we can easily interpret the judgment that a conservation law belongs to the modally privileged sub-nomically stable subset  $\Lambda^+$ . In judging a conservation law to be more necessary than a force law, I express an attitude of being for expecting the conservation law to be the case even in a hypothetical scenario where the force law is different (and likewise for many other subjunctive antecedents logically-consistent with the members of  $\Lambda^+$ ). Similar points apply to how to interpret the judgment that a given symmetry principle is a meta-law, i.e. belongs to a nomically stable subset  $\Lambda^{meta}$ . In this way, an expressivist about subjunctive conditionals can preserve the conceptual structure of Lange’s interpretation of laws of nature.<sup>23</sup>

By adopting Lange’s conceptual scheme, my account inherits another key advantage: it provides a flexible interpretive framework that can accommodate a variety of different first-order views about laws and meta-laws. This interpretive flexibility contributes to internal vindication by allowing us to accommodate *disagreements* between scientists. We can easily imagine two scientists disagreeing about whether a particular symmetry principle counts as a meta-law. Lange’s framework treats this disagreement as concerning whether the symmetry principle belongs to a modally privileged nomically stable subset of  $\Lambda^{meta}$ . Viewed through expressivism about subjunctives, this amounts (at least) to a normative disagreement regarding what we ought to expect. Section 7.2 returns to this interpretive flexibility, showing how it favors expressivism over Humean BSAs.

Typical accounts of moral expressivism share this interpretive flexibility. They supply a meta-framework that easily accommodates different first-order moral theories, such as utilitarianism vs. deontology. I take this structural parallel as another reason to base an expressivist account of laws of nature on Lange’s framework, rather than some others. Necessitarianism, for instance, holds that all laws of nature are equally necessary. In light of this, necessitarianism faces difficulties accommodating graded modal claims routinely made by physicists. Necessitarianism seems forced to retreat to an error theory regarding these graded modal claims, and to that extent it falls short of internal adequacy. Yet even if necessitarianism were correct and the majority of scientists become necessitarians, Lange’s framework could accommodate necessitarian modal discourse.

<sup>23</sup>In contrast, Ward bases his expressivist account partly on attitudes toward explanation (2002, p. 197). However, those sympathetic to expressivism about laws of nature will plausibly be drawn to expressivism about explanation (Hunt 2022). But taking explanation to itself have normative dimensions complicates Ward’s proposal, an issue he implicitly broaches in his (2003, p. 187).

## 6 Vindication à la Expressivism

The aim of internal vindication requires vindicating even those aspects of a discourse that sound ‘realist.’ This includes claims that such-and-such is *true*, a *fact*, *objective*, or *mind-independent*. Within scientifically-engaged contexts, we routinely make claims like the following: ⟨it’s a fact that nothing can travel faster than the speed of light⟩ or ⟨whatever the laws of nature are, they don’t depend on what we think they are⟩. Expressivism interprets these realist-sounding claims just like it interprets other nomological claims: they express particular states of mind.<sup>24</sup>

Consider, for instance, the realist-sounding claim that ⟨objectively, nothing can travel faster than the speed of light⟩. We can interpret this statement as expressing acceptance of a set of norms that recommend *expecting nothing to travel faster than light*, regardless of what anyone thinks about it. *Ex hypothesi*, all laws of nature are objective in this sense on Lange’s framework. For in judging a claim to be a law, we take it to belong to a sub-nomically stable set, thereby taking it to be invariant under all of these alternative thoughts that someone could have about it.

In the moral domain, expressivists have defended a similar analysis of objectivity, which Field has called “counterfactual objectivity” (2018, p. 16). A statement such as ⟨it is objectively wrong to murder someone⟩ expresses acceptance of a set of norms that recommend disapproving of murder in all scenarios. Similarly, an expressivist can interpret the statement ⟨the wrongness of murdering does not depend on people’s opinions⟩ as expressing acceptance of a set of norms that recommend disapproving of murder even in scenarios where the majority of people (or even all people) *approve* of murder.<sup>25</sup> In short, an expressivist construes these realist-sounding claims as expressing acceptance of norms that render the permissibility of a particular reactive attitude (e.g. disapproval) stable under alternative ways the world could be. Strikingly, the structure of this expressivist analysis parallels Lange’s account of laws. Objective or mind-independent moral claims are interpreted as possessing a greater degree of counterfactual stability than moral claims that are in some sense “accidentally” true.

Also internal to scientists’ nomological discourse are claims to the effect that *it is true* or *a fact* that such-and-such is a law of nature. Historically, expressivism cast itself as a kind of non-cognitivism, on which moral claims are not truth-apt. However, it is difficult to see how non-cognitivism can internally vindicate truth-claims within a discourse, making non-cognitivism into a partial error theory. Partly for this reason, contemporary expressivists have embraced minimalism about truth, understanding truth-claims using a disquotation principle: to judge that ⟨“murdering is wrong” is true⟩ is simply to judge that murdering is wrong.<sup>26</sup> More precisely, Gibbard has argued that any claim that we can agree or disagree with is truth-apt in this minimalist sense. Since scientists can clearly disagree about what counts as a law of nature rather than an accident, law-claims are truth-apt using the disquotation principle. Thanks to minimalism, expressivism can also vindicate *beliefs* in engaged-contexts. Insofar as the claim ⟨nothing can travel faster than the speed of light⟩ is truth-apt, I can believe it or not, and I can take it to be a fact or not.

Some have worried that by applying truth-minimalism, expressivism becomes indis-

<sup>24</sup>Expressivists also aim to vindicate engaged statements regarding our fallibility. See Horgan and Timmons (2015) for a detailed proposal.

<sup>25</sup>See Blackburn (1985, p. 14) and Gibbard (2003, p. 186) for similar claims.

<sup>26</sup>See Blackburn (1996), Gibbard (2003, p. 18), or Field (2009, p. 267) for endorsements of minimalism.

tinguishable from realism, leading to a “problem of creeping minimalism” (Dreier 2004). However, as long as we distinguish between engaged vs. detached contexts, there is no serious problem of creeping minimalism. In detached contexts, an expressivist can remain agnostic as to whether or not claims from the discourse are true (where ‘true’ might now be understood in a more metaphysically robust sense than minimalism). Unlike realists, expressivists are satisfied with internally vindicating a given discourse; they are not aiming for external vindication.<sup>27</sup>

## 7 Whence *these* norms?

For all that has been said, one might be left with a nagging worry about relativism. If scientists were to radically change their norms for reasoning about subjunctive conditionals, expressivism would presumably seek to vindicate these alternative norms. Given this, why privilege current norms that scientists implicitly endorse, as opposed to some other set of norms they have endorsed or could endorse in the future? Since expressivism does not presuppose that scientists’ nomological concepts *track* or represent part of reality, what sets the standards for evaluating their success or failure? The worry then, is that expressivism is a kind of relativism in disguise. We might call this threatening view *nomological relativism*. It holds that we lack stance-independent criteria for evaluating the success or failure of scientists’ nomological claims: nomological claims can be good or bad only relative to a given set of norms.

Fortunately, we can evaluate these norms indirectly by the same criteria we use to evaluate the success or failure of science. Recall that one main functional role of nomological concepts is to facilitate the aims of science, including empirical adequacy, prediction, and control of physical subsystems. Here, I intend the phrase ‘aims of science’ as a convenient shorthand for success conditions: these ‘aims’ provide criteria for assessing scientific progress.<sup>28</sup> Assuming that we are not relativists about scientific progress, we can evaluate nomological norms based on how well they facilitate these aims. Other things equal, one set of norms of nomological reasoning is better than another provided that it better facilitates these aims. In this way, nomological expressivism need not collapse into relativism.<sup>29</sup>

Pushing the worry a step further back, what would happen if some of these success criteria for science were to change? On what grounds can we say that these are the *correct* criteria by which to evaluate the success or failure of science? Although fully addressing scientific relativism lies outside the scope of this project, a simple response is at hand. To prevent an evaluative regress, it suffices that at least some success criteria are *constitutive* of science, in the sense that they provide minimal success criteria, i.e. conditions necessary for science to go well.<sup>30</sup> Plausibly, if we stopped taking predictive

<sup>27</sup>Some have tried to solve the problem of creeping minimalism by appealing to differences in the explanatory resources of realists and expressivists (Simpson 2018). However, if explanation is partly normative, this kind of response faces a circularity worry.

<sup>28</sup>I do not intend to take a stance on whether science has aims in any literal or non-metaphorical sense.

<sup>29</sup>Horgan and Timmons (2006) describe additional distinctions between expressivism and relativism. Ward (2002, 207ff.) also rehearses standard expressivist responses to worries about subjectivism and relativism (although Ward does not avail himself of minimalism about truth). Here, I provide a novel response to relativism, designed to avoid an evaluative regress.

<sup>30</sup>For structurally analogous points, developed in the context of constitutive features of agency, see Paakku-

accuracy as a criterion for evaluating science, we would be evaluating a different activity, held to different standards. (Notice how we do not hold the success or failure of pure mathematics to the standard of empirical adequacy; doing so would involve a kind of category mistake). I do not intend here to take a stance on particular minimal success criteria for science. To avoid an evaluative regress, it suffices that at least some criteria are constitutive of doing science at all. Assuming that one is not a relativist about scientific progress, one can thereby endorse nomological expressivism while denying nomological relativism.

## 7.1 Advantages of Expressivism over BSAs

By evaluating nomological norms in light of success criteria for science, expressivism bears similarities with Humean Best Systems Accounts. Largely for this reason, Callender argues that we should understand expressivism and BSAs as “climbing the same mountain, differing only in certain semantic features” (2023, p. 31). However, nomological expressivism has a number of advantages over BSAs, particularly pragmatic BSAs—which are most attractive to those averse to metaphysics. Here, I will argue that nomological expressivism is a decisively better way to climb the Humean mountain.

Pragmatic BSAs focus explicitly on scientist’s practical aims, such as to predict future phenomena (Dorst 2019). BSAs treat these features of scientists’ aims as part of the *truth conditions* of law-claims. A statement counts as a law partly in virtue of belonging to a system that facilitates these aims. However, building these agent-relative features into the *semantics* of law-claims renders scientists’ nomological claims as mind-dependent. Pragmatic BSAs thereby run afoul of the aim of internal vindication.

In contrast, expressivism considers scientific aims and other practical features at the level of meta-semantics. They are part of the story of how practitioners come to use nomological concepts, rather than part of their meaning.<sup>31</sup> At the level of meta-semantics, expressivists can describe how a community of practitioners have been led to a particular set of norms, e.g. norms that facilitate cooperation for some collective ends. Nonetheless, law-claims have nothing to do semantically with what is predictively useful, computationally tractable, or simple for agents like us. Hence, we can internally vindicate scientists’ claims that laws of nature are objective and mind-independent.

Dorst (2019) defends his Predictive BSA account on the grounds that this kind of anthropological story *explains* why scientists care about laws and have arrived at something like their current conception of laws. It seems to me that this historical story pertains to meta-semantics rather than semantics: it is a story about how scientists have come to endorse norms of nomological reasoning. Seen through a normative lens, I take Dorst (2022) to have made substantial progress on both articulating these norms and indicating how they advance plausible constitutive aims of science (such as prediction). Nevertheless, the norms themselves are silent concerning what these nomological concepts mean or what their non-deflationary truth-conditions—if any—consist in.

By building these pragmatic elements into the meta-semantics rather than the seman-

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nainen (2018, 434ff.). Railton discusses ways in which the metaphor of belief “aiming at” the truth is misleading, but how purporting to get things right is nevertheless *constitutive* of belief (1994, p. 74). This is the sense of ‘constitutive’ I have in mind here.

<sup>31</sup>For a helpful discussion of this crucial distinction between semantics and meta-semantics—albeit in the context of Wittgenstein’s meta-philosophy—see Shaw (2023, Ch. 5).

tics, expressivism attains another advantage over BSAs. Expressivism remains compatible with a wide variety of ontological and metaphysical commitments, thereby avoiding the sorts of underdetermination problems that plague realist accounts and arguably Humean BSAs as well. Nothing in my expressivist account favors either a non-reductionist or reductionist ontology for laws of nature. Unbeknownst to us, our nomological concepts may actually be tracking metaphysically robust truth-makers of some kind. Alternatively, it may be that the Humean mosaic is fundamental and that there are no primitive modal facts in reality. The success of nomological expressivism does not depend on settling this orthogonal ontological debate.

Likewise, despite being allied with what Dorst calls the *pragmatic goal conception of counterfactuals* (2022, p. 552), the account I defend leaves open the possibility that counterfactuals obtain in reality (fundamentally or otherwise). Dorst calls this latter picture the “independent domain view” of counterfactuals (2022, p. 551). My non-descriptivist account of counterfactuals is not against descriptivism or representationalism *per se*. Rather, it stands opposed to the stronger claim that descriptivism about counterfactuals (or laws) is *necessary* to achieve the aim of internal vindication.

Insofar as someone is drawn to Humeanism out of metaphysical aversion, they probably harbor doubts that the world consists fundamentally of a Humean mosaic. Indeed, it has been difficult to specify key features of this mosaic in a way consistent with our best scientific theories. Although positing a fundamental Humean mosaic is ontologically more conservative than various non-Humean fundamental ontologies, positing a Humean mosaic still amounts to a substantial commitment. An expressivist of the sort I defend is welcome to remain agnostic on these ontological questions. To the extent that an expressivist account of laws succeeds, it internally vindicates nomological discourse. As we have seen, the aim of internal vindication is largely orthogonal to the further metaphysical aim of determining what ontology—if any—our concept of laws of nature tracks.

## 7.2 Nomological Pluralism

In virtue of avoiding metaphysical commitments to claims about laws of nature, expressivism inherits a further advantage compared with BSAs. As Lewis worried, it is unclear whether epistemic virtues like simplicity or strength constrain the possible systematizations of the Humean mosaic to a uniquely best systematization. What is to prevent a systematization that is particularly good for human scientists from being particularly ill-suited for alien scientists? This worry persists for pragmatic BSAs: it is unclear if scientists’ predictive aims, computational needs, or other pragmatic features constrain the possible axiomatizations to a uniquely best one, even one that is uniquely best for *human* scientists. In such cases of underdetermination, it is unclear what BSA proponents should say. Would such worlds lack laws altogether, even if they exhibited numerous robust regularities?

One option would be to endorse a kind of supervenience, on which only axioms or theorems that belong to *all* these tied systemizations count as laws (Lewis 1986, p. 124). However, there is no guarantee that any robust regularities would survive this supervenience procedure. Additionally, supervenience makes it even more challenging to discern whether or not a claim is a law: one needs to consider *all* the equally virtuous systemizations, many of which scientists might never consider.

In contrast, expressivism faces no analogous problem. Regarding norms of nomological reasoning, an expressivist can happily admit that there may not be a unique set of norms best suited for facilitating the aims of science. Indeed, it is plausible that the optimal state for the scientific community involves an *equilibrium of different* nomological norms, peacefully coexisting. Given the complexity of the problems we confront, science as a whole might go best when different scientists explore different regions of the space of nomological norms. By not presupposing that nomological claims describe reality, expressivists can happily allow for this kind of nomological pluralism.

Crucially, pluralism does not entail relativism. Avoiding relativism simply requires that it's not anything goes—a much weaker constraint than requiring a unique best set of norms. Perhaps a small number of norms of nomological reasoning are worth including in this equilibrium where different scientific communities endorse different norms. It is also conceivable that the success criteria for science constrain the nomological norms so strongly that there is a canonically best set (mirroring Lewis's optimism for there being a canonically best system (1986, p. 124)). The important point is that expressivism can accommodate either situation. Its success does not depend on nature being so kind to us.

The same cannot be said for Best Systems Accounts. It is difficult to see how a BSA can allow for any kind of non-relativist nomological pluralism. Since BSAs seek to provide a metaphysics for laws, non-relativist nomological pluralism would seem to commit them to a contradiction in reality: for some  $\phi$ , we would have to say both that it is a law that  $\phi$  and that it is not a law that  $\phi$ . Without a uniquely best axiomatization, there is a risk of admitting either that there are contradictory laws (and hence contradictions in reality) or that there are no laws at all—even in worlds with robust, intuitively law-like regularities. As before, we see that placing pragmatic and aim-oriented features into the meta-semantics for law-claims—rather than the semantics—leads to a key advantage for expressivism.

## 8 Conclusion

Humean best systems accounts face a dilemma: within their framework, vindicating scientists' nomological discourse comes at the cost of substantial ontological commitments. I have argued that expressivism provides a more promising strategy for those who aim to both (i) avoid substantial metaphysics and (ii) vindicate scientists' concept of laws of nature. Since many proponents of Humean BSAs are in favor of these two desiderata, they ought to take expressivism seriously.

Nomological expressivism meets these two desiderata by preserving the conceptual structure of Lange's account of laws, while avoiding commitment to counterfactuals. Instead, we can understand counterfactuals as expressing pro-attitudes toward expectations, namely what to expect in a hypothetical scenario where the counterfactual antecedent has occurred. On Lange's account, to judge that a claim is a law is to judge that it belongs to a sub-nomically stable set. Nomological expressivism interprets this judgment as expressing an attitude of *being for expecting* that claim to remain true in every hypothetical scenario where any logically-consistent counterfactual antecedent obtains.



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