

Rethinking The Problem of Nomological Harmony

Tarik Tijanovic

ttijanovic@collegeofthedesert.edu

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Abstract:

Cutter and Saad (2024) argue that the striking match between the laws of nature and the states they govern calls for explanation, and they tentatively suggest that a third factor, such as a designer or an axiarchic meta-law, may explain this match. I argue that the problem of nomological harmony divides into two distinct problems: a laws-contents harmony problem, concerning whether the laws match the kinds of contents present in the world, and a laws-initial conditions harmony problem, concerning whether the initial state engages the laws. I argue that the laws-contents problem either does not arise or collapses into the laws-initial conditions problem. If contents depend on laws for their identity or nature, there can be no mismatch between laws and contents. If contents are independent of laws, then the relevant possibilities involve law-independent natures, such as quiddities, essential causal powers, or haecceities; but in each case the residual explanatory question concerns the arrangement of the initial state rather than a distinct harmony between laws and contents. The laws-initial conditions problem therefore remains, but its evidential significance is limited. Where fine-tuning is accepted, laws-initial conditions harmony is entailed by the fact that the initial conditions permit complex temporal evolution and therefore adds no independent support for third-factor explanations. Where fine-tuning is rejected, harmony remains a potentially significant datum, though its explanatory force depends on how striking harmony is taken to be. I conclude that nomological harmony does not provide a wholly independent argument for theism, axiarchism, or other third-factor views, although a residual version of the problem remains for views that simultaneously reject fine-tuning and do not appeal to a multiverse.

Keywords: nomological harmony; God; axiarchism; quiddities; properties; fine-tuning;

§1 Introduction

Cutter and Saad put forward the problem of nomological harmony: the problem of explaining the striking match between laws of nature and worldly contents such that the universe can undergo temporal evolution (Cutter and Saad 2024). I begin by dividing the problem into *two problems* that Cutter and Saad run together. Their favorite formulation concerns a match between laws and initial conditions. But their opening examples, and parts of their later discussion, concern a match in kind

between laws and types of contents. The first problem is the problem of how the set of laws matches the contents in existence. Call it the *laws-contents harmony problem*. Here is the problem. We could imagine a possible world where our laws are ready to govern contents such as protons, neutrons and electrons, but where there are no such contents, only other, alien particles. Then the laws would have nothing to act on, and the temporal development of the universe would never take off. The second problem is the problem of how laws and initial conditions can match such that temporal evolution can take off. Call it *the laws-initial conditions harmony problem*. For instance, suppose the only law is that Xs move toward nearby Ys. If Xs and Ys both exist but are never near one another, the law is never triggered and nothing happens. On Cutter and Saad's view, the harmony problems call for explanation, and they tentatively favor a third-factor solution, such as a designer or an axiarchic meta-law, though they do not commit to theism or axiarchism.

After breaking down the problem into two aforementioned problems *also*, I focus on each. When it comes to the former, I argue that it does not arise. I raise a dilemma: either contents depend on laws for their nature or identity, or they do not. If they do, then the laws-contents harmony problem cannot even get off the ground. Why? If contents acquire their nature or identity through laws, then in the absence of laws all contents are the same across all possible worlds, which means that there is no question about match or mismatch between contents and laws. For instance, consider a world that contains matter without Coulomb's law, which fixes the causal-nomic role of electrons. Without Coulomb's law there are no electrons, just a relatively undifferentiated matter, which has the same nature across all possible worlds. Hence, because there is no question about match or mismatch between laws and contents, the laws-contents harmony problem does not arise on this horn. But what if the second horn is true, namely, that contents have their identity independently of laws? In that case the proponent of the laws-contents harmony problem needs to commit to law-independent natures: either quiddities, categorical properties that exist independently of any causal-nomic role, or essential causal roles, as on powers views, which are not conferred by laws (Black 2000; Locke 2012; Bird 2007). This raises a sub-dilemma about the modal status of these natures. On the first horn, natures necessitate their causal-nomic roles, so laws are fully explainable in terms of natures. Then the question is why these natures are configured in such a way that they permit temporal evolution (what Cutter and Saad call *power harmony*). This is a question about the

arrangement of the initial state, so the laws-contents harmony problem collapses into the laws-initial conditions problem. On the second horn, quiddities are contingent, so the modal space contains all permutations of quiddities and causal-nomic roles, and any role can be attached to any quiddity (Lewis 2009). Then harmony between quiddities and roles is irrelevant. What matters for temporal evolution is whether the roles' triggering conditions are jointly met by what the initial state contains, which again collapses the laws-contents problem into the laws-initial conditions problem.

Here is the main upshot: the laws-contents harmony problem does not arise as a distinct problem. It presupposes that contents are individuated independently of laws, and once that presupposition is spelled out it either dissolves or reduces to the laws-initial conditions harmony problem which is what remains. Lastly, I argue that the remaining problem is entailed by fine-tuning when fine-tuning is understood as requiring initial conditions that permit complex temporal evolution, and so, wherever fine-tuning is granted, the remaining harmony problem adds no independent support for third-factor explanations beyond fine-tuning itself. Where fine-tuning is rejected, however, the harmony problem survives as a weaker but potentially significant datum. I finish by speculating about cases where the remaining problem of harmony remains.

I divide the rest of the paper into three sections. In §2, I introduce Cutter and Saad's problem and divide it into two sub-problems. In §3, I raise dilemmas which show that the laws-contents problem either does not get off the ground or collapses into the laws-initial conditions problem. In §4, I argue that the residual problem is subsumed by fine-tuning and adds no independent evidential support for third-factor views in some or most cases.

§2 The problem(s) of nomological harmony

Cutter and Saad (2024) put forward the problem of nomological harmony. Roughly, the actual world exhibits a striking match between its laws and its states, such that applying the laws to the states yields further states, and this calls for explanation. Their official formulation is in terms of laws and states, and they mostly work with laws and initial conditions. However, their opening is different. Namely, it begins with the observation that our universe "is governed by laws that match its contents" (§1), and it illustrates a mismatch with laws about schmarged particles paired with states containing

only charged ones, and with laws about charged particles but no states involving them.¹ I therefore separate two problems. Before I delve into the distinction, the crucial term to clarify right away is *temporal evolution*. I use ‘temporal evolution’ as minimally as Cutter and Saad’s definition of a match requires: applying the laws to the universe’s states yields further states. According to them, temporal evolution does not require life despite that being a clear example of temporal evolution. The presence of temporal evolution means that the universe is not stillborn when its initial state is not engaged by its laws (so that nothing follows from it). As we will see, both problems below concern a failure of temporal evolution in this sense—they differ in why the laws end up idle.

2.1 *The laws-contents harmony problem*

The first problem is that the laws match the *contents* of the world. Namely, it is striking how laws can take contents as inputs and produce the evolution of the universe as output. For the sake of simplicity, by contents, we can refer to matter, or more specifically anything that can be discovered by physics. Here is the quote that wonderfully illustrates the problem:

An initial motivation for thinking that nomological harmony calls for explanation is the intuition that a match between laws and initial conditions is a special outcome that would be very unlikely, absent some further explanation. Return to the game analogy. Just as most ways of pairing rulebooks with initial game-piece configurations would yield a mismatch, it seems that most conceivable ways of pairing laws with initial conditions would yield a mismatch. Presumably there are countless possible (at least conceptually possible) fundamental properties and relations, so if (as we ordinarily suppose) the initial conditions and the basic dynamical laws only involve a small set of fundamental properties and relations, it seems unlikely that there would be a match without some further story.

(Cutter and Saad, 2024:5)

To see what is at stake, consider a possible world that contains the set of laws $\{L1, L2, L3\}$, which are supposed to govern types of particles $\{P1, P2, P3\}$. Suppose that the particles $\{P1, P2, P3\}$ do not exist in that world. The world contains other types of particles, such as $\{P4, P5, P6\}$, which the laws above do not govern. We would have laws with nothing to act on, and the universe would not evolve

¹ Their later discussion of the Armstrongian view points the same way: since universals exist only if instantiated, there can be no laws about uninstantiated properties, which secures some harmony, though the view still leaves open whether the states trigger the laws (Armstrong 1983; Cutter and Saad 2024, §7).

despite the fact that laws are ready to govern. Thus, it is not enough to either have contents or laws—we need both.

Also, the issue here is not why a certain set of laws and contents exist rather than some other, which is a separate question. Nor is the issue why laws govern—we can assume that laws govern by definition as soon as relevant contents are introduced. Lastly, Cutter and Saad do not assume a well-defined probability measure over possible worlds. They appeal to evidential probabilities and to coincidence-avoidance norms: some matches call for explanation more than others. If you see a monkey typing a Shakespearean sonnet, you should look for a causal explanation rather than shrug it away. It could be that the monkey is genetically engineered, that a human is controlling its brain, or that it is a fake monkey. These hypotheses are more likely than that this was a mere coincidence. Cutter and Saad suggest that something like this is going on with respect to our laws and contents. From there, they tentatively favor a third-factor solution over brutalist, ensemble and priorist responses.²

² In particular, they consider four types of objections: brutalist objections, ensemble objections, third-factor objections. *Brutalist objections* hold that the match between laws and contents is either a metaphysically necessary or a contingent brute fact, with no further explanation available. If matches between laws and contents are necessary, then that itself requires an explanation which means that the explanandum is merely relocated. If matches between laws and contents are contingent, then a brutalist needs to say that we got incredibly lucky which is again, a missing explanation. *Ensemble objections* posit a vast number of laws in the actual world—arguably the plenitude of all laws. Such objections aim to show that temporal evolution would ensure that for any set of contents there will always be laws available to govern them. Cutter and Saad pointed out that this response doesn't work because it can easily run into troubles with inconsistency. For instance, if we have the ensemble of all possible laws—or ensemble of a large number of laws—we have another miracle which is the fact that in the actual world none of the laws from the ensemble contradict each other. The larger the ensemble, the larger the chance that we have something of the contradictory sort ($L_1 \wedge \sim L_1$) at hand. *Third-factor objections* posit something outside the laws and contents themselves—a designer or an axiarchic meta-law—that biases the pairing toward a match. Cutter and Saad argue this is not disqualified merely by being untestable, and that a theistic designer in particular need not itself constitute a further unexplained coincidence, since God's choosing a harmonious, life-permitting universe admits of an intentional explanation (a good being has reason to actualize valuable outcomes) that a brute or contingent pairing does not. *Priorist objections* instead explain either laws in terms of contents or contents in terms of laws, without appeal to any third factor; this category includes Humean views (laws as mere summaries of the pattern of instances), Armstrongian views (laws as relations between universals that can only exist if instantiated), and what Cutter and Saad regard as the most promising priorist option, powers priorism—the view that properties have their causal powers essentially, so that laws are grounded in, rather than imposed on, the distribution of powerful properties that make up the world's initial state.

2.2 The laws-initial conditions harmony problem

The second problem pertains not to the relationship between laws and the identity of contents, but to the relationship between laws and initial conditions. Here is what Cutter and Saad say:

Just as most ways of pairing rulebooks with initial game-piece configurations would yield a mismatch, it seems that most conceivable ways of pairing laws with initial conditions would yield a mismatch. Presumably there are countless possible (at least conceptually possible) fundamental properties and relations, so if (as we ordinarily suppose) the initial conditions and the basic dynamical laws only involve a small set of fundamental properties and relations, it seems unlikely that there would be a match without some further story.

(Cutter and Saad 2024)

The focus here is not on which contents the laws are about, but on whether the initial state engages the laws. Even if the right kinds are all present, the laws may never be triggered. Suppose the only law is that Xs move toward nearby Ys. If Xs and Ys are never near one another, nothing happens. The laws-initial conditions problem applies not only to views on which laws independently govern, but also to views on which laws reduce to properties. For example, even if we grant that laws just are causal-nomic roles, we still need to explain why the entities that bear those roles are arranged such that their triggering conditions are met. Cutter and Saad also consider objections that we do not need to introduce here.

The upshot is that the problem of nomological harmony comes in two varieties: the laws-contents harmony problem and the laws-initial conditions harmony problem. In the next section I explore the former.

§3 Is the laws-contents harmony problem a problem?

In this section, I question the laws-contents harmony problem. I conclude that either it is a non-starter, or it collapses into the laws-initial conditions problem. I first raise a general dilemma with two horns:

DEPENDENCE (D): Contents depend on laws for their nature and identity.

INDEPENDENCE (I): Contents do not depend on laws for their nature and identity.

This generates a general dilemma:

DILEMMA: Either DEPENDENCE is true, or INDEPENDENCE is true.

DILEMMA is as simple as it gets. There are only two possible ways in which laws and contents can relate, and only one can be true. Now let's explore what each horn implies for the laws-contents harmony problem. Beginning with DEPENDENCE, the assumption is that the contents of the world would not be what they are if laws were not in place to individuate them, give them their nature, and so on. Again, by contents, we can refer to entities discovered by physics—for the sake of simplicity. Consider a possible world that contains electrons without Coulomb's law, which specifies the causal-nomic role of electrons. The most familiar causal-nomic role of electrons is that they repel other electrons. The question is: in a world with electrons but without Coulomb's law, would electrons be capable of repelling other electrons? More precisely, would electrons even be electrons? If electrons are completely individuated by a causal-nomic role that laws confer on them, then the absence of laws implies the absence of that role. This gives a partial but satisfying answer about what electrons would look like without their causal-nomic role: they would look the same as protons, and the same as all other particles. Without laws conferring causal-nomic roles, content remains unindividuated. This idea echoes Aristotle's conception of prime matter, which roughly corresponds to matter that is unformed and unspecified in the absence of the form that makes it what it is (Aristotle 1924, *Metaphysics* Z.3, 1029a³). Putting aside the historical antecedent, this claim should not be controversial if we accept the widely held view that science only tracks causal-nomic roles. Also, if one thinks that the claim that matter is undifferentiated prior to laws is strong, one can also read my claim as there being no fact of the matter which physical kinds are instantiated even if there is *some* structure.

How is the laws-contents problem affected if DEPENDENCE is true? I claim that in that case, it cannot even get off the ground. If contents depend on laws for their identity, then the question of match or mismatch is not even askable. If contents are always qualitatively the same across all possible worlds and laws give them their identity by virtue of conferring them causal-nomic

³ The attribution of this view to Aristotle is probably contested which doesn't matter for our purposes. It establishes a historical antecedent and it illustrates the issue at hand.

roles, then there could never be a match or mismatch between laws and contents. That is, there could be many different worlds containing different contents due to different laws, but the idea that there could be laws with no corresponding content is implausible. For instance, the idea that the set of laws $\{L1, L2, L3\}$ governs particles $\{P1, P2, P3\}$ while the world only contains particles $\{P4, P5, P6\}$ does not make sense given that $\{P1, P2, P3\} = \{P4, P5, P6\}$ in the absence of laws. Particles do not have identity before we attach laws to them. So if DEPENDENCE is true, the laws-contents problem does not arise, because there is no match or mismatch between laws on the one hand and contents on the other. One and the same content will always be ready to receive laws.

One might try to respond by referring to Lewis's notion of locational role (Lewis 2009). Lewis suggests that besides causal-nomic roles, entities can have locational roles that individuate them. For instance, electrons are closer to the edge of an atom than protons. Could mere location afford identity such that contents can be independent from laws? There are two problems with this. First, one can argue that locational roles are themselves instances of causal-nomic roles. The fact that an electron sits closer to the edge of an atom is not a brute fact but can be explained by what electrons do. Second, even if locational roles are not causal, they can still be nomic, such that some laws determine the structural locations of particles.

DEPENDENCE seems to ruin the laws-contents problem. But what about INDEPENDENCE? This is what the laws-contents problem needs to establish questions about match or mismatch. If contents have their nature and identity independently of laws, then in principle the question of match or mismatch can arise. For instance, we can ask why the set of laws $\{L1, L2, L3\}$ governs particles $\{P1, P2, P3\}$ but not $\{P4, P5, P6\}$, given that $\{P1, P2, P3\} \neq \{P4, P5, P6\}$. Each set of particles has its own identity, not acquired through law and this is precisely what the laws-contents harmony problem needs. What remains to be seen is what contents would need to be like in order to have identity independent of laws.

There are two ways for contents to have identity independent of laws. The first is for their natures to be independent of their causal-nomic roles altogether. Features of individuals that do not depend on their causal-nomic roles are known as categorical properties or quiddities (Black 2000; Locke 2012). A quiddity is the intrinsic nature of an individual, possessed by it and yet not directly observable. The second is for the causal-nomic roles to be essential to their bearers, as on powers views (Bird 2007). Such roles are not conferred by laws, so identity is law-independent, though it is not role-independent. This is, I think, the indispensable first-pass commitment that any proponent of the laws-contents problem needs: contents must have some law-independent individuation, either quiddities (or haecceities, which I consider below) or essential roles. Without a feature that exists independently of laws, we cannot adequately talk about a match or mismatch between laws and contents. What remains to be seen is how exactly these natures must be for the laws-contents problem to work. I therefore generate a micro-dilemma contained within the INDEPENDENCE horn, based on the modal profile of these natures:

NECESSARY NATURES: The law-independent natures of contents necessitate their causal-nomic roles (as on powers essentialism, where the nature just is the essential role, or on quidditism with necessary connections).

CONTINGENT QUIDDITIES: Quiddities do not necessitate their causal-nomic roles and permit permutations.

MICRO-DILEMMA: If INDEPENDENCE is true, then either NECESSARY NATURES or CONTINGENT QUIDDITIES is true.

Begin with NECESSARY NATURES. For natures to necessitate their causal-nomic roles means, for example, that electrons repel other electrons across all possible worlds because their nature necessitates such behavior (Bird 2007; Wang 2016). Given their nature, there is no way electrons could behave otherwise. How would this affect the laws-contents harmony problem? Either the problem would show up at a different place, with respect to these natures, or it would dissolve entirely. Cutter and Saad anticipate the issue. They argue that on powers prioritism a version of the problem recurs at the level of powers, which they call *power harmony*:

Even if a universe has an initial state constituted by properties with certain essential causal powers, these powers will only induce temporal evolution if their stimulus conditions are met, which requires a kind of harmony with the other properties and relations involved in the initial state.

(Cutter and Saad 2024)

The suggestion is that it remains striking that the actual world evolves, even if it contains essential causal powers. The rationale is that if we had some powers but not the others that trigger them (for instance, electrons but no protons), temporal evolution would fail. So we still need harmony among the powers, which I entirely agree with. Even a naturalist who posits such natures needs to explain how this harmony comes about. But is harmony among powers the laws-contents harmony problem? If natures necessitate causal-nomic roles, then laws are reducible to, or eliminable in favor of, those natures. Why posit both laws and natures if the natures do all of the explanatory work? Once laws are gone, no mismatch between laws and contents is left to explain. What is left is whether the powers instantiated in the initial state have their triggering conditions jointly met by what that state contains. But if the proper arrangement of initial conditions is what matters, then the laws-contents harmony problem collapses into the laws-initial conditions problem.

The only place left for the proponent of the laws-contents problem is CONTINGENT QUIDDITIES. Here there are all possible recombinations of quiddities and causal-nomic roles. For example, take a set of quiddities $\{Q1, Q2\}$ and a set of causal-nomic roles $\{CN1, CN2\}$. We can generate the possible worlds: world A $\{Q1 \rightarrow CN1$ and $Q2 \rightarrow CN2\}$ and world B $\{Q1 \rightarrow CN2$ and $Q2 \rightarrow CN1\}$. This roughly follows Lewis's principle of recombination, on which we can patch together different individuals as long as they are distinct (Lewis 1986). In principle, we can even permit quiddities without causal-nomic roles, roles without quiddities, or the same quiddity bearing different roles across space and time.

Would contingent quiddities bring the laws-contents harmony problem back to life? The proponent is now asking about match or mismatch not between laws and contents but between quiddities and causal-nomic roles. To make the actual match surprising, we would need worlds in which quiddities and roles mismatch in a way that matters. But on this view there are no interesting combinations: which quiddity occupies which role makes no difference to what happens. Suppose a world contains quiddities and roles that do not permit temporal evolution. The absence of evolution cannot be due to a mismatch between quiddities and roles. What would matter in such a world is that it contains roles with no proper arrangement. That is, the issue is that the roles *alone* do not permit temporal evolution. So the question about harmony ends up being a question about the roles themselves. Thus, again the laws-contents harmony problem collapses back again into the laws-initial conditions problem, while quiddities remain irrelevant.⁴

One might object that quiddities and essential roles are not the only ways of securing independence from laws. Suppose particles have primitive identity, or haecceity, independently of all qualitative properties, including causal-nomic roles. One might say it is striking that laws govern these particles rather than others. But haecceities are qualitatively bare. Either they lack causal-nomic roles of their own, in which case laws can confer a role on whatever haecceities exist, so there is no possible mismatch; or they already carry causal-nomic roles, in which case laws are idle with respect to the particles' behavior, and the residual question concerns the distribution of haecceities, which is again the laws-initial conditions problem. Haecceitism thus reproduces the structure of the micro-dilemma. Lastly, a quick note on entailment. The laws-initial conditions match entails the laws-contents match. If applying the laws to the initial state yields further states, the laws must engage some of the kinds that state contains. But the converse fails: a match in kind does not guarantee that the state triggers the laws.

Now we can summarize this section. We raised DILEMMA: either contents depend on laws for their identity (DEPENDENCE) or they do not (INDEPENDENCE). If they do, the question

⁴ Furthermore, after granting CONTINGENT QUIDDITIES, further problems arise for anyone who wants to infer the existence of God from them. If two possible worlds are indiscernible with respect to causal-nomic roles but differ in their quiddities, on what basis does God choose one over the other? God could swap one quiddity for another every other second without anything important changing in the universe.

of match or mismatch does not arise, because contents have no identity outside of laws. If they do not, the proponent needs law-independent natures, either quiddities or haecceities or essential roles. This raised MICRO-DILEMMA: such natures either necessitate their causal-nomic roles (NECESSARY NATURES) or do not (CONTINGENT QUIDDITIES). If they necessitate the roles, laws become reducible to, or idle beside the natures, and the residual question is whether the powers in the initial state are jointly triggered, which is the laws-initial conditions harmony problem. If they are contingent, mismatch between quiddities and roles makes no difference, and the residual question is again whether the roles' triggering conditions are met by the initial state. Haecceitism reproduces the same fork. The laws-contents problem only makes sense under the assumption that contents and laws are entirely distinct, and on that assumption it collapses. Here is the chart of the entire project:

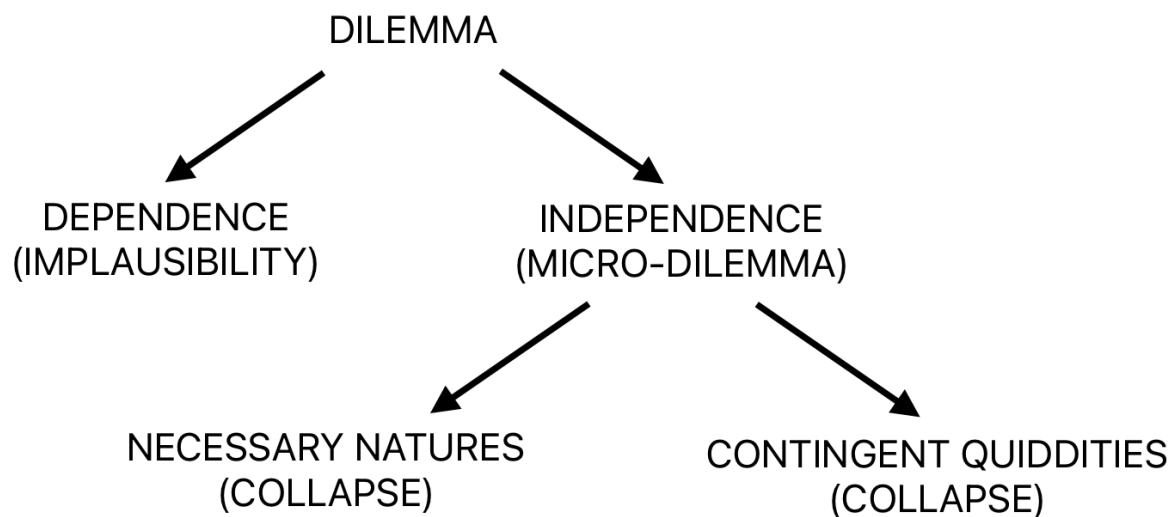


Figure 1: The project

§4 Is the laws-initial conditions harmony problem significant?

At this point, the first version of the problem—the laws-contents harmony problem—is either incoherent or it collapses into the second version of the problem, the laws-initial conditions harmony problem. In this section, I proceed to explore the second version of the problem. I will argue that the residual version of the harmony problem can work in some cases and not in all. Further, I will speculate how well it works in cases in which I grant that it works.

There are three places where the residual harmony problem can be applicable which I adopt from Cutter and Saad's (2024) own analysis. The first place where the nomological harmony argument can be useful is in cases where someone rejects that the universe is fine-tuned. First, a word about fine-tuning itself. Fine-tuning suggests that a large number of parameters of the universe are finely tuned to permit for life. (Collins, 2011) For instance, take the cosmological constant which governs the rate of the expansion of the universe. If the cosmological constant was slightly stronger, the early universe would expand too fast which wouldn't result in the formation of planets. If the cosmological constant was slightly weaker, the early universe would collapse into itself. A better example for our purposes would involve fine-tuning of initial conditions, such as initial density fluctuations. Given the laws governing gravitational dynamics, the early universe had to begin with an appropriate distribution of density inhomogeneities, in order for galaxies and other complex structures to develop. Philosophers suggest that the evidence of fine-tuning points towards the existence of God since it is in the interest of God to promote life. (Collins, 2011) In almost all cases, the laws-initial conditions harmony problem will not add anything new to the discussion since fine-tuning implies the laws-initial conditions harmony problem. If initial conditions are fine-tuned for complex structure or life, then applying the laws to those conditions must yield further states, since a stillborn universe supports neither. So fine-tuning of the initial conditions entails laws-initial conditions harmony. The converse fails: harmony is compatible with evolution that is lifeless, chaotic or trivial. Harmony is therefore the weakest consequence of initial-condition fine-tuning. If the fine-tuning datum EF entails the harmony datum EH, then, given EF, adding EH changes the probability of no hypothesis: $P(H \mid EF \ \& \ EH) = P(H \mid EF)$. This does not depend on any measure over the space of possible initial conditions. Prima facie, this means that the laws-initial conditions harmony problem is redundant in cases when we accept fine-tuning. However, as already announced the harmony problem might be relevant once we reject fine-tuning. For instance, some believe that complete physics will eliminate fine-tuning altogether, or that fine-tuning is a feature of our theories but not the feature of the world. But Cutter and Saad (2024) suggest that even if one rejects fine-tuning in such manners, one still cannot reject harmony. That is, even if physical constants are not finely tuned, matter must be arranged such that it permits temporal evolution of the universe. Thus, the law-initial conditions harmony in the actual world is a striking datum that requires explanation.

The second case involves the multiverse. Many naturalists explain fine-tuning in terms of the existence of many worlds whose physical constants vary from world to world. Thus, it is not that big of a miracle that we find ourselves in one of such universes. But what if the majority (or all) universes in the multiverse are harmonious such that they permit for temporal evolution? If that is the case, one might say that a largely (or totally) harmonious multiverse calls for explanation and that multiverse cannot be helpful to a naturalist, unlike with fine-tuning where naturalists tend to resort to the multiverse hypothesis.

The third case involves simulation theory. According to simulation theory, our world is simulated which might explain fine-tuning, and not in terms of God—but in terms of a physical designer. A proponent of the laws-initial conditions harmony problem can say that even if our world is simulated, the base reality must be harmonious which calls for further explanation. A conjunction of simulation theory and fine-tuning is the only place where fine-tuning doesn't exhaust everything such that the harmony problem can contribute.

So far, the upshot is that if one accepts fine-tuning without accepting multiverse or simulation theory, one doesn't need the laws-initial conditions harmony in order to draw further conclusions about the world. In that case, the laws-initial conditions harmony is entirely uninteresting. If we combine this with what we establish in the previous section, the upshot is that the first version of nomological harmony (the laws-contents harmony problem) is non-existent while the second version of nomological harmony (the laws-initial conditions harmony problem) is uninteresting to everyone who accepts fine-tuning without accepting multiverse or simulation theory. Thus, the question about nomological harmony is only restricted to those who accept simulation theory (which at most few philosophers endorse) and fine-tuning, those who reject fine-tuning altogether, and those who accept multiverse.

So far, I conclude that the remaining version of nomological harmony is only interesting in cases of rejection of fine-tuning or in cases of affirmation of multiverse, or simulation in conjunction with fine-tuning. Now, I want to go even further in order to narrow down the range of cases in which nomological harmony bites hard. Crucially, I will not take a strong stance on the upcoming claims—they are more exploratory. I will consider the claim that the laws-initial conditions harmony problem

is best applicable in cases where naturalists reject both fine-tuning and multiverse, but potentially not in the cases where naturalists accept multiverse (regardless of fine-tuning). Let's start with the latter case and show why the harmony problem might not be as strong in the cases of multiverse. Consider two possible worlds, one harmonious and other not harmonious by definition. World 1 contains 1000 particles which are all apart such that none interact in order for temporal evolution to occur. World 2 contains 1000 particles where 998 are apart without interacting while 2 particles interact. World 1 does not involve temporal evolution while World 2 does, which means that the latter is harmonious if harmony is defined by the presence of temporal evolution. Does World 2 call for explanation as opposed to World 1? It is not clear that it does since there is nothing special about World 2. This means that harmony as explanandum does not only involve the presence of temporal evolution, but the presence of interestingness—which is something that Cutter and Saad would not deny. This raises the question, how interesting does a harmonious world need to be, in order to be striking such that it calls for explanation? I do not intend to answer this question but the answer is kind of intuitive: it has to be striking enough such that we feel as if it calls for explanation. World 2 above does not need explanation while our world does. Thus, we can distinguish different types of harmony: uninteresting harmony (World 2), complex harmony (harmony that is interesting enough such that it calls for explanation), fine-tuning harmony (harmony that contains fine-tuned parameters).

The question about the degree of strikingness of harmonious worlds is crucial when it comes to the residual questions in which harmony matters. When it comes to the multiverse, a naturalist can say that some worlds within the multiverse are not harmonious, a large number of worlds are harmonious but not interesting and that some are both harmonious and interesting (or even fine-tuned). If it turns out that a relatively large number of universes are not interesting in the context of harmony, that would significantly weaken the idea that the multiverse itself is a datum that requires an explanation due to the presence of harmony in a minority of worlds.

While the problem of harmony might not potentially apply as strongly in the cases of multiverse, I claim that it might best work in cases where fine-tuning in the actual world is rejected, together with multiverse. Here is why. Even if our world is not fine-tuned it is nevertheless harmonious in a striking sense which calls for explanation. Thus, it seems to me that the harmony

problem puts a lot of pressure on a naturalist who rejects fine-tuning. In case they don't want to accept the multiverse, their only response is that it is a brute fact that our world is harmonious which might be costly. I presume that such a naturalist would like to retreat to the multiverse in order to account for the strikingness of the harmony in the actual world. But as already stated, one can argue against multiverse harmony by potentially relying on the idea above that many worlds are harmonious but uninteresting. Thus, it might be that the laws-initial conditions harmony problem works better in the cases of rejection of fine-tuning while it might not work as good in cases of multiverse.

Conclusion

This paper explored the plausibility and power behind the nomological harmony problem. First, I claimed that the problem of nomological harmony breaks down into two distinct problems. I further showed that the former problem is either incoherent due to wrong assumptions about identity of contents, or it collapses into the second problem. I further explored the remaining second problem and concluded that it is entirely uninteresting if we already accept fine-tuning. However, I claimed that it is interesting in cases where one rejects fine-tuning or where one accepts multiverse or simulation theory in conjunction with fine-tuning. In these cases, one needs to explain the presence of harmony nevertheless. Lastly, I further speculated about the applicability of the second version of harmony problem in the context of rejection of fine-tuning and affirmation of multiverse, or simulation theory. I argued that potentially, the proponent of multiverse can reject the harmony problem if a decent number of universes are harmonious but uninteresting. Most likely, the harmony problem best applies if one rejects both fine-tuning and multiverse. The ultimate upshot is that the problem of nomological harmony loses most of its initial power while there are remaining portions that should be taken seriously.

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