



An Evaluation of the Biological Case for Design

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Kojonen's The Compatibility of Evolution and Design

with Zachary Ardern, "The Contentious Compatibility of Evolution and Design: Introduction to the Book Symposium"; David H. Glass, "An Evaluation of the Biological Case for Design"; Meghan D. Page, "Thomist or Tumblrist: Comments on The Compatibility of Evolution and Design by E. V. R. Kojonen"; Peter Jeavons, "The Design of Evolutionary Algorithms: A Computer Science Perspective on the Compatibility of Evolution and Design"; Denis R. Alexander, "Evolution, Chance, Necessity, and Design"; Bethany N. Sollereder, "Response to The Compatibility of Evolution and Design"; Mats Wahlberg, "Divine Design and Evolutionary Evil"; and Erkki V. R. Kojonen, "Response: The Compatibility of Evolution and Design."

AN EVALUATION OF THE BIOLOGICAL CASE FOR DESIGN

by David H. Glass 

Abstract. Rope Kojonen has presented a novel argument for design in biology by drawing on insights from evolutionary science. Without objecting to the explanatory role of evolution, he argues that there is further explanatory work to be done and that this is best achieved by an appeal to design. Here, I interpret his argument, and attempt to evaluate it, as a conjunctive explanation since he appeals to two explanations to account for the purposeful order and complexity of living organisms. Understood in this way, I argue that he makes a very plausible case that two explanations (evolution and design) are better than one (evolution). I also explore the role that direct guidance by God might play in such an argument.

Keywords: biological design argument; conjunctive explanation; contingency; design; evolution; theistic evolution

INTRODUCTION

There is a surprisingly wide consensus that biological design arguments (BDAs) and evolution are in conflict. Young Earth creationists and atheistic evolutionists agree on this point even though they disagree on just about everything else. Intelligent design (ID) proponents do not rule out the possibility that the designer could have used an evolutionary process

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of some sort, but their case for design is usually framed in opposition to evolution, particularly Darwinian evolution, and involves arguing against its explanatory power. Theistic evolutionists, as the name suggests, see no conflict between belief in God and evolution or even between belief in design and evolution since God is typically understood not only to have created the universe but also designed it. However, it is important to distinguish between *design* and *design arguments*. One can believe in the former without the latter. A theist, for example, might believe in design as part of an overall worldview or on the basis of revelation without embracing a design argument that supports that belief. While typically believing in design, theistic evolutionists differ in their attitudes to design arguments. Some reject them for philosophical or theological reasons, while others accept design arguments based on the laws of nature or the fine-tuning of physical constants. However, theistic evolutions are often reluctant to appeal to BDAs since the features of living organisms are to be explained by evolution, not design.

Against this consensus, Rope Kojonen sets out in his book *The Compatibility of Evolution and Design* to salvage the BDA by “showing that biology’s apparently purposeful order can provide at least some supporting evidence for religious belief, even for a person who accepts the veracity of mainstream evolutionary biology” (Kojonen 2021, 20). In light of all the objections that might be raised against such an approach, Kojonen addresses a wide range of issues to set the stage for his argument. To my mind, he does an admirable job of dealing with objections to natural theology and design arguments in general, proposing the BDA as primarily a philosophical rather than scientific argument, identifying it as an inference to the best explanation (IBE), specifying what is required for his argument to be successful and distinguishing his position from others in the literature. Consider, for example, general philosophical objections to design. Obviously, if there are good reasons to rule out design in principle on the basis of philosophical arguments, Kojonen’s project cannot even get off the ground. Anticipating this concern, he addresses Humean-type concerns, for example, that we can only reliably infer human, not divine, design and the “who designed the designer” objection. He draws on thought experiments to show why objections along these lines are unpersuasive. Indeed, one of the problems with them is that they prove too much since they are based on “principles that would not allow us to discern evidence of design even in cases where this evidence was seemingly very compelling” (Kojonen 2021, 86). Kojonen makes a very good case that design cannot be ruled out *a priori* and so our attention can turn to the more interesting question of whether design can be defended in the context of biology. Hence, my goal in the rest of this article is to explore and evaluate his BDA. He addresses a lot of scientific issues to make his case, but

here I will focus primarily on the logical and philosophical aspects of the argument.

KOJONEN'S BIOLOGICAL DESIGN ARGUMENT

In terms of design arguments in general, Kojonen (2016, 2021, 77–79) thinks they are best understood as IBEs, though he also acknowledges the merits of formulating them in Bayesian terms. He formulates a design argument as follows:

Premise 1. Some things in nature (or nature itself) exhibit property D (such as complexity ordered toward a purpose).
 Premise 2. This property would be well explained if design was the cause. However, other explanations explain this property poorly.
 Therefore, when comparing all available explanations, design is the best overall explanation of this property.
 Therefore, property D was probably designed; at least this property provides more reason to infer design over competing explanations. (Kojonen 2021, 78)

One minor point is that it is not clear that other explanations need to explain the property poorly. Granted, the poorer the competing explanations are in comparison with design, the stronger the inference to design, but provided design is better than its competitors there would still be more reason to infer it. More importantly, as Kojonen recognizes, this version of IBE is based on competing explanations, which is how it is often formulated (Lipton 2003; Douven 2021). As he also points out, design and evolution are often presented as competing explanations, but in the context of the BDA, this should not be assumed. In such cases, there may not be a “single ‘best explanation’” and a “full explanation may require combining, rather than just contrasting, explanations” (Kojonen 2021, 88). This leads to some tricky questions. What does it mean for two explanations to compete? Even if two explanations are compatible, they may nevertheless compete either directly (because the truth of one makes the other less likely) or indirectly via explaining away (because the ability of one to account for the evidence can reduce the need to infer the other) (Glass 2012; Schupbach and Glass 2017). If incorrect assumptions are made, this can lead to the danger of inferring two explanations when only one is needed. Also, how does this affect IBE? For example, in the above formulation, it is no longer required that design provide the best explanation. Perhaps, there is a better explanation, but it is legitimate to infer design too. If incorrect assumptions are made, this can lead to the opposite danger from that mentioned above, that is, of inferring only one explanation when it is legitimate to infer two.

So, how are we to decide when two explanations (design and evolution) are better than one (evolution)?¹ Here, I want to draw on some recent

work on conjunctive explanations to help address this question (Glass and Schupbach 2022; Glass 2022). If one already accepts evolution as an explanation for biological order and complexity, which is the underlying assumption in Kojonen's work, one might think that Ockham's razor excludes the need for also appealing to design as an explanation. Design might be needed to explain other things (the laws of nature, for example), but why opt for a conjunctive explanation for biological order and complexity that appeals to design and evolution when evolution already provides an explanation? The central idea in the work on conjunctive explanations is that while there is indeed an *explanatory cost* incurred by a more complex explanation, this can be outweighed if it presents sufficient *explanatory gain*. Although this can be spelled out formally in terms of probability and information, it is clear that the relevant equations cannot be applied directly in the context of evolution and design. Nevertheless, the formal approach can still provide guiding principles that might help to address the issue.

How might conjoining design with evolution provide explanatory gain for the explanandum in question (biological order and complexity)? Basically, by making the explanandum more likely to come about than it would be otherwise. Roughly speaking, there are two ways in which design proponents might wish to argue that the conjunctive explanation could achieve this. First, they might draw attention to contingency within evolution and argue that certain evolutionary outcomes are much more likely to occur in the presence of design than would otherwise be the case. The idea here would be that God guides the evolutionary process through some type of divine action, though it would not be necessary to specify exactly how often or in what way this occurs. Second, they might seek to argue that evolutionary mechanisms require other factors to be in place in order for evolutionary explanations to work effectively. According to this approach, design may not be needed to supplement evolutionary explanations by means of divine action, but it is necessary to explain why evolution is possible in the first place. Of course, a third option would be a hybrid of these approaches. I will return to the first and third options later, but for the moment I will focus on the second option since that is the one adopted by Kojonen. His approach is to show that evolutionary explanations depend on various factors such as "laws of form," which support design. He argues that

the scientific data point to a more important role for evolutionary mechanisms other than selection, as well as the dependency of evolution on the "wider teleology" of the cosmos. As biologists continue to posit "laws of form" that provide some directionality of evolution, this has the effect of also weakening the opposition between design arguments and evolutionary explanations. (Kojonen 2021, 9)

In assessing explanatory gain arising from this approach, we need to consider the extent to which appealing to both design and evolution results in a better overall explanation. What about explanatory cost? This will depend on how well the design explanation fits with background knowledge and could include considerations of the plausibility of God's existence and the strength of other arguments for design. Of course, there is plenty of room for disagreement on such topics. Nevertheless, if there is substantial explanatory gain, this could be sufficient to make a plausible case for design and put the onus on those who would wish to claim that the explanatory cost of design is so great that it cannot be outweighed by the explanatory gain.²

A further issue that needs to be considered is how the BDA relates to other design arguments. For example, Kojonen argues that "evolution pushes the explanation for life's order back to the laws of nature at least to some degree, and probably to a large degree" (Kojonen 2021, 152). Evolution may well depend on the laws of nature and the fine-tuning of physical constants and it can be argued that these in turn depend on design. If so, evolution may not explain away design in a general sense, but if the BDA is to be of any interest it needs to provide evidence for design over and above any evidence for design due to the laws of nature and fine-tuning (Glass and McCartney 2014). Hence, it will be important to determine whether Kojonen establishes that the relevant factors he considers depend on design in a more fundamental way. Otherwise, the concern might be that evolution is no more in need of design than the "course which the wind blows" as Darwin (1958 [1887], 88, quoted in Kojonen 2021, 2) claimed.

To evaluate whether Kojonen's argument succeeds, let us now explore some further aspects of his BDA. First, what is the explanandum for which design is proposed as the explanans? Both proponents and opponents of design agree that there is incredible complexity in living organisms that needs to be explained and this is what Kojonen concentrates on. He describes it variously as "biology's apparently purposeful order" (20), "complexity ordered toward a purpose" (78), "the immanent apparent teleology of biological organisms" (132), and "biological teleology" (153) and by "teleology" he means "the potential of things to act in certain ways and to cause certain effects" (72). For consistency with Kojonen's terminology, I will refer to the explanandum as "biological teleology" from here on. Based on the proximate/ultimate distinction noted above, I understand him to be arguing that evolution is the proximate explanation of this biological teleology and design as the ultimate explanation. In principle, evolution could explain away design, but the claim is that it does not do so because design is needed to make evolution possible and explain biological teleology.³

Why is design needed to explain biological teleology? Kojonen argues that evolution depends on preconditions including "laws of form," so that

instead of being a highly contingent process based solely on random mutation and natural selection and with an endless variety of possible forms, evolution is actually a highly constrained process with a much more limited range of viable forms. Interestingly, he makes his case by appealing to arguments made in order to defend evolutionary accounts in light of criticisms by ID proponents. First, he considers ID arguments based on the conservation of information and No Free Lunch theorem and a line of response that claims such arguments would be unsuccessful unless the fitness landscape for the evolutionary search space could be shown to be unsuitable for evolution to work. Kojonen's point is that appropriate fitness landscapes provide a precondition for evolution. Second, he turns his attention to ID arguments based on irreducible complexity. Allowing that such arguments are partially correct, he nevertheless argues that a "theistic evolutionist could well argue that the irreducible complexity argument merely shows how demanding the conditions for evolvability are, and how much fine-tuning evolution actually requires" (Kojonen 2021, 119). Third, he considers ID arguments relating to protein evolution and in particular the rarity of functional forms. In response, Kojonen draws on recent work that suggests proteins are closely connected in a network of functional forms, a so-called "library of forms" that makes evolution possible. Based on these considerations, he claims that there are "some reasons to think that evolution must be fine-tuned in order to work" (Kojonen 2021, 122).

There is a certain irony in Kojonen's use of these responses to ID to argue for design as part of his BDA, but this raises a question about their role as defeaters of ID arguments. Are these claims being proposed as defeaters of ID because they *are true* or because they *could be true*? For example, how strong are the reasons for thinking that the fitness landscapes actually are suitable for evolution? If the claim is merely that this could be true, that might serve as an undercutting defeater of ID, though that could be challenged, but it would be very weak as an evidential base for the BDA. However, in at least some of these cases, Kojonen draws on relevant literature to provide reasons for believing that they are true (or likely to be true) rather than merely that they could be true. He also makes a stronger case from the literature in support of "laws of form," particularly in the context of evolutionary convergence. It is not my goal to evaluate the scientific evidence for these claims, but overall the case seems very plausible.

A somewhat tangential question concerns what implications these findings might have for our understanding of evolution itself. Kojonen states that he is "assuming the success of Darwinian explanations, and [uses] this to ask whether the unnecessary of divine interventions in the history of life then refutes the biological design argument" (Kojonen 2021, 105). However, it might be argued that by appealing to various factors that constrain evolutionary processes, he has moved beyond a Darwinian approach to

evolution. He also suggests that the extended synthesis might be relevant to design. He quotes Hoggard Creegan, “While teleology strained against the grammar of natural selection alone, it is not at all a foreign or difficult concept in the light of convergence, evo devo, and epigenetics” (Hoggard Creegan 2013, 121; Kojonen 2021, 132). Nevertheless, setting this point aside, the question I wish to explore here is whether the findings concerning the constraints on evolution provide good grounds for the BDA.

One issue relevant to the explanatory gain provided by design is whether the laws of form that constrain evolution require design. Consider a standard neo-Darwinian account that does not appeal to such constraints. If it accounts for biological teleology, why not simply appeal to it as the mechanism that requires design? As Kojonen points out, Asa Gray thought evolution “leaves the question of design just where it was before” (Kojonen 2021, 4). The reason why many, including Darwin himself, have not been satisfied with this approach is that the mechanisms of mutation and natural selection do not obviously seem to need an explanation in terms of design. Of course, they do depend on laws of nature, but they do not seem to need much by way of additional explanation, which means they do not provide any additional evidence for design of the kind that would be needed for a BDA.⁴ By contrast, the preconditions and laws of form are more suggestive of design since presumably they would need to be of the right kind for evolution to work and so comparisons with fine-tuning do not seem out of place. Of course, there are legitimate questions about just how fine the tuning of these factors need to be, but there does seem to be an appropriate evidential base for a BDA.

A second issue relevant to explanatory gain concerns how likely it is that biological teleology would have come about as a result of evolutionary processes if the right preconditions were in place. This raises the question of contingency in evolution, to which I will return later, but suffice it to say there is some debate on this point. If the chances of biological teleology arising are still quite low, that might be thought to present a problem for the BDA. In fact, there are two issues here. First, it might be thought that unless biological teleology was very likely to result, there would be no reason to attribute the factors to design. However, again a comparison with fine-tuning of physical constants seems appropriate. There is no reason to think that life is inevitable or even very probable in a fine-tuned universe. It is the nature of the fine-tuning itself and the fact that it makes life possible that is arguably enough to warrant a design inference. Plausibly, something similar applies to the preconditions for evolution. Second, if the chances of biological teleology arising are quite low, that might seem to raise a problem for explanatory gain. Does the probability of the explanandum not need to be high given design? Well, the higher the better and hence the strength of the resulting BDA may well depend on the extent to which contingency is reduced (see “Contingency, Guidance, and Gaps” section).

Nevertheless, the key factor is how much *more likely* design makes the explanandum compared to the case where design is not factored in. If the scientific findings identified are correct, they suggest that evolution would not really be feasible at all without the preconditions and laws of form, and this suggests there is significant explanatory gain.

Finally, let us return to the question of whether there is evidence for design that goes beyond any evidence arising from the laws of nature and fine-tuning. A possible concern here might be that this cannot be the case since the preconditions and laws of form are inevitable consequence of the laws of nature and fine-tuning. Although this might be true, though presumably initial conditions would also need to be taken into account, it does not seem to be a problem for the BDA. Design arguments based on the laws of nature and fine-tuning do not depend on their precise details, but just on the order in the universe as described by the laws and a sufficient amount of fine-tuning to make life possible. Arguably, the preconditions and laws of form would place further constraints on what sorts of laws of nature and values of physical constants would be needed and so could provide *additional* evidence for design.

I will not explore the explanatory cost here, but if the discussion regarding explanatory gain is correct, this would provide good evidence for design and so the burden of proof would lie with opponents to show that it was insufficient to outweigh the cost of inferring design. Hence, overall it seems to me that Kojonen has presented a persuasive case for the BDA. In particular, I think there is a good case that constraints that make evolution possible are not merely compatible with design or dependent on design in terms of the laws of nature, but provide evidence for design that goes beyond other design arguments. Just how strong the argument is depends on the strength of the evidence for the various constraints, the extent to which they are required for evolution to work and the extent to which they make it more likely that evolution would produce the sort of biological teleology that needs to be explained. Further scientific knowledge should shed more light on these questions. I will now consider some ways in which I think the case could be developed further.

CONTINGENCY, GUIDANCE, AND GAPS

Constraints on evolutionary processes are very relevant to debates about contingency in evolution. Many evolutionists, particularly Gould (1989), have emphasized the way in which evolution is contingent on events that have occurred during the history of life on Earth, whereas others, such as Conway Morris (2010), emphasizing evolutionary constraints, have argued that evolution has a direction and is perhaps even predictable to some extent. Kojonen notes that that this is an ongoing debate and that, “Most evolutionary biologists today seem to take the view that there is evidence

for both constraint and contingency in the evolutionary process” (Kojonen 2021, 130). No doubt, the constraints reduce the extent of contingency, but by how much? It seems likely that there is still a lot of contingency involved. For example, whatever constraints are in place, the history of life on Earth could still have turned out very differently if various mass extinctions had not occurred. Also, as Kojonen points out “uncertainties regarding convergence and the origin of life may affect the relative role of laws of form and the extent to which evolution is predictable, and they may affect estimates about overall purpose in evolution” (Kojonen 2021, 132).

Suppose new evidence comes to light to show either that the constraints on evolution are much more limited than Kojonen has argued. What impact would that have on his BDA? It seems clear that it would weaken it considerably. For example, given the criticisms of evolution by ID proponents, it is precisely the constraints, which make it much more feasible for evolution to produce biological teleology than would otherwise be the case, that enable his BDA to succeed. However, it is not clear that this is the right conclusion to draw. Why did Asa Gray think that evolution leaves design where it was before? According to Kojonen, it is because “Seeing the end result, Gray claims, is still enough to create a compelling case for design” (Kojonen 2021, 4). For Gray, the biological case for design does not depend on the means used by God as the designer and, in particular, whether God brought about certain outcomes via secondary causes or by acting in direct ways to guide the evolutionary process. However, for Kojonen the means used by God is central to his argument. He excludes Gray’s second option (direct guidance of evolutionary processes) as part of his BDA.

Interestingly, it is not that Kojonen excludes the possibility of God’s direct action in the world. He writes

In addition to setting up the process of evolution, God could well also be more intimately involved in directing the process, and all outcomes of the process could well be specifically intentioned by God, because of his foreknowledge of what results the contingent process will create. Moreover, nothing about the design argument as such prevents even divine interventions in the process. (Kojonen 2021, 153)

In fact, he even allows for the possibility that the origin of life was a “creative miracle” (Kojonen 2021, 127). However, his point is “that this invisible guidance and interventions do not play any necessary role in the design argument” (Kojonen 2021, 153–54).⁵ I would like to provide some reasons for adopting a view that is open to direct guidance as part of a BDA, and hence more similar to Gray’s approach to design.

To start with, I would suggest that there are no convincing scientific reasons for thinking that God does not act directly in the world in ways

that go beyond secondary causation. There are good reasons to think that special divine action of this kind does not conflict with scientific laws such as conservation of energy (see Plantinga 2011; Koperski 2021). In fact, Plantinga argues that in the context of quantum mechanics it is not even possible to say what an intervention is (Plantinga 2008). Alleged problems arise from determinism and causal closure, but these are philosophical or theological assumptions. I do not need to labor these points here since Kojonen has no objection to divine action of this kind as is clear from the passages quoted above. However, given this point, it seems to me that he needs to present good reasons for excluding such divine action from his BDA.

One reason he gives is that “the explanatory value of divinely guided mutations has been decisively rejected by mainstream evolutionary biology ever since Darwin” (Kojonen 2021, 155).⁶ However, there is no need to think that divine guidance—whether of mutations or anything else—should be adopted as part of evolutionary biology. If the BDA were being proposed as a new scientific theory that would indeed be a legitimate concern, but that is not Kojonen’s goal. As noted earlier, he proposes his BDA as a philosophical, not scientific, argument. Understood in this way, it is not difficult to see how divine guidance could provide additional explanatory gain since God could guide natural processes to bring about an outcome that would have been unlikely otherwise.

Closely related to this is Kojonen’s concern about the God-of-the-gaps. Does this present a problem for the idea that God might have acted to guide evolutionary processes? It is difficult to see how. My suggestion is not that God should be brought in to plug a gap in some otherwise well understood scientific process, but simply that divine guidance should not be ruled out *a priori* and so the defender of the BDA can keep an open mind as to what God might have done. Some might be concerned that God’s action in the world to guide evolution would contradict the theory of evolution, but again it is difficult to see why. If God’s action in the world does not conflict with scientific laws such as conservation of energy, as I have claimed above, why would it conflict with a scientific theory such as evolution? Of course, divine action would not be part of a scientific explanation, but it need not be in conflict with it either. As Elliott Sober has argued

there is no contradiction in their [theistic evolutionists] embracing a more active God whose post-Creation interventions fly under the radar of evolutionary biology. Divine intervention isn’t part of science, but the theory of evolution does not entail that none occurs. (Sober 2011, 198)

In any case, this cannot be Kojonen’s concern since he allows for divine action, but then why not allow for this as a part of the BDA?

When explaining why he does not appeal to divine action in his BDA, Kojonen writes, “God does not need to be directly responsible for every single detail of biological teleology, or to be the sole cause acting in order for divine design to be a central causal factor that explains the existence of biological teleology” (Kojonen 2021, 154). This seems correct, but does not undermine the idea that divine action, or at least the possibility of it, could be included as part of the BDA.

A further reason for being open to direct divine guidance as part of a BDA is simply that it might be what God has done. Many theistic evolutionists view evolution as a God-guided process, but how exactly is that to be understood? A straightforward way to make sense of it is to say that in addition to creating and sustaining the universe, and designing the laws of nature including laws of form, God also acts in the world to guide evolutionary processes to achieve certain ends. If it is possible that God has actually guided evolutionary process in some shape or form or on very rare occasions, it would seem prudent for the defender of the BDA to keep this option on the table.

Finally, there is nothing in this proposal that conflicts with Kojonen’s BDA, so there is no reason why it would not be possible to supplement his proposal in this way. In general, design arguments do not need to specify the mechanism used by the designer. It is the explanatory power of design to account for the explanandum that is the issue, not the means by which this is achieved. Of course, insofar as there is evidence for a particular mechanism, one can incorporate it into the argument and if the mechanism in question enhances the case for design, so much the better. This is the approach Kojonen has adopted and it seems very plausible. However, that may not be the whole story as far as design is concerned. There may still be significant contingency in the resulting process and here too design might have a contribution to make to further strengthen the argument. Essentially, the idea is that design provides an explanation for biological teleology that enhances explanatory gain. The preconditions and laws of form provide one means by which this gain could be achieved, while divine action to guide evolution provides a further means and potentially greater explanatory gain.

CONCLUSION

Many have argued, and perhaps many more have assumed, that there is a conflict between BDAs and evolution. By dealing with objections to design arguments and exploring the nature of evolutionary biology itself, Rope Kojonen has shown us why such a conclusion is much too hasty. To my mind, this is a significant achievement irrespective of whether his particular BDA succeeds. After all, one could have reservations about the

details of his argument, while also recognizing that there is the potential for new arguments of this kind.

So, does his argument succeed? I have attempted to explore and evaluate it as a conjunctive explanation that brings design and evolutionary explanations together to account for the purposeful order and complexity of living organisms. From this perspective, I have argued that he has presented a very plausible case which amounts to showing that design provides significant explanatory gain over and above an evolutionary account and hence, if that is right, his argument does succeed. Ultimately, the success and strength of the argument depend on the underlying science and so this aspect of his work merits further exploration and evaluation. Future developments in science should also shed more light on the argument. I have also suggested that a greater openness to direct divine guidance is quite compatible with his argument and might even strengthen it.

In my estimation, Kojonen has contributed significantly to rehabilitating biological design, and opened up interesting, new ways in which a design perspective might interact with ongoing scientific developments.

NOTES

1. Here, following Kojonen, the assumption is that evolution is accepted as an explanation, though of course, one could also approach the question based on the assumption that design is accepted.

2. A further aspect to explanatory cost concerns the extent to which evolution depends on design: the greater the dependence, the lower the cost. There are two different ways to explore Kojonen's argument in the context of conjunctive explanations depending on what exactly is meant by the term "evolution." Here, I have taken it to refer to a range of evolutionary mechanisms that would be limited in their ability to explain the relevant evidence were it not for additional preconditions and laws of form. Alternatively, it could be understood to mean a range of evolutionary mechanisms *plus* the preconditions and laws of form. Understanding it in the latter way would be very relevant to reducing the cost, but given my approach I will exclude it since that seems to involve double counting.

3. Kojonen also refers to this in terms of a causal chain (151) and that God as the ultimate explanation works through evolution (149). This would pose a problem for analyzing his argument as a conjunctive explanation if evolution screens design off from the explanandum (biological teleology), so that biological teleology would be probabilistically independent of design given evolution and this would mean that there would be no explanatory gain. However, this does not seem to be what Kojonen has in mind (see his discussion of explaining away, 151–52). If I understand him correctly, his view is that while design operates via evolution, it does so in such a way that the probability of biological teleology is greater when both design and evolution are taken into account. See also note 2.

4. This would place more emphasis on contingency, which could give rise to a different approach to design, see "Contingency, Guidance, and Gaps" section.

5. The use of the word "necessary" might suggest that his argument is indifferent between direct guidance and secondary causation, like Gray's argument, but this would be misleading since he rejects Gray's direct guidance option and all his focus in terms of the BDA is on secondary causation.

6. Divine guidance would not need to be restricted to guiding mutations, but presumably the same point would apply to other ways in which it might occur.

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