

A Response to Objections by Kyler Kuehn

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In August 2003, Kyler Kuehn provided a critical response to our presentation on *The Privileged Planet* at the annual meeting of the American Scientific Affiliation. At the time, Kuehn was at a disadvantage, since the book had not yet been published and his response was based on an incomplete manuscript of our book. In our opinion, the objections resulted almost entirely from a misunderstanding of our argument. We assumed they would be resolved in due course in light of the arguments and evidence in the book itself, so we did not think a written response was necessary. But Kuehn has since posted essentially the same critical response online, and at least one public conference. Thus, a brief response is appropriate.

The Basic Thesis

In *The Privileged Planet*, we argue, on the basis of a wide range of empirical evidence, that the places in the universe most habitable to complex life, such as Earth's surface, are also the best places, overall, to make a wide range of scientific discoveries, in areas as diverse as geology, astronomy, and cosmology. Ours is a cumulative argument that doesn't rest on any single example.

It depends on the premises that water is the best solvent for chemically-based life, and that carbon, for which water is most fit, is by far the best element for building biological organisms. Since the laws of physics and chemistry are universal, these insights into organic life on Earth allow us to apply what we learn about habitability on Earth to the universe at large. Environments elsewhere will be habitable largely to the degree that they are Earth-like.

Habitability is one pillar of our argument. So far as we know, Kuehn agrees with this part as does a sizable portion of the astrobiological community. The other pillar is the concept of measurability. Measurability, as we put it in the introduction, "refers to those features of the universe as a whole, and especially to our particular location in it—both in space and time—which allow us to detect, observe, discover, and determine the size, age, history, laws, and other properties of the physical universe" (p. xiii). We argue that the most habitable places are also the most measurable places, overall. To put it more technically, habitability correlates with measurability. Since our argument is intrinsically comparative, we compare our environment with other places in the universe, with respect to both their habitability and their measurability.

It's *crucial* to understand what we mean when we say that habitable environments provide the "best" environments for discovery. We're not referring to some Platonic concept of perfection. Nor are we saying that scientific discoveries are always easy, or that nothing could be discovered anywhere else (which would be absurd). Rather, we are referring to an optimal balance of competing conditions, which engineer and historian Henry Petroski calls *constrained optimization* in his book *Invention by Design*: "All

design involves conflicting objectives and hence compromise, and the best designs will always be those that come up with the best compromise” (Cambridge: Harvard University Press, 1996, p. 30). The best compromise will inevitably involve tradeoffs. In the introduction, we explain this concept with a familiar example, the laptop computer:

Computer engineers seek to design laptops that have the best overall compromise among various, conflicting factors. Large screens and keyboards, all things being equal, are preferable to small ones. But in a laptop, all things aren’t equal. The engineer has to compromise between such matters as CPU speed, hard drive capacity, peripherals, size, weight, screen resolution, cost, aesthetics, durability, ease of production, and the like. The best design will be the best compromise. Similarly, if we are to make discoveries in a variety of fields from geology to cosmology, our physical environment must be a good compromise of competing factors, an environment where a whole host of “thresholds” for discovery are met or exceeded. (*The Privileged Planet*, pp. xiv-xv).

To discover that the environments most hospitable to complex observers like us, are also the best places overall for making diverse scientific discoveries, is intrinsically interesting. If the universe were designed for discovery, this is what you would expect. If it were not so designed, you would not expect it. For this and other reasons, we conclude that the best explanation for this correlation is that the universe is designed for discovery.

Kuehn’s objections all seem to deal with this second pillar of our argument. So, with this summary as a backdrop, we’ll try to describe and respond to Kuehn’s criticisms. Since his objections exist only as slides, we’ll have to reconstruct them as best we can.

➤ *Habitability and Measurability do not warrant inference to design.*

We don’t know what Kuehn’s detailed argument is, so we can’t respond to it. But any empirical argument against the correlation between habitability and measurability will have to take account of the evidence we discuss in detail in the book. It will also have to address the many different and competing ways in which habitable environments are measurable, and of how we define optimality in terms of the constrained optimization of competing conditions. Pointing out that something could be discovered somewhere else is not a good argument.

➤ *Habitability and measurability cannot provide warrant for design.*

So far as we can tell, Kuehn’s criticism here is that our argument doesn’t follow the “explanatory filter” laid out in *The Design Inference* and other publications by philosopher William Dembski. Therefore, our argument doesn’t warrant the design inference.

Unfortunately, this implies that we rest our argument exclusively on Dembski’s rational reconstruction of the design inference. We don’t. Dembski contrasts “law” and “chance” with “design.” When considering causal explanations within the cosmos, which is

Dembski's concern, this makes sense. Within the natural world, designed events normally stand out against the backdrop of both law-like regularities and chance. In *The Privileged Planet*, however, we are concerned with whether the universe *as a whole* bears the marks of design and purpose, and that includes the laws and localized "chance" events that take place within it. It would be obtuse, then, to contrast the laws of physics with design, since the laws are among the very things we're interested in explaining. At the cosmic level, design contrasts with *logical* necessity, not the "necessity" of physical laws. ($2 + 2 = 4$ in every possible world. That's logical necessity. In contrast, there's no reason to suppose that gravity—or a counterpart to gravity—must have the same value it has in this world in every possible world). As a result, we revise Dembski's argument so that it can apply to the universe as a whole. Kuehn misses this, and attempts to shoehorn our argument into a framework we don't employ.

Chance also functions differently in our argument, again, because we're considering design at the *cosmic* level. We assume, for the sake of argument, that given the cosmic initial conditions and the laws of physics, the universe has enough probabilistic resources to produce at least one habitable planet stochastically. Our argument doesn't require that a habitable environment be a direct artifact of intelligent agency, as Newton argued in the *General Scholium* (that's always a logical possibility, of course, but we don't make that argument in the book). It also doesn't require that a habitable environment be strongly determined by the laws of physics (which obviously isn't the case, since most environments in the universe aren't especially habitable.) The artifact of intelligence, in this case, is the universe as a whole, a universe that exhibits a pattern of correlation between habitability and measurability. So we argue that even localized chance constrained by law doesn't prevent us from detecting design *at the cosmic level*.

It's important to note that we pursue a pluralistic strategy in arguing for design. We draw on Dembski's seminal insights but also on other ways of construing the design argument. First, we enrich Dembski's formal concept of specification, drawing on the work of philosopher of science Del Ratzsch and others. We describe our argument in terms of "likelihood," and also as an inference to the best explanation. So our argument for design is multi-pronged. The pattern of habitability correlating with measurability strongly favors "design" over "not designed," when these two are treated as alternative hypotheses. We think design is the best explanation, even though no such argument has the certainty of a deductive proof.

But even if we limited our discussion to Dembski's categories of complexity and specification, Kuehn's description of our argument would still be incorrect. He describes our argument this way: "Measurability provides the detachable specification (the target), habitability provides the complexity (the arrow)." This is a complete muddle. Complexity (or improbability) is relevant to our argument in this sense: Habitable environments, we argue, are quite rare in the universe. They stand out in relief against the much more common environments that are much less habitable. Similarly, environments that are as measurable as are habitable environments are also quite rare. As a result, we can compare such environments with the more common environments that are less habitable and measurable (overall).

The correlation between habitability and measurability is the specification. It's the pattern. To discover that habitable environments (i.e., environments compatible with observers like ourselves) are also the most measurable is an intrinsically interesting pattern. It's fishy. "Habitability" and "measurability" are distinct concepts. There's no *logical* requirement that these two properties must align in every possible universe. So, to discover that they are yoked in our universe is interesting. It's what you would expect if the universe were designed for discovery.

- *Measurability is not quantifiable. This includes such difficult to quantify things as human creativity, vagaries of research, and other sociological factors.*

There are lots of necessary conditions for making scientific discoveries—intellectual, sociological, religious, historical, physical. Some of these conditions are more tractable than others. In the book, we focus primarily on the various physical preconditions for measuring certain phenomena. These can be discussed apart from the vagaries of culture and sociology.

That said, there's no reason in principle that the physical preconditions for measurability can't be quantified. In fact, we do some quantifying of both habitability and measurability in the book. Moreover, experts will probably be able to develop more detailed quantifications in the future as more data streams in from such fields as astrobiology and physics. We take it as a virtue of our argument that it suggests new lines of inquiry, and quantifying aspects of the argument is one such line.

But even if we didn't offer any numbers, and failed to quantify measurability (which is different from saying it isn't quantifiable *simpliciter*), this is hardly a serious objection. Lots of things aren't easy to quantify, but they do important work nonetheless. So far as we know, there's no "habitability index" used in science, but astrobiologists still make lots of reasonable judgments about habitability. The lack of a strictly quantified concept of habitability doesn't prevent us from noticing the obvious truth that Earth's surface is more habitable for complex life than the surface of Venus. We can still reason with comparisons of "more or less" even where the comparison is less extreme. For instance, Mars and Jupiter are both terrible places for complex life, but no sensible astrobiologist would argue with the claim that a gas giant like Jupiter is even less habitable than Mars.

Similarly, even though we don't have an explicit "measurability index," we can still conclude that it's easier to do astronomy with an atmosphere that is relatively transparent to visible light than with one that is translucent or opaque. That should be obvious. It should also be obvious that if we never had a night sky, if our sky was always filled with the bright light of a nearby star, or obstructed by gas and dust in the nearby interstellar medium, astronomy would be more difficult. Similarly, if Earth had no magnetic field, or its oceans were much deeper, or its depositional processes much more chaotic, it would be much more difficult to reconstruct Earth's history and climate. The book is filled with such comparisons. The same holds when these features are considered for their effect on habitability.

Thus, just because we can't quantify, say, human creativity, doesn't mean we can't compare our ability to do astronomy, geology, and cosmology, with lots of other locations in the universe.

➤ *Some things are very difficult to observe (neutrinos).*

That's true, but so what? We argue that habitable environments provide the best overall locations for a diverse range of scientific discoveries. It doesn't follow that every individual discovery is easy (discovery wouldn't be much of an adventure if it were). We make this point explicitly in the book. In fact, we discuss the detection of neutrinos, and how much *more* difficult such detection would be around many different, less habitable stars than our Sun.

➤ *Many things are measurable essentially because of human ingenuity.*

It's perplexing that Kuehn makes no mention of our discussion of this issue. Quite apart from the role of technological ingenuity in scientific discovery, it's clear that a wide range of physical pre-conditions affect our ability to make scientific discoveries. If we lived in the very center of the galaxy, for instance, local and cosmic sources of radiation would be distributed evenly across the sky. As a result, it would be very difficult to separate the cosmic microwave background radiation from local sources of contamination. Likewise, if we lived in the distant future, the cosmic background radiation would be much more difficult to detect than it is now. These comparative arguments are true whether or not some unspecified technology might have allowed someone at some point to detect the background radiation in other situations.

Here and elsewhere, Kuehn seems to imply that our argument is binary: either something is measurable or it isn't. Since the book is filled with comparisons, however, rather than either-or arguments, it's hard to see how he could arrive at this assumption. Throughout the book, we treat measurability in degrees. Some places are more or less conducive to individual scientific discoveries. Some are more or less conducive to a diverse range of scientific discoveries. Our argument is that habitable environments are the *best* environments for the latter. Only at the limit would certain phenomena be strictly impossible to measure. So the fact that we use technology to improve our detection of certain phenomena is no objection to our argument. In fact, we argue that the ability to have high technology correlates tightly with habitability, which makes this objection doubly baffling.

➤ *What about inhospitable locations that still provide scientific opportunities?*

It should now be clear why Kuehn's supposed counterexample of Antarctica, which isn't very habitable, but provides some important scientific opportunities, isn't a sound objection to our argument. Once again, it misses the crucial concept of *constrained* optimization. Our habitable environment provides the best overall setting for scientific discovery. Our primary environment is Earth's surface. But habitability and measurability

still vary considerably even across Earth's surface. Solar eclipses are only visible along the path of the eclipse. Stars are more visible on tall mountains on clear nights. Ice cores are only available near the poles. The plate tectonics that form mountains and recycle carbon, and the temperature variability between equator and poles contribute to our planet's habitability in fascinating ways we discuss at length in the book. And such environmental diversity allows us to make different kinds of scientific discoveries much more easily than would a less diverse and less habitable planet.

We actually offer a stronger (apparent) objection than Antarctica in the book itself. We provide numerous examples of places other than Earth's surface that are actually *better* for isolated scientific discoveries. For instance, we could more easily detect the cosmic background radiation from intergalactic space. But there would be many things we could never discover in such a setting, so it's not a good trade off. These settings, we argue, are nowhere near as good overall for scientific discovery.

Conclusion

In chapter 16 of *The Privileged Planet*, we discuss fifteen possible objections to our argument. These are the fifteen strongest objections we could think of. Any fair criticism, then, should first take account of our responses to these objections. Kyler Kuehn's objections don't do this. In fact, they all stem from a basic misunderstanding of our argument. We hope future responses will show more evidence of grappling with our actual argument, and the evidence we marshal in support of it.