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Article

Cosmogenesis, Complexity, and Neo-Natural Faith in the Context of Astrobiology

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Abstract: It is fair to say that religion, and in particular the ways in which some Christian and Islamic thinkers have again begun to encroach on the domain of science (e.g., global warming, the teaching of evolution), has caused a great deal of consternation within the scientific and philosophical communities. An understandable reaction to these developments is to reject out of hand even the slightest taint of religion in these fields—a position that has now attained the status of orthodoxy, at least in the western world. This is curious on its face, given the fact that religion has clearly provided a sense of meaning and purpose for most of our fellow humans as long as there have been humans pondering such things. Moreover, it is probably not necessary, provided one is very careful what sort of faith one endorses. Thus, the basic question I wish to address here, albeit in a very preliminary fashion, is whether it may be possible to delineate a form of faith that can inspire and guide humanity without the metaphysical baggage that causes conflict with epistemically conservative disciplines like science. To that end, I examine one recent thread within cosmology that views the universe as *creative* in the sense that it is biased towards the production of ever-increasing complexity at its edges. If that is true, it gives those so inclined permission, as it were, to view the creation of complexity (including human culture and its products) as a moral good (perhaps even an imperative) without the assumption of supernatural entities with mysterious motives and goals. After arguing that there is indeed logical space for such a faith that does not impinge on the essential commitments of either science or philosophy (properly conceived) I will examine its potential use in framing some of the emerging debates concerning space exploration. The prospect of humanity venturing beyond our homeworld in the near future offers an excellent case study of this “neo-naturalism” in action for two basic reasons. First, it seems likely that such a massive and complex undertaking *needs* a motivational source beyond mere discovery and expansion. Second, a neo-natural faith may influence how we go about this, and not always in ways those steeped in more traditional approaches to religion would predict.

Keywords: neo-rationalism; astrobiology; Martian; complexity; diversity; anthropocentrism; moral; ethics; alien; life

1. Introduction

The basic claim of this paper is that there are good reasons for both science and religion to compromise on their traditional positions, as well as logical space for such compromise to result in a new kind of “neo-rational” faith.¹ As with any faith claim, the truth of neo-rationalism is not established by the empirical evidence. However, unlike traditional religions, it is specifically designed to be completely consistent with our best scientific knowledge, both now and in future. After laying

¹ I use “neo-rational” in an attempt to distinguish this from natural theology and other movements.

out the basic motivation for neo-rationalism, I will turn to the new science of astrobiology to show neo-rationalism's potential to help us think about the many social and ethical issues this field brings to the fore. To be clear: My goal is not to advocate for the adoption of neo-rationalism, but merely to invite further, hopefully productive, discussion along these lines.

I was trained as a philosopher of science and evolutionary biologist and spent the first 20 years of my professional career either ignoring religion altogether or fighting with those of its adherents who chose to get in the way of science (Smith 2012). If someone had suggested to me just 6 years ago that I would be putting forward a faith claim as anything other than a joke, I would have found this amusingly ridiculous. But it's hard to predict one's intellectual development and my work in astrobiology has caused me to reassess many of my previous positions, since it is simply not possible to contemplate the possibility of life beyond Earth without treading on ground traditionally reserved for faith. My work in this new field has brought me into contact with many theists and fostered some truly illuminating discussions. For example, a rabbi once asked me why I chose to make reason rather than love the sine qua non of moral value (something I am still pondering) and I have been impressed with the highly abstract concept of God expressed by some Catholic theologians working on the search for alien life. From such experiences, as well as my own personal exploration of Buddhist thought, I have come to the conclusion that faith traditions can do much to enrich science. No doubt this revelation is underwhelming to the readers of this particular journal, but I submit that the fact it took me so long to learn this simple truth says a lot about the dysfunctional nature of the discourse between science and religion at present.

Elsewhere, I have written about these ideas for social scientists (Smith 2015) and the physical scientists and engineers who compose the bulk of the space science community (Smith Forthcoming), but here my aim is primarily to address the faith community. This is a new experience for me, however, and thus I must beg the reader's indulgence with what will undoubtedly be many imprecisions and oversimplifications. If, despite these shortcomings, the tentative ideas I put forward here inspire further discussion and debate, the experiment will have been a success.

2. Where Science Goes too Far

Though my primary target here is not the scientific community, I want to briefly outline some of the points I have thrown in their direction. Scientists like to believe they are engaged in an objective search for truth about the natural world and that their work is free of the taint of unsupported assumption. While I certainly agree that science is a uniquely powerful tool for uncovering natural truths, it is simply not true that it sidesteps all philosophical assumptions that might tempt someone to use the term "faith". Consider that science is simply not possible without the assumption that the world is a *kosmos* (a system which can be understood by human reason) and also that science is up to this task. There is, in principle, no way to establish such a claim empirically, but it is absolutely integral to science as there would be no point in dedicating one's life to explaining the inexplicable. More technically, science is an inherently *inductive* enterprise and, as such, suffers from the famous *problem of induction* (Henderson 2018). I do not wish to take up space here recreating this argument in detail, so will just jump to the punchline: scientific induction is not logically possible without the assumption that the world we observe today is representative of the world everywhere and always. Since that assumption simply cannot be supported using the methods of induction, science is therefore reliant, *in principle*, on faith of a certain sort. This is really not a controversial point, though few scientists appreciate its significance.

Some radical theists make much of this kind of argument, claiming that it shows science is ultimately just another form of religion (Behe 1996). While this is true in a sense, it is also quite misleading. As Immanuel Kant argued decisively (Williams 2017), human reason will never get very far without making *some* assumptions—where would we be if, for example, we refuse to believe that deductive logic is reliable - how could we ever establish the validity of logic without the use of logic? On the other hand, science is careful to adopt only the *minimal* set of assumptions it needs to make

sense of the world around us. It is thus a religion only in the sense that *all* human attempts to explain are religions, and is quite different from traditional religions, which are much less circumspect about the faith claims they allow. Put another way, the difference between science and religion is not the existence of what might be called faith claims, but rather their nature and extent.

The bottom line is that, while science is the best tool humans have discovered for revealing truths about the natural world, it is ultimately merely an extremely useful *heuristic*. It cannot, in principle, provide all the answers humans are driven to seek. There is absolutely nothing wrong with this, even if scientists who do not understand the limits of their own discipline are apt to become defensive on this point—as when prominent scientists disavow all faith claims as inconsistent with science (Dawkins 2008). While the scientist is well within her rights to oppose a specific faith claim that conflicts with scientific evidence, or to highlight the lack of evidence for faith claims in general, or to warn about the indirect threat that faith in the supernatural can pose to scientific methods; disavowal of *all* faith claims requires one to go beyond the available evidence. In essence, the rejection of faith *in general* is ultimately a different sort of faith claim.

3. Where Religion Goes too Far

Unlike science, religion is explicitly focused on the big questions and has no problem with faith claims. Indeed, this is the central difficulty with religion, at least how it is traditionally thought of in the West: it has no problem with faith claims, though it should. The danger of faith claims is not that they are necessarily wrong. The real difficulty is that believing in things which are, by definition, disconnected from evidence ensures such claims will multiply in unmanageable ways—if it's legitimate to believe one thing without sufficient evidence, why not another? Moreover, traditional religion is, unlike science, largely in the business of building a *social* movement, not an epistemic system. To appeal to the broadest audience, religion collectively tends to adopt a permissive and inclusive view towards faith claims of every possible stripe. This dynamic is exacerbated by the fact that religions tend to rely on sacred texts that cannot simply be rejected (for political reasons if nothing else), even when educated believers come to see them as outdated. So, while the believer has a point when she suggests the scientist must examine her base assumptions, the scientist also has a point that it's hard to take religion seriously when it makes little concerted effort to disassociate itself from its most problematic claims.

I don't mean that there are no specific religions that can be endorsed by reasonable people, or more specifically that it's impossible to be a believer and also practice good science. But most religions incorporate belief in supernatural beings and forces as integral elements of faith. Even those which do not, such as traditional Buddhism, are still religions and thus have a tendency to evolve in this direction (as evidenced by the growing popularity of Tibetan and Pure Land variants). This is something that science simply cannot countenance because of its corrosive effect on the scientific enterprise. The bottom line is that, to the extent supernatural "explanation" is considered legitimate, the motivation for doing the hard work of scientific investigation is diminished—why spend multiple lifetimes attempting to answer questions that can be answered with supernatural shortcuts? Moreover, while it may not be strictly necessary for this to occur, history seems to establish that, once supernatural forces are accepted, metaphysical claims tend to proliferate in ways that pose major problems—especially but hardly exclusively for the scientific investigation of the natural world. This is the real crux of the dispute between science and religion—while science cannot completely avoid its own empirically unsupportable (faith) claims, it simply cannot countenance supernatural explanations of the natural world. To be clear, this is a methodological necessity rather than a metaphysical one—it's not that

such forces are not possible,² simply that accepting them without sufficient evidence undercuts the scientific heuristic in a fundamental way.

If science already involves faith claims, and not all such claims pose the kinds of problems that supernaturalism does, then it seems there is logical space for a compromise. So below I put forward a neo-rationalist faith that might allow us to have our metaphysical cake and eat it too: providing a broad basis for human meaning and purpose, while still allowing rational investigation of the natural world free rein.

4. A Creative Universe?

Before we discuss the nature of that compromise, let's consider some important recent developments in science that help motivate it. There is a very old tradition (in both science and religion) which views the universe as a system which generates increasing "complexity" over time. It's not difficult to tell a compelling science story along these lines:

As the universe cooled following the big bang, fundamental particles (e.g., quarks, leptons) came into being, which then joined to form larger subatomic particles (e.g., electrons, protons), which in turn came together in atoms. Atoms formed molecules, which aggregated under the force of gravity to produce large scale objects (e.g., stars, solar systems, and planets). Some collections of specifically situated molecules (e.g., organic soups on the surfaces of planets) transitioned into autocatalytic systems, which manufactured new chemical compounds (e.g., complex organic molecules). Some of the resulting chemical systems transitioned into living systems subject to evolution by natural selection and, in the fullness of geological time, evolved into excruciatingly complex ecosystems. At least one such ecosystem gave rise to intelligent beings and their attendant social and cultural systems. These cultural systems exhibited new dynamics via cultural evolution, which eventually led to the development of science, religion, and the kinds of conceptual debates that are published in professional journals such as this.

There are excellent reasons to think this account is true, at least in broad strokes—the vexing question is what, if anything, we are to make of this pattern. The standard view in science is that there is nothing more we can say—this is simply the way things worked, and we do not have evidence to say anything more at present. However, there is a nascent scientific movement that thinks this pattern of increasing complexity demands an attempt at explanation even if this requires more speculative moves than science is generally comfortable with. It spans several disciplines, from physics to chemistry to information science and is so new that there is not even a shared vocabulary yet, so it goes by various names: the epic of evolution, big history, cosmic evolution, etc. (Brown 2018; Chaisson 2002; Polkinghorne 2001). The basic hypothesis is that the universe has an unknown structure which naturally manifests increasing levels of complexity over time through an evolutionary process. Recently, some biologists have provided material support in the form of a candidate for the first true natural law in biology: the zero-force evolutionary law, which predicts that increasing complexity is a universal, and entirely predictable, property of all evolving systems, even in the absence of natural selection (McShea and Brandon 2010).

To be sure, the extent to increasing complexity, either for the universe in general or for living systems in particular, is a real phenomenon at all, much less one that can or should be explained, is debatable. But for our present purposes, it suffices to say that this *creative universe hypothesis* is at least perfectly consistent with the facts as we know them (Barrow and Tipler 1988; Conway-Morris 2003; Smith 2014). If this hypothesis is correct, it means that the universe produces the kinds of complexity we see all around us, including our scientific culture, in a perfectly natural fashion. This is especially

² As I tell my students, it is not difficult to get a philosopher to admit that almost anything is *possible*, but that's just the beginning, not the end, of the conversation.

important because one major motivation for supernatural beliefs is the feeling that the complexity we see in our universe requires a supernatural *designer*—an argument the proponents of intelligent design creationism in particular have made much mischief with (Pennock 2001). But with the complex universe hypothesis, there is no more need to postulate supernatural forces to explain our existence than to explain the formation of crystals in a supersaturated solution—under the right conditions, such things happen spontaneously. At the moment, it's fair to say this hypothesis is on the speculative edge of science—in particular, there are a number of empirical and conceptual problems that have yet to be resolved. To illustrate, I will briefly outline two sorts of challenges in need of further analysis.

The first issue has to do with the meaning of “complexity”. Complexity is complicated. We all have an intuitive idea of what complexity means when we say the universe seems to be getting more complex, which is what causes us to nod approvingly as we read the story about the unfolding of a complex universe above. However, it is extremely difficult to cash out precisely what is increasing, particularly if we demand that our definition allow for scientific testing. Scientists who discuss complexity trends thus tend to impose an operational definition that suffices for the study at hand but does not fully capture our intuitions. For example, the Shannon–Weaver notion of “information” is well understood and can be measured in concrete ways (Shannon and Weaver 1949), but it's not really what we mean when we say the universe is becoming more complex. The basic problem is that Shannon–Weaver has no way to distinguish between important and trivial information, so we can easily construct an information dense structure by, say, throwing a handful of pebbles on the ground. This problem is still unresolved, though recently the idea that we should not focus on static complexity so much as the capacity of a system to *generate* complexity over time has been gaining ground, especially with respect to living systems (Joyce et al. 1994; Smith 2018).

The second issue has to do with how science should *interpret* a trend if one could be established. It is certainly possible to identify a trend without explaining it. A thoroughly empirically minded scientist might thus say, “We just happen to live in a universe which just happens to become more complex—so what? Anything more you might wish to make of this will go beyond the evidence and is thus no longer science”. While it is true that we can interpret this as simply a brute fact about the universe, it is also true that it cries out for explanation—in particular, an explanation for the complexity around us seems precisely the kind of thing that could ground a sense of *meaning* in an otherwise cold and impersonal universe. True, science is not traditionally in the business of finding meaning, but at best this observation establishes that science should remain neutral on such questions, not that such speculation is inappropriate in general.

Another way to put this point is that science should not make the extreme rationalist claim William Clifford (1877) put so famously, namely that: “*it is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence*”. It's one thing for science to insist that scientists must not give in to the impulse toward unfounded belief when they are acting as scientists, or even that others should refrain from unfounded beliefs that will indirectly impact science's progress, but it's another thing entirely to insist that we should never, under any circumstances, accept such beliefs. If nothing else, such a strong admonition is simply not possible to follow, given that our curiosity will always outstrip our knowledge. The reason scientists so often go too far here is that they have failed to grasp the basic nature of their own discipline: science is a very powerful heuristic for exploring the natural world, but it is not an ultimate arbiter of truth. If we are clear about that, then we are free to go beyond scientific evidence as long as we acknowledge what we are doing and take care not to damage science in the process. So, if one chooses to overlay the fact of increasing complexity with a faith claim that supports a sense of purpose and meaning, science should have nothing to say about this one way or another.

Of course, it's important to keep in mind that a defense of the possibility of a scientifically neutral faith claim is not a defense of *all possible* faith claims. But science can't be about refuting *all* faith claims, since it incorporates some of its own. Therefore, a thoughtful scientist should focus on two key questions:

1. Is this faith claim *useful* for some legitimate purpose (scientific or otherwise)?
2. Is this faith claim *consistent* with science (directly or indirectly, now or in future)?

5. Neo-Naturalism

Thus far, our discussion of faith claims has been rather abstract, so let's get specific. I wish to suggest that there is logical space between religion and science, as traditionally conceived, for a neo-natural faith based on two central beliefs:

1. The creative universe hypothesis is correct
2. The complexity thus created is morally *good*

As discussed above, the first is a perfectly legitimate scientific hypothesis, if a speculative one. The second is a *normative* claim which deals with non-empirical values and thus not the concern of science per se. That also means it's not *inconsistent* with science, of course. Certainly nothing compels us to believe either claim—doing so is a choice we are free to make or not and thus an act of faith in the most general sense (belief in things for which there is inadequate evidence).

If we are not compelled to believe these claims, why should we? The reason is deeply pragmatic: because doing so opens the door to deriving meaning and purpose from the natural universe. If the universe creates complexity and this is good, then perhaps we should adopt a sense of *reverence* for the universe in general and its complex creations in particular. Such a view also provides at least a broad guide for human action: all else being equal, we should strive to preserve and foster complexity. Of course, providing meaning and purpose is not a traditional concern of science, and thus scientists are within their rights to refuse to get involved. On the other hand, if they go this route, they should not be surprised when others stubbornly seek such things elsewhere.³

Unfortunately, both sides tend to present this as a zero-sum choice. In general, traditional religions are focused on meaning and purpose, so favor faith claims over empirical evidence. When those claims embrace supernatural claims, they should expect many to react by adopting a view of science that rejects all faith claims. Traditional science argues that natural truth is what matters, so favors empirical evidence over faith. If that means that no claims capable of supporting meaning and purpose are ever sanctioned, they should expect many to react by choosing the time-honored alternative of supernatural religion. In other words, by refusing to countenance a middle ground, the two sides ensure a continuing zero-sum struggle⁴. To paraphrase Berkeley (1734): "*they first raise a dust, then complain they cannot see*".

Neo-rationalism, on the other hand, is explicitly designed as a middle ground between these two warring camps. But it does require each side to compromise on some of its traditional positions, which means it will inevitably encounter the problem all compromises face—to be opposed by both extremes. Science must come to appreciate its own basis in faith and eschew the extreme position that it is improper to believe in *anything* for which there is insufficient evidence. Of course, it's perfectly fair to insist that we assess faith claims first and foremost in light of their consistency with the scientific enterprise, since science clearly provides a service of incalculable value. But if a *particular* faith claim is consistent with science and provides important benefits (e.g., psychological comfort, ethical direction), then science should at the very least remain neutral. Indeed, given the consequences of ignoring critical human needs, perhaps it should consider a guarded endorsement of some of these claims. Put another way, science should consider putting at least *some* effort into providing metaphysical and ethical direction instead of focusing exclusively on epistemology.

³ Consider, for example, the spectacular failure communism encountered when attempting to eliminate faith in favor of science.

⁴ This dynamic is reinforced by the structure of the disciplines as well. For example, the author gets pushback from both science and religion publications (though in completely opposite ways) for suggesting that their approach to faith is problematic. This makes it difficult to even have a conversation about a middle that is not simply preaching to the choir, as it were.

For its part, religion must do a much better job of policing its faith claims and, in particular, eschew supernatural beliefs that are inconsistent with science. This does not necessarily mean an end to *all* supernatural belief as it is possible to accept supernatural forces - even allow them to explain very broad features of the universe—without stepping on scientific toes. For example, if one identifies as a creationist, but means by this only that the universe was created by God (rather than that God intervenes in its processes in an ongoing way), then there is little for a thoughtful scientist to complain about—at least, to the extent they are speaking *as a scientist*. But this is an unstable equilibrium that the average believer is ill-equipped to maintain, so religion must develop a robust critical culture, with specific enforcement mechanisms and processes similar to what is practiced in science, in order to police itself. There is nothing inherently wrong with faith claims, but faith itself is not a *justification* and thus all faith claims must be open to revision in light of new evidence. Should cosmologists one day establish that the complex universe hypothesis is wrong, or that its mechanism is not the right kind to support normative claims, then neo-rationalism as described here will have to be abandoned. In other words, religion must begin to take its epistemic duties as seriously as its metaphysical and ethical ones.

No matter what direction one approaches the question from, human choice is always a critical element in the creation of meaning and purpose. Empirical evidence has a role to play—indeed, a more important one than professional ethicists typically appreciate—but claims about how we should see ourselves and our ethical obligations will always go beyond the evidence. Indeed, persistence in spite of the evidence is often seen as a *virtue* of such commitments. Consider a story about the late senator Edward Kennedy: an aide approached him on the beach one day amidst dozens of star fish that had been stranded by the receding tide. As Kennedy picked each one up and threw it back into the sea, the aide asked him why, since it would not really make any difference. Throwing another one back, Kennedy observed, “It made a difference to that one”.

6. Neo-Rationalism in the Context of Astrobiology

Astrobiology is the search for life beyond Earth. As the newest scientific discipline, it has made enormous progress within just the last 20 years (Schulze-Makuch 2019). The general public is not yet aware of this, however, and still thinks of any speculation concerning alien life as the stuff of science fiction. Yet NASA’s chief scientist, Ellen Stofan, predicts that we will likely have evidence of life beyond the Earth within the next 20 years (Netburn 2015)⁵. The prospect of such a momentous discovery has focused attention on an array of social and ethical issues that the discovery of life beyond Earth would immediately raise. These cry out for more sustained inquiry—a challenge scholars beyond the confines of the space sciences are just beginning to address (Dick 2018; Schwartz 2020; Smith and Mariscal 2020).⁶

Whatever religious and ethical systems we adopt in future, expansion into space will pose fundamentally new challenges and require much more inclusive perspectives. While some traditional faiths will no doubt evolve and survive, neo-rationalism has the advantage of being specifically designed for this purpose. Consider, for example:

1. Its two main faith claims are about the universe in general and are not tied to this particular planet, much less any particular beings on it. In fact, it’s the broadest possible natural framework one could adopt, since it adopts the viewpoint of the entire universe.
2. It is, and will continue to be, completely consistent with our best science.

To flesh these claims out, let’s examine a few specific issues that have long occupied ethicists. First, there is the problem of anthropocentrism—the belief that humans have *unique* moral value *simply*

⁵ To be sure, some scientists think this is overly optimistic, but the point here is simply that there are good scientific reasons to make such claims.

⁶ For example, the author is currently president of the *Society for Social and Conceptual Issues in Astrobiology* (SSoCIA), which is working to create a highly interdisciplinary community of scholars to examine these questions.

because they are human. That this has been a common view even amongst sophisticated ethical theorists for most of recorded history. However, one would be hard-pressed to find a secular ethicist these days who would actually defend this position, largely because they accept the natural account of human origins which makes humans simply one of many different lifeforms, all of which share a common history. In religious ethics, the situation is more complex, since for some it's an explicit article of faith that humans were specifically created as morally unique. But despite this, modern religious ethicists are far less willing to assert strong anthropomorphic views of moral value than they used to be. We have therefore made real progress here, though simplistic anthropocentrism remains a common view among the lay public in general, and believers in particular.

However, if one embraces the promise of astrobiology—that the universe is teeming with life—then anthropocentrism becomes (almost) impossible to defend. If humans are not simply one of many forms of life on Earth, but instead one lifeform amidst a vast multitude spread across a stupendously expansive universe, how can we continue to believe humans are truly morally *unique*? It seems at best we might claim to be members of a special club, along with all the other species which have the requisite moral essence (whatever that may be—intelligence, sociality, etc.).

Discovering life on another planet would force us to reconsider many other common moral assumptions. On Earth, for example, ethicists defend the moral importance of environmental protection for very different reasons. Some argue that all life on Earth has *intrinsic* (independent of any utility to humans) moral value⁷, while others argue that the moral value of life is *instrumental* (a function of their value to humans—whether in terms of the connections within our shared ecosystem or the scientific and aesthetic value humans place on them) (Zimmerman and Bradley 2019). At the moment, proponents of these very different theories of value tend to converge on the conclusion that we should preserve the environment, at least in general. To some extent, this applies to the planetary protection questions that arise when humans visit other, potentially life-bearing, worlds as well. Should we discover life on Mars, for example, most reasonable commentators support strong rules to ensure environmental protection. Whether we believe such life is intrinsically valuable in its own right or wish to preserve it for the enrichment of our scientific knowledge, we can all agree that we should take great care not to contaminate it. What happens, however, once we have scratched our initial scientific itch?⁸ Those with an intrinsic value view will argue that nothing has changed and we should continue to preserve alien life from human encroachment—a sentiment famously captured by Carl Sagan's claim that "Mars belongs to the Martians", forever and always, even if the Martians are merely microbes (Sagan 1985). But those with an instrumental approach will begin to peel away, arguing increasingly for exploitation of the resources of Mars for human ends, even if this causes harm to the indigenous lifeforms. On any world beyond Earth, there will be no shared ecosystem pushing these two sides to converge on sustained environmental protection.

Neo-rationalism, however, allows us to think about moral value in a novel way. For example, we already tend to believe in the value of diversity—all else being equal, rare and unique things are considered to be more valuable and richly diverse systems are prized (Rolston 2020). In much of the current literature, this is presented as simply an intuition. But a neo-rational perspective offers a novel explanation: diversity is essential for the creation of things which have moral value. It's not that diversity serves human interests or has intrinsic value, but instead that it is the central ingredient in evolution. Evolution simply cannot take place if there is no diversity and (as far as we know) evolution is the only means of producing complexity of the sort we value.⁹ If we choose to view ourselves as members of "team complexity" who should assist in the universal creation of complexity, we must

⁷ Though, ironically, this concept was originally employed by Kant to draw a clean distinction between humans and other animals.

⁸ Or, alternately, found ways to continue scientific study of such life while also exploiting other opportunities—for example, by creating in situ "wilderness areas" or cultivating it in the lab.

⁹ Leaving aside second order creation of complexity (e.g., artificial beings) by beings who themselves evolved.

value not just complex things, but also the *processes* which make them possible. Therefore, diversity has moral value by virtue of its central role in the process of creating complexity.

This gives us a powerful reason to value Martian microbes that has nothing to do with human self-interest. And, unlike intrinsic value theory, it also allows us to manage complex moral tradeoffs. For example, while it is certainly true that Martian microbes have significant moral value by virtue of being complex lifeforms, it does not necessarily follow that we should adopt Sagan's recommendation. For one thing, because *human* social development is also an example of morally valuable complexity, preservation of alien life may not take precedence over the establishment of a human settlement that would further social complexity. Thus, we could in principle justify interference with Martian life if there were sufficiently compelling reasons to do so (Smith 2016). I certainly don't mean to suggest that these decisions will be easy ones, merely that neo-rationalism provides a new and potentially useful framework within which to explore the tradeoffs involved in a systematic fashion.

Finally, neo-rationalism may allow us to establish a better theoretical foundation for our existing intuitions concerning the value of non-living things, especially if they are rare or unique. For example, most would allow that the Olympus Mons volcano on Mars (arguably the largest in the solar system) has moral value of some sort. While we can probably all agree that we should not destroy such things for no good reason, some will argue that they should always be preserved and others will be more willing to compromise, especially when important human interests enter into the equation. Right now, it's hard to adjudicate between these raw intuitions, but neo-rationalism might be able to help. A universe with Olympus Mons is more diverse, all else being equal, than a universe without it. Thus, we have a clear *prima facie* duty to protect it, though such duties are defeasible. Volcanoes are complex, but unlike living things, they do not have the capacity to create more complexity. Their value is static, consisting entirely of their present complexity and thus their destruction will not reduce the range of *future* complexity. From a neo-rationalist perspective, therefore, non-living things have value, but generally much less than living and other systems which actively *create* complexity.

7. Conclusions

It would be nice if we could have our metaphysical and ethical cakes and eat them too—if we could, on the one hand, retain the scientific worldview with its unprecedented ability to explain the natural world, while on the other hand adopt a wider perspective which grounds a sense of meaning and purpose of the sort religions have historically provided. This is the task neo-rationalism sets itself—developing a new perspective that fuses science and faith, revealing that we are neither accidents of an uncaring universe nor products of an intelligent Designer, but rather the creation of a natural universe that transcends our own individual existence.

Again, it is not my intent to argue for the adoption of neo-rationalism so much as foster what I hope will prove to be a productive debate along new lines. Certainly, neo-rationalism as discussed here is the merest sketch of a faith system, though it does at least show that such a system is possible. It may not survive the test of time, either because empirical discoveries force us to reject its basic tenets or because people are psychologically unable to walk the razor's edge between natural explanation and metaphysics without falling off on one side or the other. For now, however, I choose to have faith in the possibility of fruitful compromise between science and religion along these lines.

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