rain and cold away by wishing it so. We must use what is available in our environment to bring about the ends we desire. More generally, products of design are usually easy to identify because they fulfill needs humans have and come from whatever materials are available to humans. If a being has no needs and no obstacles—if it never lacks anything and is never constrained in bringing about what it wants—then it becomes very hard to see what does and does not count as a sign of its activity.

Theists cannot say it was likely that God created a world like ours because it was necessary to create it. They would be denying God's absolute freedom not to create. Creation is an act of God's grace; it is in no way compelled. Indeed, according to some theologians, this is part of what it means to say that God created the world ex nihilo.

If not these reasons, then what reasons can traditional theists give for thinking God would likely create a world like ours? Proponents of the fine-tuning argument tend to give the same answer. Typically they say that a world with life in it—more specifically, intelligent life—is a very good sort of world. Such a world is said to be good for a variety of reasons: because life itself is good, because intelligent life is good, because intelligent life with the capacity to enter into a meaningful relationship with God is good, and so on. God, being perfectly good, is likely to create a world that is good. Because a world like ours is good, God is likely to create it.

There are many problems with this line of response. Here are two. First, if the goods alluded to require the creation of beings distinct from God and if God by his very nature brings about as much good as he can, then we are back to our earlier problem: God's creation is necessary, not free. God will have to create a world like ours on pain of no longer being perfectly good. That is not going to sit well with many traditional theists. Second, if God created this world because it is a good sort of world, it stands to reason that God would create not just a good world but the very best possible world. It seems, however, that, our world is not the very best possible world—given the great evil in the world. Saying its goodness is the reason God would probably create a world like ours raises the problem of evil all over again.

TAKING STOCK OF THE FINE-TUNING ARGUMENT

Cosmic fine-tuning is certainly a fascinating phenomenon. Atheists can agree with theists that there is something strange and awesome about it. Nonetheless, there are grave problems in arguing from cosmic fine-tuning to the existence of God. First, it is unclear whether cosmic fine-tuning is improbable. Second, the multiverse hypothesis explains cosmic fine-tuning without bringing God into the picture. Third, traditional theists cannot say with confidence that God is likely to create a life-permitting physical universe such as ours. For these reasons and others, it seems the phenomenon of cosmic fine-tuning gives theism no advantage over atheism.

THE ARGUMENT FROM DESIGN: BIOLOGICAL COMPLEXITY AND INTERDEPENDENCE

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FUNCTIONAL INTEGRATION IN THE LIVING WORLD

The argument from design is one of the oldest and most venerable attempts to use evidence from the observable universe to infer the existence of a deity. Rhetorically, the most potent version of this argument relies on the living world, especially the apparent fit or adaptation between organism and environment. This fit was taken to be evidence of a deity's work in creating the universe. Charles Darwin's and Alfred Russel Wallace's mechanism of natural selection provided an alternative explanation of adaptation, one that naturalized adaptation without recourse to extranatural causes such as inferred deities. This rejection of the argument from design was central to evolutionary theory's nineteenth-century challenge to Judeo-Christian-Islamic theology and continues to be debated by theists and their opponents in the twenty-first century.

That adaptation is present in the living world has been recognized in the Western intellectual tradition at least since the age of Aristotle. By the nineteenth century Western naturalists exploring the world tended to find adaptation everywhere. For example, neotropical sloths have often been regarded as the most ungainly of animals. They were first systematically studied in the early nineteenth century by the English naturalist and traveler Charles Waterton. In his 1825 travelogue, *Wanderings in South America*, Waterton observed:

> On comparing [a sloth] to other animals, you would say that you could perceive deficiency, deformity and super-abundance in his composition. He has no cutting teeth, and though four stomachs, he still wants the long intestines of ruminating animals. He has only one inferior aperture, as in birds. He has no soles to his feet, nor has he the power of moving his toes separately. His hair is flat, and puts you in mind of grass withered by the wintry blast. His legs are too short; they appear deformed by the manner in which they are joined to the body; and when he is on the ground, they seem as if only calculated to be of use in climbing trees. He has forty-six ribs, while the elephant has only forty; and his claws are disproportionably long. Were you to mark down, upon a graduated scale, the different claims to superiority amongst the four-footed animals, this poor ill-formed creature's claim would be the last upon the lowest degree. (1973 [1825], 5–6)

But, as Waterton perceptively observes later in the book, however, these initial judgments are misleading: "This singular animal is destined by nature to be produced, to live and die in the trees; and to do justice to him, naturalists must examine him in his upper element" (1973 [1825], 93). From an arboreal perspective, the sloth's apparent malformations can be recognized as adaptations for a life largely spent hanging from branches. Waterton proceeded to give the first reasonably accurate description of its natural history and took the Comte de Buffon to task for assuming that the sloth must live its life in misery because of the poverty of its design. Modern research largely vindicates Waterton's judgment (Sarkar 2007).

THE DESIGN ARGUMENT

What explains the sloth's adaptations, all the more impressive because they initially appear to be a bundle of malformations? The theological answer is the existence of a deity qua designer of adaptations. While versions of the design argument date back to Plato (Ruse 2003), it was most famously elaborated by the natural theologian William Paley in his 1802 book, *Natural Theology*:

> In crossing a heath, suppose I pitched my foot against a *stone*, and were asked how the stone came to be there; I might possibly answer, that, for any thing I knew to the contrary, it had lain there for ever: nor would it perhaps be very easy to show the absurdity of this answer. But suppose I had found a *watch* upon the ground, and it should be inquired how the watch happened to be in that place; I should hardly think of the answer which I had before given, that, for any thing I knew, the watch might have always been there. Yet why should not this answer serve for the watch as well as for the stone? why is it not as admissible in the second case, as in the first? For this reason, and for no other, viz. that, when we come to inspect the watch, we perceive (what we could not discover in the stone) that its several parts are framed and put together for a purpose, *e. g.* that they are so formed and adjusted as to produce motion, and that motion so regulated as to point out the hour of the day; that, if the different parts had been differently shaped from what they are, of a different size from what they are, or placed after any other manner, or in any other order, than that in which they are placed, either no motion at all would have been carried on in the machine, or none which would have answered the use that is now served by it. (2006 [1802], 1–2)

If the inference about watches and their human designers is tenable, Paley argues, the same inference about adaptations in living systems and their designers leads to a deity.

Paley's most compelling example—and one that Darwin felt forced to address explicitly—was that of the eye, which he compared to the telescope. Paley explored the eye's complexity in detail, for instance, how light rays must bend more when they pass from water into the eye than when they pass from air into the eye. This requires that the lens be more convex in the former case. "Accordingly," Paley observed, "we find that the eye of a fish, in that part of it called the crystalline lens, is much rounder than the eye of terrestrial animals" (2006 [1802], 19).

Paley's design argument is typically treated as a single argument, but it consists of two distinct ones run together (Sarkar 2007). The first is an argument for functionality: that there is something special about genuine artefacts such as watches that is also found in living systems due to their composite functionality. By this Paley refers to their purposiveness, their goal-directedness which requires integrated actions from their components. The second is an argument to a designer—that functionality implies the existence of a conscious designer and, in most versions, an intelligent designer.

CRITIQUE

By the time Paley was writing, the argument for functionality had already been subjected to a scathing critique by David Hume in his 1779 *Dialogues concerning Natural Religion*. While Paley focused on individual organisms and their adaptations, Hume focused on the question of whether the world as a whole could be used as evidence of the handiwork of a deity. Hume presented arguments to suggest that the world is more like a vegetable or animal than a machine, in which case there is no requirement for a conscious designer. (Hume also had other reasons for rejecting the argument from design, including whether the putative designer had to be intelligent rather than some entity capable of only rote repetition of an action.) Insofar as Paley was offering a credibly reconstructed design argument that would survive Hume's skepticism, that argument depended on two claims: first, that the relevant entity is an individual organism along with its biological adaptations (and not the world as a whole) and, second, the argument to a designer as inferred from observed functionality.

This is where Darwin and Wallace enter the story. Independently, they proposed that the survival of the most fit would lead to the establishment of adaptation between organism and environment. The plausibility of the mechanism was undeniable after Darwin published the *Origin of Species* in 1859. Darwin furnished example after example of how a fit between organism and environment (e.g., the feeding apparatus of insects and the structure of flowers) would contribute to viability or fertility, the two components of fitness. What added force to Darwin's argument is his careful attention to potential problems for the theory of natural selection, including the existence of organs of extreme perfection such as Paley's most important example, the eye. Darwin accepted that the evolution of such features through natural selection would be a slow process requiring millions of years. He believed that the earth was old enough for such evolution to have been possible. Both Darwin and Wallace also proposed that natural selection could lead to indefinite divergence between lineages of organisms: speciation was a ubiquitous and almost trivial consequence of this worldview. Beyond the design argument, the prospect of speciation through the mechanical action of blind variation and natural selection posed difficult problems from all religious perspectives that demanded the special creation of each species by a deity. (However, this issue is beyond the scope of this section.)

In the first edition of the *Origin* (1859), Darwin relied almost entirely on blind variation and natural selection as the mechanisms of evolutionary change. But, he began to admit and emphasize other mechanisms of evolutionary change in subsequent editions, partly in response to now-discredited arguments from physicists that not enough time had been available for the slow process of natural selection acting on blind variation to have effected the observed evolutionary changes in the history of the earth. By the end of the nineteenth century, evolution by natural selection alone was often not deemed to be sufficient to explain the complete history of life on the earth.

However, evolution by natural selection became the standard view of evolution by the end of the 1920s, when work in theoretical population genetics by J. B. S. Haldane, Sewall Wright, and Ronald Fisher established that ample time had been available for natural selection to have effected the observed modifications during the evolutionary history of life on the earth. Empirical data, such as for the emergence of adaptive melanism in the peppered moth (*Biston betularia*) in Britain, supported this theoretical work. By the mid-twentieth century, the argument from biological design had come to have little relevance for those who took science seriously.

FIRST RESURRECTION: DEMBSKI AND THE EXPLANATORY FILTER

When scientific creationism emerged to challenge evolutionary biology in the United States in the 1960s, one of its major goals was the insertion of creation science into science curricula (Numbers

1992). Most scientific creationists supported literal readings of the Bible and sought direct evidence for these claims. Arguments such as that from design were peripheral to that strategy. A 1987 US Supreme Court decision (*Edwards v. Aguillard*) ended these attempts to corrupt science curricula in the United States. While the core of the scientific creationism movement went into decline subsequently, in the late 1990s part of that movement morphed into the neo-creationist intelligent design (ID) movement in which design arguments play a central role. There is a critical way in which the context had changed from Paley's time. It was no longer credible to deny that any natural process could lead to design in the sense of adaptation: natural selection took care of that. In general, ID theorists accepted natural selection as a sufficient explanation for many aspects of adaptive microevolution (that is, relatively minor modifications within species). However, they continued to deny that it was sufficient for complex and highly integrated microadaptations and especially for macroevolution (at taxonomic levels higher than that of species).

ID relies on two strategies that map neatly into the two components of the traditional design argument that were distinguished earlier. The first is usefully dubbed the argument for complexity, which is the neocreationist reconstruction of Paley's argument for functionality. The main proponent is ID theorist William Dembski, who has proposed an "explanatory filter" to identify events that are too complex and, therefore, too improbable to have arisen by chance and that must reflect some lawlike feature in operation. Suppose that these events are also specified, that is, in some sense, they fit a pattern. For critics and neutral commentators, this sense has always remained illegitimately vague. Dembski (2002) later tried to explicate this concept of specification through an invocation of information theory that almost all commentators have dismissed as vacuous—space constraints will prevent any further discussion of this issue here, but see Sahotra Sarkar (2007).

Dembski's explanatory filter aimed to show that if this lawlike feature is not a natural regularity, it must be due to design. Sarkar (2007, 51), following Branden Fitelson, Christopher Stephens, and Elliott Sober (1999), reconstructs Dembski's (1998) procedure. Given an event E to be explained:

i. Assume that three explanations of E, regularity (R), chance (C), and design (D), are mutually exclusive and jointly exhaustive.
ii. Assume that there is a method for determining if E is specified.
iii. Assume that R is preferred over C and C over D (which leaves D as the last option standing if no other explanation works).
iv. Because of this ranking, R, C, and D should be examined and eliminated as needed in that order.
v. If E has high probability, R should be accepted; otherwise, it should be rejected in favor of C or D.
vi. If C does not assign a low probability on E or if E is not specified, C should be accepted; otherwise it should be rejected.
vii. Only D remains and should be accepted.

The filter relies on small probabilities to rule out a nondesign explanation of events, such as complex adaptations (though its first definitive exposition in Dembski's 1998 book avoided all biological examples).

Philosophers of science across the board have criticized Dembski's explanatory filter for making a mockery out of scientific inference (e.g., Fitelson, Stephens, and Sober 1999; Wilkins and Elsberry 2001; Sarkar 2007):

- Perhaps the most bizarre aspect of the filter is that at no stage does the filter ask what probability design D confers on event E. This leaves open the possibility that, after passing through the filter, E is attributed to D even if the conditional probability that D assigns to E, $Pr\{E|D\}$ is low, perhaps close to 0.
- Because Dembski never explains what design means (and makes no reference to a designer, presumably to avoid accusations of illegitimately importing religious assumptions), there is no method for calculating the probability that D assigns to E, $Pr\{E|D\}$.

- The filter starts with the evaluation of the probability of E and not the probability that R confers on E, that is, $Pr\{E|R\}$. Here it is in conflict with both Bayesian and classical modes of inference, which are the standard modes of statistical inference in contemporary science. (Problems with assigning $Pr\{E\}$ with no consideration of what R is are noted below.)
- The filter gives no way of determining what the threshold probability is below which R should be rejected or what C must assign to E (that is $Pr\{E|C\}$) before C must be rejected. Such a threshold is completely arbitrary.
- Perhaps most oddly, R is considered to be all laws of nature in general rather than some particular law. It is difficult to imagine what this hypothesis could mean in practice.
- Asking what $Pr\{E\}$ is with no specification of context is meaningless. Probabilities depend on reference classes, and these can be constructed only using all the relevant information one has about the type of event that is being considered—that is, there must be a conditional probability even if the conditions are left implicit.

Indeed, Dembski's explanatory filter consists of logical trickeries, as Fitelson and colleagues (1999) were the first to note. The first piece of trickery consists of considering regularity, chance, and design in that order when any other would lead to different inferences. The second is that regularity, chance, and design have to be considered singly; there is no option to consider any two (or more) of them together, thus excluding by fiat the evolutionary mechanism of natural selection (a regularity) acting on blind variation (chance). Sarkar (2007) provides many counterexamples to the explanatory filter.

The critiques have been compelling, and so far Dembski has not offered responses in the peer-reviewed literature in which the critiques first appeared. It is, therefore, perhaps not surprising that the explanatory filter has rarely been invoked in the ID corpus since the start of the twenty-first century, though it has never been officially repudiated.

SECOND RESURRECTION: BEHE AND IRREDUCIBLE COMPLEXITY

In the late 1990s, in parallel with Dembski's advocacy of the explanatory filter, Michael Behe (1996) presented a set of biochemical objections to evolution by natural selection. Behe began by identifying biochemical phenomena for which there was as yet no plausible evolutionary history and argued that these phenomena present problems for evolutionary theory. Such phenomena are easy to find: in any science that continues to be a living field of research, there are bound to be open problems. For theism, the trouble is that such a strategy constitutes deploying a "God of the gaps" argument, saving for a deity what science cannot currently explain (Drummond 1894). As science progresses, the role of the deity continually diminishes. Long derided by theologians for thus progressively demoting the role of God in the universe, to the extent that Behe has relied only on this strategy, he provides little new reason to embrace a deity.

However, Behe does add some respectability to his objections to evolution by natural selection by supplementing this God of the gaps strategy with an argument that the unexplained biochemical features of systems have remained unexplained not because insufficient effort has been dedicated to their explanation, but because these systems are "irreducibly complex" and therefore, in principle, immune to evolution through natural selection. Behe's definition of irreducible complexity seems innocuous: "By irreducibly complex I mean a single system which is composed of well-matched, interacting parts that contribute to the basic function, and where the removal of any one of these parts causes the system to effectively cease functioning" (1996, 39). While Behe seems to suggest that such biological systems are special, they are in fact ubiquitous (Sarkar 2007).

Behe's crucial claim is that irreducible complexity cannot evolve through natural selection. His examples include the bacterial flagellum and the human blood-clotting system. These were well chosen, because in 1996 evolutionary reconstructions of their history were sparse (unlike now—see Sarkar 2007); however, the recognition of such cases goes no further that a God of the gaps argument. Is there any biologically based argument that shows that irreducible complexity cannot evolve through natural selection?

Given that irreducible complexity is ubiquitous, it would be surprising—and perhaps telling—if biologists have paid no attention to the pathways by which they may emerge through standard biological mechanisms. Indeed, they have. There are two common pathways: lost functional redundancy and structure co-option.

H. Allen Orr succinctly explained the redundancy pathway in a review of Behe's 1996 book:

> An irreducibly complex system can be built gradually by adding parts that, while initially just advantageous [later] … become essential. The logic is very simple. Some part (A) initially does some job (and not very well, perhaps). Another part (B) later gets added because it helps A. The new part isn't essential, it merely improves things. But later on A … may change in such a way that B now becomes indispensable. (1996–1997, 29)

The system is irreducibly complex in Behe's sense. Examples include the mitochondria in cells, which were initially free-living organisms but are no longer capable of independent existence (Sarkar 2007). They have lost many genes required for independent existence, because the functions of those genes were taken over by genes in the nuclear genome of the cell of which the mitochondria are a part.

The logic of the co-option pathway is only slightly more complicated: Suppose two features *A* and *B* are present because of a function *F* for which they were selected. *A* also contributes to a function *G*. If *G* becomes more important, *A* may be modified to serve *G* even better and could lose function *F*. *B* will have become indispensable, and the system would become irreducibly complex in Behe's sense. In one example, bird feathers are supposed to have evolved because they initially contributed to thermoregulation but later became modified for flight (Sarkar 2007).

In later work Behe (2008) does not engage his critics, and there is no evidence that any adequate response exists. Irreducible complexity remains a poor argument for design. Worse, is it even a sign of good design? Though there is ample evidence of evolved irreducible complexity in living systems, they may be no more than indicative of how such systems may persist if selection against them is not strong. Irreducible complexity may well be very poor design (Miller 1999). It results in potentially devastating fragility: the system cannot persist if a single component fails. In contrast, functional redundancy, the opposite of irreducible complexity, may be very good design, allowing a system to survive the failure of some parts. Functional redundancy has evolved in the living world many times more often than irreducible complexity. From the perspective of evolution by natural selection, this is no surprise.

The 2005 decision by a Pennsylvania federal court ruling that ID was religion rather than science (*Kitzmiller v. Dover*) defused the neocreationist movement in the United States, at least temporarily. Since then, the new design arguments of Dembski, Behe, and their ilk have receded from public view. Do biological design arguments have a future? Probably not, because design, even in the naturalized form of adaptation, may not be as common in nature as once thought.

NATURE AND DESIGN IN THE LIGHT OF RECENT FINDINGS IN BIOLOGY

The design argument relies on the ubiquity of well-constructed biological systems, ones in which the interdependent parts interact harmoniously and thereby contribute to the betterment of the whole. At the level of the individual organism, such integrated operation would be manifested as adaptation of each part in which it contributes to individual fitness. At the level of ecological communities, consisting of individuals of multiple species, being well constructed would suggest exhibiting a "balance of nature." Twentieth-century biology inherited both these assumptions from earlier eras. While the role of natural theology in promoting the first of these two assumptions is well known (and mentioned earlier, in the discussion of Paley), the balance of nature assumption also has theological roots (see, e.g., Egerton 1973), though they have not so far played a prominent role in creationist arguments. Both have been challenged and largely abandoned in evolutionary biology and ecology since the 1950s.

In evolutionary biology, the claim that there is pervasive adaptation is known as adaptationism. It has been highly controversial since a critique by Stephen J. Gould and Richard C. Lewontin (1979) called it the Panglossian paradigm and showed how it was typically based on "just so" stories

rather than empirical data. Genomic data have since challenged adaptationism even more strongly (Sarkar 2015). It is hard even to find "just so" stories for why rice has almost three times as many genes as humans or why most of the DNA in eukaryotic genomes appear not to have any function at all. Adaptationism requires the decisive action of natural selection, but since the 1960s it has also been recognized that evolution at the molecular level may be driven by neutral mutations and their spread through drift (statistical fluctuation effects during reproduction) at least as much as by selection (Dietrich 2007). It may be the case that living organisms are far from Paley's well-designed watches. Most living features may be as much a result of contingency and chance as natural selection. If this is correct, in general, there is no putative design to explain at all. Rather, theology should address the problem of why so many features of organisms may not be functional and may even be dysfunctional, though not dysfunctional enough to be eliminated by natural selection.

In ecology, the idea of a balance of nature also has not survived the twentieth century. Even in the early part of the twentieth century disagreement existed between those who viewed ecological assemblages of species as integrated communities forming a superorganism and those who regarded them as a result of the fortuitous mixing of species placed in the same spatial locale (Cooper 2007). While this controversy remains unresolved, the wealth of evidence collected since the 1950s favors the fortuitous assembly of species (Wu and Loucks 1995). The balance of nature assumption also underlies a once-common belief in ecology that, by and large, natural communities were at equilibrium or reached equilibrium soon after disturbance (Egerton 1973). Empirical data from the last half-century have discredited this belief. Equilibrium systems are nonexistent among natural communities; what has emerged as being of most interest is the structure of disequilibrial communities (Wu and Loucks 1995). As in the case of evolutionary features of organisms, contingency and history are central to the structure of ecological communities. To summarize: Just as contemporary evolutionary biology denies the preponderance of well-designed features within living organisms, contemporary ecology denies a balance of nature and the preponderance of fully functionally integrated ecological communities. There just may be insufficient design in nature to support an inference to a deity, even if both components of the biological design argument survive the objections leveled against them.

Both components of the biological design argument—that design similar to that of human artefacts occurs in the living world and calls out for special explanation and that the best such explanation is the postulation of a conscious designer—are no longer plausible in the light of modern biology. Whether there is design in nature similar to anthropogenic design has always been a matter of controversy; developments in evolutionary biology and ecology in the late twentieth century show that any assumption of such design is scientifically unwarranted. Meanwhile, Darwin's and Wallace's elaboration of the mechanism of natural selection indicates that any design in nature has a straightforward natural explanation. The design argument adds very little, if any, warrant for the claim that a deity governs the universe.

DISTRIBUTION OF LIFE ARGUMENTS

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In his book *The Non-existence of God* (2004), Nicholas Everitt presents what he dubs "arguments from scale" (see Chapter 11) in support of atheism. He thinks that such arguments, while not conclusive, provide significant inductive support for atheism. In this section we examine both arguments from scale and the broader question of whether spatiotemporal distribution patterns pertaining to life carry any significant evidential weight concerning some forms of theism or atheism that are of broad interest.

Everitt provides us with a fictional example as a way of making clear how he conceives the structure of his arguments from scale. Suppose that Robinson Crusoe is on an island and wonders whether there are any other shipwreck survivors or any other human beings on the island. He should consider what other humans in similar situations might reasonably do and then check the island for such signs

An additional consideration concerns the fact that the universe appears not just indifferent to humans but, indeed, unremittingly hostile, except for one body, the earth. Although astronomers have discovered an enormous plethora of planets, there are reasons for thinking that the conditions required to support life, especially multicellular life, are extremely narrow. Although there remains much uncertainty, it is plausible that the earth is either unique or among an infinitesimal minority in the universe with the right Goldilocks conditions, we might say (see Ward and Brownlee 2000). This crushing hostility to human life is not what one would expect to observe if there is a creator who produced the universe in significant part to enable humans to flourish.

Hostility to human expansion and flourishing is a matter of degree, of course. Maybe within a century or two there will be human outposts on an extraterrestrial body or two, such as Mars or one of the moons of Jupiter or Saturn. Even so, given that humans are told to be fruitful and multiply, there appear to be limits to such fruitfulness, considering the very limited parts of our universe that are at all compatible with human life. Perhaps a novel technology will be developed to readily terrestrialize planets, as occurs in various science fiction scenarios. Even if so and even if the population can grow by an order of magnitude or two by inhabiting the oceans and underground cities, the prospects for indefinite fruitfulness and multiplication are dim. Yet suppose we had been presented with purported divine revelations telling humans to be fruitful and multiply, suggesting that there is a creator who has human fruitfulness as an important goal or desideratum. If it then turned out upon investigation that the entire earth was utterly uninhabitable besides a few acres near Eden, this discovery would naturally generate perplexity as to why this creator would produce a world so unfriendly to multiplication. Analogously, the discovery of the hostility of the vast majority of the universe to human existence counts against the existence of a God who values human lives.

A possible rejoinder might be that God meant that we should be fruitful and multiply to some degree but to stop around 10 billion, give or take an order of magnitude. But any de facto numerical bound on human population growth would seem unmotivated, to the extent that additional meaningful lives are of value to God. This argument, as Everitt repeatedly emphasizes for his arguments from scale, is as defeasible as any that has to conjecture about possible intentions or further developments, either revelatory or technological. On the face of it, the discovery that the universe is almost completely and unremittingly hostile to human life counts somewhat against the existence of a God who supports the sort of human expansive flourishing for Abraham's descendants that is suggested in Judeo-Christian accounts.

Because of their dependence on assumptions concerning the importance of humankind to God's affairs, the significance of facts concerning the distribution of life vary depending upon what intentions are attributed to God. Arguments from astronomical patterns pertaining to life or distribution of life arguments, of which Everitt's arguments from scale are examples, provide independent reasons to doubt the existence of God as commonly conceived within orthodox Judaic and Christian doctrine.

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