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What Would Thomas Aquinas Say about Intelligent Design?

Marie George

Abstract

In light of Aquinas's teaching, I first critique William Dembski's mathematical approach to design in nature, and then critique Michael Behe's failure to distinguish between causes that physically produce an object and causes responsible for the plan for that object. I then investigate Aquinas's Fifth Way, both comparing it to Paley's argument, and attempting to discern where it disagrees with atheistic accounts of evolution. I show that Aquinas acknowledges that living things can result from finality at one level and chance at another level; in other words, he acknowledges that contingent intermediary causes are able to be part of God's plan or design for the production of new species. Thus, the disagreement between Aquinas and the proponents of atheistic versions of evolution is not due to any denial on his part that chance may have role in the production of new species. I then show that even atheist biologists and philosophers recognize a regular tendency in nature to something good, namely, the tendency for niches to be filled, resulting in the good of biodiversity. Where they and Aquinas part ways is as to whether things that lack cognition can only tend to an end when directed by an intelligent being.

Keywords

Aquinas's Fifth Way, Design Arguments, Evolution, Intelligent Design, Paley

The purposes of this paper are threefold: First, to provide a Thomistic critique of the arguments put forth by proponents of "Intelligent Design" (ID); secondly, to investigate whether Aquinas's "Fifth Way" is an alternative design argument; thirdly, to evaluate how the Fifth Way fares in the face of claims made by atheist evolutionists. The two main ID proponents whose views I will examine are William Dembski and Michael Behe.

Dembski's key notion is "specified complexity". The presence of specified complexity is grounds for inferring an intelligent designer

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has been at work. Dembski often illustrates what he means by specified complexity by giving an example of how we would determine that radio signals we received had been sent by an intelligent life form. First, the signal would have to be complex; a sequence of ones and zeros that was only twelve digits long is too short to be complex. A sequence that was 1126 digits long would be complex, but would not necessarily be specified. Specification means that the sequence contains "a suitable pattern", e.g., the sequence of prime numbers or something else that one can specify, and not just a random pattern. The probability that such a pattern arise by chance can be mathematically calculated. It turns out to be so small that it would be unreasonable to think that such a sequence originated by chance. Intelligence is the obvious alternative explanation for such a sequence.

What is crucial in Dembski's notion of specified complexity is that of mathematical probability. Dembski is quite clear on this point:

> So there exists a reliable criterion [namely, specified complexity] for detecting design strictly from observational features of the world. This criterion belongs to probability and complexity theory, not to metaphysics and theology. And although it cannot achieve logical demonstration, it does achieve statistical justification so compelling as to demand consent. This criterion is relevant to biology. When applied to the complex, information-rich structures of biology, it detects design.[1]

The method of looking to mathematical representations that treat different natural things as if they were uniform entities, rather than as beings endowed with distinctive causal abilities following upon their forms, is not an adequate way of determining the effects these beings can or cannot extend to. One can take the chemical formulas for water, vinegar, salt, and baking soda, and figure out mathematically that they can be grouped in six different pairs. But doing so is not going to allow one to determine which pairs are going to cause a chemical reaction. Dembski is far from being the first to attempt to solve questions about what is possible in the living realm by looking to the realm of mathematics. Michael Denton, author of a couple of provocative books concerning evolution, also talks about the statistical improbabilities of a cell arising by chance,[2] as if natural things did not have natures that incline them to act in certain ways, but were indifferent subjects of juxtaposition to one another, like cards in a shuffled deck.

[1] William A. Dembski, 'Science and Design', *First Things*, 86 (October 1998), p. 26.

[2] See Michael Denton, *Evolution: A Theory in Crisis* (Bethesda, MD: Adler & Adler, 1985), p. 323: "To get a cell by chance would require at least one hundred functional proteins to appear simultaneously in one place. That is one hundred simultaneous events each of an independent probability which could hardly be more than 10^{-20} giving a maximum combined probability of 10^{-2000}."

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At this juncture ID proponents will say "not so fast", the order of base pairs in DNA are like cards shuffled in a deck in that their position relative to one another is arbitrary. DNA is not a crystal, like salt, where there is simply a repetition of the same sequence over and over. While cytosine on one strand of the double helix is always united to a guanine on the other, and similarly for adenine with thymine, on the same strand any base pair can follow another. This is what allows segments of DNA to code for different proteins, instead of repeating the same message over and over.

The chances that the correct order of base pairs arises to form the genes needed to code for say the hemoglobin molecule are something like 1 in 10^{190}.[3] According to Dembski this gives us ample reason to infer that an intelligent designer has been at work. Would a Thomist fault Dembski's argument, which after all seems very persuasive?

Again, we must insist upon the differences between the mathematical realm and the realm of nature.[4] The order of base pairs in DNA seems to lend itself to mathematical analysis without any residue. However, it is a little premature to assume that there is not material and efficient causality involved which removes some of the apparent arbitrariness from the base pairs' arrangement. For example, it would seem if the order of base pairs is entirely arbitrary, then mutations would take place arbitrarily at any location. However, this is not the case, mutations actually take place preferentially, e.g., at certain cytosine residues.[5]

An analogy with games is helpful here. Compare the letters one picks in a game like Scrabble to the cards one picks from a standard playing deck. In Scrabble there is not the same frequency of letters,

[3] I do not know myself how to make this calculation. I am assuming that the likelihood that the base pairs be sequenced in the correct order to produce such a protein corresponds fairly closely to the likelihood that the protein itself arise by chance, and that Richard Dawkins has correctly calculated the latter possibility. See Richard Dawkins, 'Accumulating Small Change' (excerpt from *The Blind Watchmaker*), in Michael Ruse, ed., *Philosophy of Biology* (New York: Macmillan Publishing Company, 1989), p. 64.

[4] See Aquinas, *Quaestiones Disputatae de Potentia Dei* in *Quaestiones Disputatae*, vol. 2, P. Bazzi *et al*., ed., (Turin: Marietti, 1965), q. 3, a. 17, ad 17: "that argument does not prove that motion always was, but that circular motion is able to be perpetual, for one cannot efficaciously conclude something about motion from mathematics." (Hereafter cited as *DP*. All translations of Aquinas are my own.)

[5] See William K. Purves, Gordon H. Orians, and H. Craig Heller, *Life: The Science of Biology* (Sunderland, MA: Sinauer Associates, Inc., 1998), p. 382: "DNA sequencing has revealed that mutations occur most often at certain base pairs in human DNA. These 'hot spots' are often located where cytosine residues have been methylated to 5-methlcytosine (see Chapter 14). The explanation of this mutation phenomenon has to do with the natural instability of bases in DNA." An internet search for "directed mutation" and "mutational bias" turns up many articles by mainstream scientists who argue that mutations do in some cases arise in a directed way in response to environmental stressors and that there are places in the DNA where mutations take place preferentially.

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as there is of fives, sixes, Jacks, etc. in a deck of cards. In Scrabble, there are more "e's" than other letters (e.g., there is only one "q"), because "e" is the letter most often needed to spell a word. Do we know so much about DNA to know that it is like a deck of cards? Perhaps it is rather the case that there are natural causes that bias the order of DNA in such a way that it is more likely to produce "words", i.e. sequences that will code for functional proteins. Until we know which way nature is, probability calculations have no solid basis. So it may turn out that it is not so far-fetched that non-intelligent natural causes produce DNA after all. Again, the capabilities of a group of natural things pooled together cannot be determined by mathematical analyses that treat them as if their ability to act and to undergo change was uniform; such analyses also ignore the possibility that they may have causal abilities that are yet to be discovered. This is the major flaw in Dembski's approach.

Another problem with the Dembski's ID argument is that it is based on "probability and complexity theory". As other authors have pointed out, since Dembski's argument is based on theory it is subject to revision like any theory. Dembski's design inference by his own admission is only one of high probability. He goes so far as to say that he is simply putting forth a research project for science which may prove to be fruitful or unfruitful, but which makes no claims to being true:

> Paley's business was natural theology. Intelligent design's business is much more modest: it seeks to identify signs of intelligence to generate scientific insights. Thus, instead of looking to signs of intelligence to obtain theological mileage, as Paley did, intelligent design treats signs of intelligence as strictly part of science. Indeed, within the theory of intelligent design, any appeal to a designer may be viewed as a fruitful device for understanding the world. Construed in this way, intelligent design attaches no significance to questions such as whether a theory of design is in some ultimate sense true, or whether the designer actually exists or what the attributes of that designer are.[6]

So much for Dembski's version of ID putting the argument from design for God's existence on a firmer foundation.[7]

Yet another problem with Dembski's view lies in the false dichotomy upon which it is based, a dichotomy that inappropriately pits natural causes against intelligent ones. Dembski's version of ID claims to identify features of organisms whose production could not be explained by natural causes. His ID argument by his own

[6] Dembski, *The Design Revolution*, p. 65.

[7] Aquinas plainly thinks that the existence of God can be known by demonstration, and offers his five ways to this end (see *Summa Theologiae*, I, q. 2, a. 2–3. Hereafter *ST*).

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admission loses its cogency if it turns out that the Intelligent Being uses natural causes to achieve its ends:

> One could, for instance, argue that a designer had designed the laws of physics and chemistry so that life would emerge by means of the Darwinian mechanism. In that case intelligent design would not, strictly speaking, be falsified. Biologists, however, would rightly discard it as superfluous.[8]

Let us turn now to Michael Behe, whose key notion is irreducible complexity.[9] Irreducible complexity is present in functional wholes that have to have all their parts in place or they will not work at all. An example Behe gives of this is the mousetrap; remove a single piece from a mousetrap and it won't catch mice. Irreducibly complex things cannot arise in a stepwise fashion from simpler systems that do the same thing; they thus require an intelligent agent to assemble them.[10] Behe goes on from there to show that in natural things there are irreducibly complex features such as the flagellum and the clotting system — if one component isn't there, the system is non-functional; whence the need for an intelligent designer to assemble it.

Behe is widely criticized for appealing to ignorance, using God to fill in what he perceives to be gaps that nature cannot navigate across.[11] Yet Behe's inability to figure out how a given irreducibly complex system arose may be simply due to his lack of imagination and experience. This has proven to be the case. Behe claimed that Factor XII was part of the irreducibly complex clotting system. However, as biologist Kenneth Miller point outs: "Once again, however, a nasty little fact gets in the way of intelligent design theory. Dolphins lack Factor XII (Robinson, Kasting, and Aggeler 1969), and yet their blood clots perfectly well."[12] In the case of the flagellum it turns out that it contains within itself the equivalent of a smaller functional unit that is found in other organisms serving

[8] *The Design Revolution,* p. 281.

[9] Probability calculations were not initially part of Behe's argument, although they are prominent in his more recent book, *The Edge of Evolution*.

[10] Michael Behe, *Darwin's Black Box* (New York: The Free Press, 1996), p. 39: "By *irreducibly complex* I mean a single system composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning. An irreducibly complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system . . . "

[11] See, for example, biologist Sean B. Carroll's critique of Behe's book, *The Edge of Evolution*: 'God as Genetic Engineer', *Science* 316 (8 June 2007), pp. 1427–28.

[12] Kenneth Miller, 'The Flagellum Unspun', http://www.millerandlevine.com/km/evol/design2/article.html.

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the purposes of translocating proteins.[13] The flagellum then is not irreducibly complex, but can in principle be broken down into a simpler functioning system. Another paper shows how one hormone receptor which binds cortisol could have evolved from a more promiscuous ancestral receptor by two point mutations; and this despite the irreducibly complex appearance of the system supposedly ruling out such stepwise evolution.[14] What if all the systems that Behe thinks are irreducibly complex turn out not to be? Gone would be Behe's reason for concluding to an intelligence behind nature.

Note that the way Behe and Aquinas formulates their arguments are quite different. Behe's argument stands to lose ground each time science discovers natural causes that can account for the formation of systems that he could see no natural explanation for;[15] the more science discovers natural causes can do the job, the less there is a need for God. Aquinas's argument, on the other hand, is unaffected by scientific discoveries of the said sort. This is because Aquinas does not reason to God based on a surmise of what effects natural causes cannot extend to as immediate efficient causes, but rather reasons to God on grounds that are sure, namely, that there is an ordering to an end in nature.

Behe and Aquinas also part company in their views concerning secondary causes. For Behe, if natural causes marking out traceable biological pathways were discovered to explain how the foot and eye arose from simpler precursors, his argument for an intelligent designer would no longer have any cogency.[16] Ironically Behe appears

[13] The unit is called the "type III secretory system". It is found in gram negative bacteria. See ibid.

[14] See Oliver Putz, 'Hormone-Receptors and Complexity: Putting to Rest Another God of the Gaps?', *Theology and Science* 4:3 (2006), p. 211. While I agree with Behe that Thorton's discovery concerning the hormone receptor MR and CR has to do with only one small part of a complex system, at the same time it is the case that this small part turned out to be producible by two small steps. Thorton *et al*'s discovery opens the door to the possibility that other parts of complex systems can develop in gradual ways from a previous system that was simpler. The question does then remain as to how the simpler systems arose, for all known biological systems involve considerable complexity.

[15] I can't help remark a certain disingenuousness as far as Behe's claims regarding biologists' failure to explain irreducibly complex systems. The neo-Darwinian synthesis is of fairly recent date (1930s-1940s). Most biologists nowadays are not evolutionary biologists. And the majority of those that are do not spend their time researching pathways to putative irreducibly complex systems. Moreover, researching such pathways is very difficult to do. It is not as if one always had a lineage of living organisms, one descended from the other, whose physiology and genetics one could compare.

[16] See Behe, *Darwin's Black Box*, pp. 203–4: "Throughout this book, however, I have shown why many biochemical systems cannot be built up by natural selection working on mutations: no direct, gradual route exists to these irreducibly complex systems... Alternatives to gradualism that work through unintelligent causes, such as symbiosis and complexity theory, cannot (and do not even try to) explain the fundamental biochemical machines of life... Might there be an as-yet-undiscovered natural process that would

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to agree with Richard Dawkins. Both seem to think that if natural efficient causes can be discovered to account for the original assembly of organisms' parts, then there is no need for an intelligent designer.

What both fail to distinguish is that causes which physically produce the object may be other than the causes responsible for the plan according to which the object is made. Planning and construction may both be the work of the same agent, but need not be. The architect may never touch any component of the house, but is certainly responsible for its construction; whereas the artisans who actually assemble the house may have no idea of its overall layout, but simply follow instructions. Aquinas makes this distinction when speaking about divine providence:

> Two things pertain to divine providence, namely, the plan (ratio) for the order to their end of the things provided for; and the execution of this order which is called governance. As to the first of these God immediately provides for all things. For in his intellect he has the notion of all things, even the least of them; and any causes whatsoever he charges with a certain effect, he gives them the power for producing those effects. Whence, it is necessary that the order of those effects be held in advance in his reason. However, as to the second, there are some intermediaries to divine providence. That the inferior is governed through the superior is not due to the defect of his power, but on account of the abundance of his goodness, which is such that it communicates even the dignity of causality to creatures.[17]

To give another illustration of the mistake both the IDers and Dawkins are making: it is like saying that if the feature of my computer that saves my documents automatically after a certain period of time can be fully explained in terms of the mechanism by which this is accomplished, then there is no need to bring in an intelligent being. But of course someone had to design the mechanism. Many other illustrations of beings working to an end they have no knowledge of can be given: a bread maker, the assembly line worker who has no idea of the design of the finished product, but simply inserts a given part, etc. The final product, however, plainly requires someone who determined how to organize the device or the assembly line, and what the various parts or workers would do. The one who plans an

explain biochemical complexity? No one would be foolish enough to categorically deny the possibility. Nonetheless, we can say that if there is such a process, no one has a clue how it would. Further, it would go against all human experience, like postulating that a natural process might explain computers... In the face of the massive evidence we do have for biochemical design, ignoring the evidence in the name of a phantom process would be to play the role of the detective who ignores the elephant." His more recent book also gives as reason for positing deliberate design the insufficiency of natural causes for the production of complex molecular machinery (see *The Edge of Evolution*, [New York: Free Press, 2007], pp. 165–66).

[17] *ST* I, q. 22, a. 3.

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assembly line need never handle part of the finished product. And again, as Aquinas notes, the architect or engineer responsible for the design of a building, as such, never puts a single part in place.[18]

We have to ask: Are those who deny design doing so simply because they have found agents which account for the organism's completed assembly (Dawkins and company)? Are those who are trying to defend design, seeking to show that there are no natural causes capable of assembling organisms so that a Designer has to intervene directly (Behe and Dembski)?

Dembski and Behe see the *only* path to concluding to an intelligent being to consist in showing the inadequacy of natural causes as immediate causes of organisms with their complex features.[19] Aquinas would squarely reject this view on the grounds that it fails to distinguish planning an order from executing it; that natural causes suffice as immediate causes bringing about a complex functional feature does not eliminate the need for an intelligent being to plan that feature.

Aquinas would also level a far weaker sort of argument against the ID position, an argument by fittingness. The aim of the ID project is basically to show that natural causes are deficient when it comes to the production of new species. It is true that there are forms of causality that God cannot impart to creatures because this would imply contradiction, e.g., God cannot give a creature the power to create. The IDers, however, do not deny that God could have organized the universe so that new species would be produced by natural causes; and indeed this is not inherently impossible, for the origin of new species by such causes would come about by change and not by creation.[20] Aquinas would regard the view that God withheld a sort

[18] See *Scriptum super Sententiis* (Paris: Lethielleux, 1956), Bk. 2 dist. 10, q. 1, a. 3 ad 1: "There is found in regard to artificial things an artisan who only works with his hands, executing the orders of another and commanding no one, as the one who prepares the material; another who commands the one preparing the material, and himself works to introduce the form; another who does not work at all but commands, possessing the plan (*rationes*) of the work taken from the end of which he is the director, and such a one is called an architect . . . "

[19] Behe has since modified his position to allow for natural causes to be the immediate causes of biological complexity. His position, however, is incoherent. His reason for concluding to the existence of a deliberate designer is that known natural causes are unable to change DNA in ways that produce new complex parts and new life forms, and that hypothetical natural causes fare no better, but then he turns around and says that the same hypothetical causes he just dismissed can be adequate immediate causes of evolution when ordered by a deliberate designer. See Behe, *The Edge of Evolution*, pp. 165–66.

[20] In a number of passages, Aquinas shows that he is open to the possibility that the substantial forms of certain created things do not exist in act in the beginning, e.g., *ST* I, q. 65, a. 4, *ST* I, q. 69, a. 2, *ST* I, q. 73, a. 1, ad 3, and *Scriptum super Sententiis*, Bk. II, dist. 12, q. 1, a. 2. The latter passage reads: "Thus, therefore, something concerning the beginning of the world pertains to the substance of the faith, namely that the created world began, and this all the saints say in one accord. In what manner and in what order it is made,

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of causal ability that he could have endowed creatures as unbefitting God's perfect governance:

> [S]ince through governance the things that are governed are led to perfection, so much the better will be the governance to the extent that greater perfection is imparted by the governor to the things governed. However, there is greater perfection when something that is in itself good is also the cause of goodness for another than if it would be only good in itself. And therefore God governs things in such a manner that he establishes certain things as causes of other things in governing; just as if a teacher would make his students not only knowing, but even teachers of others.[21]

In other words, Aquinas, who insists that God "not only makes things to be, but to be causes", and this reveals "the abundance of his goodness",[22] would regard the ID position to be implausible insofar as it subtracts from the causality that could in principle be imparted to natural things,[23] and by doing so detracts from God's beneficence.[24]

It is time to ask whether Aquinas thinks there is another argument from design, one which is viable. This is a hard question. Some Thomists reject speaking of the Fifth Way in terms of design.

does not pertain to the faith except accidentally, insofar as it is narrated by Scripture, whose truth the saints preserve by diverse exposition, handing on diverse [views]. For Augustine is of the opinion that in the beginning itself of creation certain things existed distinct in their proper nature, such as the elements, heavenly bodies, and spiritual substances; others only in seminal reasons (rationibus seminalibus), such as animals, plants, and human beings, all of which were produced afterwards in their proper natures by that work in which God, after the six days [of creation], governs previously established nature." And *ST* I, q. 65, a. 4, ad 2 Aquinas adds concerning these seminal reasons that they can be traced back to the divine intellect: "from which the seeds of the forms are put in created things, so *that through motion they may be educed in act*" (emphasis added).

[21] *ST* I, q. 103, a. 6.

[22] *Summa Contra Gentiles*, C. Pera, O.P. *et al*., ed., (Turin: Marietti, 1961), III, 70. (Hereafter cited as *SCG*).

[23] See also *SCG* III, 69: "to detract from the perfection of creatures is to detract from the perfection of divine power."

[24] Though I am not sure that Thomas would make this case, as he viewed angels as being responsible for many seemingly natural events on earth (see *ST* I, q. 110, a. 1, ad 2), one might argue that it would not befit a wise, omnipotent, and most good maker that he create a universe of beings in which he or his angels must periodically intervene to make new non-rational species appear. If a human being can design a dishwater to go through a variety of different cycles without needing someone to step in and nudge it along, and this pertains to his perfection as engineer, it seems unfitting that God would choose not to design a universe in which new kinds of beings can develop as a result of natural causes within that universe. This view does not entail the endorsement of deism, as is sometimes claimed, but rather is rather a rejection of occasionalism, i.e., of the view that affirms God's causality in regard to every becoming and motion at the expense of denying that creatures can do things; see *SCG* III, 69 and 70, "On the opinion of those who subtract from natural things their proper actions', and "In what manner the same effect is from God and from a natural agent."

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Certainly, one would not want to define design in terms of a designer; such a definition would be question-begging when used in an argument from design.

I also agree that design is sometimes used simply to refer to a pattern apart from any reference to final causality. Usually such designs are decorative. In this case we speak of a design as being pleasing or ugly. But there is another sense of design which we speak of as being good or bad (or poor), and we determine this by seeing how well the thing achieves its end.

Design in the latter sense refers to a plan for something that is to serve a purpose as it exists in the mind of an intelligent being or as it realized in the thing actually produced. Design in the mind of an intelligent being seems to be the equivalent of idea or exemplar which according to Aquinas "has in a certain manner the notion of end".[25] Design in the thing is that plan as realized in the thing allowing it to achieve some end. Design for an electric mixer involves a handle, a motor which is arranged to rotate beaters, and so forth. The design within the thing is what allows the device to achieve its end of mixing foods more rapidly and with less effort than stirring with a spoon. It seems to me that design as a plan realized in a thing allowing it to achieve an end is what Aquinas is speaking in his commentary on the *Physics* at the very end of the discussion of final causality in nature: "nature is nothing other than the plan (*ratio*) of a certain art, namely, the divine, placed in things, by which things move to a determinate end; as if the ship-builder could give to the wood something so that the wood of itself would move to bringing about the form of the ship."[26]

In any case, I think people are right to resist too readily assimilating the Fifth Way to arguments from design such as Paley's. Let me set out Paley's argument, and we can think along the way about how the Fifth Way is like or unlike it. For Paley a thing manifests design when it has a multiplicity of parts ordered and adjusted to achieve a goal.[27] Paley takes as evident, at least to the wise, that anything

[25] *Quaestiones Disputatae de Veritate*, in *Quaestiones Disputatae*, vol. 1, Raymundi M. Spiazzi, O.P. , ed., (Turin: Marietti, 1964), q.3, a.1. (Hereafter cited as *DV*.)

[26] *In Octo Libros de Physico Auditu Commentaria*, Angeli M. Pirotta, O.P. , ed., (Naples: M. D'Auria Pontificius Editor, 1953), 519. (Hereafter *In Phys*.)

[27] See William Paley, *Natural Theology*, (1802) (Houston: St. Thomas Press, 1972), pp. 1–2: "[W]hen 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."

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manifesting design is ultimately the product of intelligence.[28] Given that organic parts, such as the eye, manifest design, Paley concludes that they are the product of intelligence. Now let us look at the Fifth Way:

> The fifth way is taken from the governance of things. We see that some things which lack cognition, namely, natural bodies act for an end; which appears from this that they always or more frequently act in the same manner such that what follows is the best; whence it is manifest that they arrive at the end from a tendency, and not from chance.
>
> Those things which lack cognition do not tend to an end unless directed by someone knowing and intelligent, as the arrow by an archer. Therefore, there is something intelligent by which all natural things are ordered on an end, and this we call God.[29]

There are two syllogisms in the overall argument:

(1) Everything that always or frequently operates in the same mode such that what is obtained is the best acts for an end, and not by chance.
Natural bodies, lacking knowledge, operate in the same mode such that what is obtained is the best.
Natural bodies, lacking knowledge, act for an end, and not by chance.

(2) Everything which tends to an end, lacking knowledge, is a thing that is directed by some knowing and intelligent being.
Natural bodies are things that lacking knowledge act for an end.
Natural bodies are things directed [to an end] by some knowing and intelligent being.

The first premise in the first syllogism harkens back to the discussion in Aristotle's *Physics* as to whether natural things act for an end. Aristotle takes up the arguments of philosophers like Empedocles who says that rain is not for the sake of helping the plants grow, but material causes necessarily result in water evaporating and eventually falling again, regardless of the plants' needs, and also that teeth and other parts of living things which allow for eating and other life activities did not arise to serve those purposes, but arose by necessity and by chance happened in some cases to be useful to

[28] See Paley, *Natural Theology*, p. 9: "Arrangement, disposition of parts, subserviency of means to end, relation of instruments to an [sic] use, imply the presence of intelligence and mind."

[29] *ST* I, q. 2, a. 3.

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organisms in which they arose, and these organisms survived as a consequence. Aquinas response to this is:

> [T]hose that held that nature did not act for the sake of something, tried to confirm this by removing that from which nature chiefly appears to act for the sake of something. This however is what chiefly shows that nature acts for the sake of something, [namely,] that from the operation of nature something is always found to become the best and most advantageous that it can be: as the foot comes to be according to nature in a manner such that it is apt for walking; whence if it recedes from its natural disposition, it is not apt for this use; and similarly with the rest [of things that come to be by nature].[30]

It is noteworthy that Aquinas picks the foot as a premier example of nature acting for an end; the examples that had been given were teeth and rainfall, and Aquinas sees the organic parts of animals as the clearer examples of nature acting for an end.[31]

Empedocles' response to this, or that of his modern-day contemporaries, would be to say, sure, there is a difference between a foot well adapted for walking and a foot that is not. However, even a poorly adapted foot may offer an advantage over no foot, and with time natural selection may lead to better and better adapted feet. A rudimentary, poorly functional organ is sometimes due to a defect of nature, but sometimes it is nature's way to the production of a new species.

Nor would Empedocles be fazed by Aristotle's insistence that teeth and other organic parts come up regularly, and so they cannot be a product of chance, but must be for the sake of something. Empedocles does not think that it is just chance that lungs proved to be useful on land, and that animals that had them survived and had offspring that had the same useful feature. Empedocles' position is that these features *arose* by chance. He doesn't think it chance that certain features are adaptive in a given environment nor does he think that reproduction infrequently and by accident reproduces adaptive features. And the modern day followers of Empedocles are insistent on this point: it is random variation and natural selection that replace God, chance *and* necessity, chance alone is not enough.[32]

[30] *In Phys*., 491.

[31] Aquinas also reasons to an intelligent being starting from finality in the parts of organisms, rather than in the actions of the inanimate natural things in *DP* q. 2, a. 3, ad 5, and in *In Duodecim Libros Metaphysicorum Aristotelis Expositio*, Raymundi M. Spiazzi, O.P. , ed., (Rome: Marietti, 1950), 98. Hereafter cited as *In Meta*.

[32] Throughout this paper I lump together chance occurrences with random ones. A full understanding of the relation of design arguments to evolutionary accounts would require distinguishing the two. It would also require distinguishing randomness in nature from purely mathematical randomness.

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Let us look more closely at the Fifth Way to see whether Aquinas and Empedocles cannot be brought closer together and at what point they definitively part company, beginning with the first syllogism: "We see that some things which lack cognition, namely, natural bodies act for an end; which appears from this that they always or frequently act in the same manner such that what follows is the best; whence it is manifest that they arrive at the end from a tendency, and not from chance."

Empedocles or at least his contemporary counterparts would want to qualify "the best". Natural selection does not always produce an ideally designed organism, but rather it tinkers together organisms with what random variation makes available. Aquinas is aware that intelligent agents sometimes choose things suited to their purpose despite certain unavoidable drawbacks that accompany the employment of those things, e.g., iron holds an edge, but also rusts. He makes explicit reference to this sort of thing occurring in the case of the human body.[33] If Aquinas had been aware of evolution, he would have recognized the available options for producing new species are more limited than if each species was specially created, and consequently would have expected to see more imperfections in evolved organisms than would be found in those produced directly from the drawing board.[34]

Empedocles would point out that chance is a needed element in the production of new species, for if organisms always reproduce true to type there would be no new species,[35] and so bodies acting

[33] *Quaestio Disputata de Anima* in *Quaestiones Disputatae*, vol. 2, P. Bazzi *et al*., ed., (Turin: Marietti, 1965), a. 8: "And through this very mode [looking to finality] the reason for the disposition of the human body is to be assigned as to each single part which is proper to man. But nevertheless one needs to consider in those things that are from matter that there are certain dispositions in the matter itself for the sake of which this sort of matter is selected for this form, and other dispositions which follow from the necessity of the matter, and not from the choice of the agent." See also *Quaestiones Disputatae de Malo* q. 5, a. 5 and *ST* I, q. 91, a. 3.

[34] Although the production of new species through evolution rather than by directly forming them means that there will be more defects in them, still from a Thomistic point of view this is outweighed by the following goods: first, God imparts the dignity of causality more extensively to things; secondly, God renders things in the world more interactive (what evolutionary biologist would prefer the comparably static world of pre-Darwinian biology?); thirdly, evolution bears better tribute to God's infinite wisdom insofar as the project of getting from unicellular organisms to complex organisms like ourselves through an unbroken series of intermediary living species requires far more intelligence than simply creating each living species from scratch.

[35] One could maintain that novelty arises in an entirely determinate way, rather than at least in part by chance, but this fits poorly with a number of facts. For example, there is reason to think that mutations in some cases do not occur in response to environmental pressure, but arise randomly before a given environmental pressure appears (see 'The Lederberg Experiment', http://evolution.berkeley.edu/evosite/evo101/IIIC1bLederberg.shtml). Also, if transitions to new species are automatic, then one would not expect different patterns

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in the same manner are not the only source of good things (this is assuming that Empedocles would regard the diversity of life forms as a good thing) — and Aquinas would not disagree with him that chance events can have good results. Let us examine further what Aquinas holds regarding chance causes.

Aquinas thinks that causes that act in a contingent way are a desirable feature in the universe. Without chance causality, however, there would be no contingency. For contingent causes differ from necessary causes in that "they can fail in the fewer number of cases", and "fortune and chance are said in regard to those things that happen in the fewer number of cases".[36] Aquinas says that contingency contributes to the beauty of the universe which consists in there being various grades of beings, some more like God who never changes, and some less like God and more subject to change.[37] Chance causes increase the order of the universe by increasing the interactivity within it.[38] In a world without chance, natural causes could not occasionally interfere with each other, but all would unchangeably follow fixed paths.

Aquinas maintains that in nature there are occurrences that are chance at one level, but are aimed at or tended towards at another level. For example, he holds this to be the case in regard to the production of female offspring. For him, semen, the efficient cause of generation, is tending to produce something like itself, namely, a male. If it produces a female, it has failed due to some sort of interference. What is bad luck from the point of view of the semen, is, however, aimed at by nature at a more universal level.[39] It is not a matter of luck that the sex ratio is maintained as this good outcome

in evolution; yet parent species sometimes giving rise to a single daughter species, and sometimes to more than one.

[36] *SCG* III, 74.

[37] See *SCG* III, 72.

[38] See *SCG* III, 69 concerning the goodness of interactivity: "[T]o subtract the order from created things is to subtract from them what they have that is best... If, however, one takes things' actions away from them, one takes away the order of things to each other. For there is no assembling of things which are diverse according to their natures in a unity of order, except through this that certain of them act and certain of them are acted upon."

[39] See *DV* q. 5, a. 9, ad 9: "It is necessary to reduce the diversity of the sexes to the celestial powers. For every agent, to the extent it can, tends to assimilate the patient to itself; whence the active power which is in the seed of the male tends to always lead the conceptus to the male sex, which is more perfect; whence the female sex happens outside the tendency of the nature of the particular agent. Therefore, unless there was some power which tended to the female sex, the generation of the female would be entirely by chance, as even is the generation of other monsters; and therefore it is said that although it [i.e., the generation of females] is contrary to the tendency of the particular nature, by reason of which the female is called a ruined male, nevertheless is it of the tendency of universal nature, which is the power of the heavenly body, as Avicenna says."

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occurs frequently. Let us not be sidetracked by the fact that Aquinas's understanding of reproduction is inaccurate. What is important to see here is that Aquinas acknowledges cases where a more global end that nature tends towards is realized by chance events at the level of the immediate causes.

Now what evolutionists are saying is that chance occurrences are involved in the development of every new species. We have seen that the mere introduction of chance is not a reason for Aquinas to deny tendency to an end at another level. Why then the following categorical rejection of Empedocles' evolutionary views?

> Everything that does not have a determinate cause happens by chance. Whence it was necessary that according to the position mentioned that all the suitable and advantageous features which are found in things would casual; which is exactly what Empedocles held, saying that it had come about by chance that through friendship the parts of animals were so assembled that the animal was able to be healthy, and this happened many times.
>
> However, this cannot be: For those things that happen by chance happen in the fewer number of cases; however, we see that suitable and useful features of this sort occur in the works of nature either always or for the most part; whence they cannot happen by chance; and so it is necessary that they proceed from tending to an end.[40]

It is certainly true that the same thing cannot occur as the result of chance and as a result of tendency, in the same respect. Thus, if Empedocles is saying that the origin of new species does not result from natural tendencies to an end at any level, then he is saying that it must be purely the result of chance. Why though doesn't Aquinas make plain that Empedocles' error lies in denying finality at any level, and why does he not suggest that Empedocles should have considered the possibility that chance and finality are operative at different levels? It seems here that, unlike the case of the sex ratio, he fails to consider the possibility of different levels of causality because he has no evidence that new features arise, aside from two kinds of cases. The first is the production of individuals afflicted by birth defects; the second are some of the seemingly spontaneously generated animals.[41] In the vast number of cases, however, what is observed is that like produces like, which is to be expected given

[40] *DV* q. 5, a. 2.

[41] Aquinas was inclined to think that spontaneous generation could occur since this is what he understands Genesis to indicate: "Let the waters produce creeping things having a living soul" (Gen. 1:20); see *ST* I, q. 118, a. 1, sed contra. Aquinas did not think that every living thing that is spontaneously generated belongs to a new species, but certain imperfect animals can be generated both by spontaneous generation and by seed; see *In Meta*., 1454. While the mule could be added to the list of species that Aquinas thought have newly arisen, Aquinas regards the mule's characteristics as intermediary between

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that agents act according to their forms.[42] One can hardly blame Aquinas for being ignorant of the fossil record which reveals a vast number of species arising (and sometimes disappearing) over immense periods of time, as well as being ignorant of evidence that points to this occurring by natural causes, rather than through direct divine intervention. It seems to me it is this ignorance which elicits his categorical rejection of Empedocles, for again, he thinks that it is possible for chance at one level to be compatible with finality at another level, as is evident in the case of the semen, and also in the case of spontaneously generated organisms, as we shall now see:

> [N]othing prevents a certain generation to be *per se* when referred to one cause, which nevertheless is *per accidens* and of a chance nature when referred to another cause... [Such is the true in the case of] the generation of animals generated from putrefaction; if it is referred to particular causes, acting here at the lower level, it is found to be *per accidens* and casual. For heat which causes putridness does not tend by its natural appetite to the generation of this or that animal which follows from putrefaction, as the virtue which is from the seed does tend to the production of such a species. But if it is referred to the heavenly power which is the universal virtue ruling generation and corruption in these lower things, this is not *per accidens*, but *per se* tended towards; because it belongs to its tendency that all the forms which are in the potency of matter be drawn into act.[43]

Aquinas is plainly saying here that certain animals can arise by chance at the level of particular causes while be tended towards by more universal causes in nature,[44] causes that tend towards the

those of its parents, rather than being entirely new; see *DP* q. 3, a. 8, obj. 16 and ad 16, and *In Meta*., 1432–33.

[42] See *SCG* II, 16: "every agent whatsoever produces something like itself; for it acts according as it is in act."

[43] *In Meta*., 1403.

[44] In the passage quoted in footnote 38 "universal nature" is identified with power of the heavenly bodies, and elsewhere as well Aquinas refers to the heavenly bodies as a universal agent, responsible, among other things, for spontaneous generation (see *SCG* III, 102 and *DP* q. 6, a. 1, ad 1). While there is reason to attribute change in the living realm primarily to the heavenly bodies, and especially to the sun whose heat and light are crucial for the actualization of various life forms on earth, still they alone do not seem to be what Aquinas is referring to when he says that "the corruption of seeds and every defect are contrary to the particular nature of this [individual] thing determined by a form, although it is according to nature at a universal level, by whose virtue matter is brought to the act of every form to which it is in potency, and when one thing is generated it is necessary that another is corrupted" (*Quaestiones Disputatae de Malo*, q. 5, a. 5). There seems no need for an additional cause within nature to bring about that the right number of acorns is eaten by squirrels, etc., so that squirrels, etc. are kept alive and the area is not overrun with oaks, while enough acorns remain to continue the species. The question of universal

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universal effect of actualizing all the forms material is capable of. The forms in question here, unlike the case of birth defects, are a goal. The same basic position can be fitted to the evidence we have for evolution without in any way undermining the Fifth Way.

Is there a universal tendency of nature to actualize all the potencies of matter? If indeed it is correct to infer that action for an end is present when the same good result is achieved frequently, and not rarely, we can ask does nature regularly or rarely tend to fill up available niches?[45] It is generally thought that 99% of species once extant are now extinct; if so, this indicates that throughout evolutionary history niches were continually being filled. Moreover, after each mass extinction, the number of life forms subsequently proliferated so as to either eventually exceed pre-extinction numbers or at least to return almost to them,[46] again indicating that where there is an open niche an organism will generally evolve to fill it. If it is rare that a new species forms compared to how often species remain stable before going extinct, it is rare that a seed grows to maturity compared to how often seeds fail to do so. Yet seed-bearing plants regularly replace themselves, and species give rise to new species to fill available niches, despite the rarity of these outcomes for the particular causes involved in these events.[47]

Whether or not chance causes alone can lead to speciation, they are involved in it, and while individually they occur unpredictably, as a group they regularly contribute to the production of new species. In other words, while environmental changes, the migration of part of a population to new areas, changes required for the various sorts of reproductive barriers to form, etc. may be chance occurrences, they

agent causality in nature needs to be examined at greater length, and then applied to the case of evolution.

[45] Whereas a habitat is the environment in which an organism lives (including both the living and the non-living things found there), a niche is the role an organism plays in a given habitat. A niche is sometimes described as how an organism makes its living.

[46] See Menno Schilthuizen, *Frogs flies & dandelions* (Oxford: Oxford University Press, 2001), pp. 191–2: "As should now be apparent, speciation likes nothing better than a good empty niche. Given half a chance, it will rapidly fill it. And that is exactly what happened. Almost immediately after the great dying [Cretaceous/Tertiary], new species started to appear, splitting off from the few species that had survived the cataclysm. Things happened slowly at first, but, as ecosystems began to reassemble, new niches opened up and a great profusion of speciation a few million years later brought species richness back to pre-catastrophe levels . . . whichever map scale you look at, speciation is prompted by vacating niches at any scale between apple orchard and asteroid impact."

[47] Aquinas himself seems to go along with Aristotle's view that new species have *frequently* arisen by spontaneous generation; see *Scriptum super Sententiis*, Bk. II, dist. 15, q. 3, a. 1, arg. 7, and *ST* I, q. 73, a. 1, obj. 3.

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happen often enough to account in part for the continual filling of unoccupied niches by new species.[48]

We see then that we can adjust Aquinas's argument to take in account the evidence for evolution. Aquinas in light of this evidence would say, yes, there is chance involved in the production of new species; without chance like would keep reproducing like, and no new species could originate. However, part and parcel of evolution is a tendency towards something good, the wondrous diversification of life forms. Evolution, then, substantiates the first syllogism in the Fifth Way.

It might seem then that the updated version of Aquinas and Empedocles' evolutionary views are entirely compatible. Empedocles would not necessarily disagree that chance produces new species with a certain regularity, and so it is not chance that all available niches tend to get filled with species. Some neo-Darwinians might say that there is no tendency here, it just happens by accident as a by-product of copying errors or the like. But what factually happened/happens? Niches are regularly filled, and when new niches open up, new species arise to fill them (e.g., with the apparition of trees, mosses had a new habitat to colonize, and many new species of mosses appeared).[49] That it is through contingent events that niches are filled, and that if conditions were somewhat different, different organisms would have arisen to fill those niches, does nothing to

[48] It seems then that Aquinas would have to revise his critique of Empedocles, namely, "[Empedocles reckoned that] it came about by chance that through friendship the parts of animals were brought together so that the animal could live, and that this happened many times. This, however, cannot be, for those things that happen by chance happen in the fewer number of cases; however, we see that suitability and usefulness occur in the works of nature either always or for the most part . . . " (*DV* q. 5, a. 2). There is no reason for chance events not to always or frequently be involved in the regular achievement of a goal, namely, the filling of vacant niches, any more than there is a reason to deny that the bad luck of the sperm must frequently occur to maintain the desirable and regularly occurring sex ratio.

[49] P. B. Moyle, biologist at UC Davis, contends that: "Some of the myriad confusions surrounding the niche concept result from the idea of "empty" or "vacant" niches. Some ecologists have suggested that niches actually exist out in the environment and that organisms evolve to 'fill' or 'occupy' them. Most ecologists consider this to be nonsense. Hutchinson's niche concept very clearly expressed the idea that a species' niche is the sum total of adaptations to the environment possessed by the species in question. *The niche is just as much an attribute of a species as its color, size, shape, or physiology*" ('Essays on Wildlife Conservation' http://marinebio.org/Oceans/Conservation/Moyle/ch7.asp). However, while it is true that being a college professor is an attribute of me, still it could not be an attribute of me, if there had been no job opening in a college for me to fill. In a similar way, dung beetles could not live off dung before animals that produced dung arrived on the scene, nor could the specialized bacteria that live in the termite gut do so before there were termites. And if one considers how the evolution of trees was followed by the apparition of new species of moss that grew upon them, it is plain that trees created new "job openings" which the mosses went on to fill.

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show that there is no tendency.[50] And evolutionary biologists are not in the habit of denying that biodiversity is a good.

Where some evolutionists diverge from Aquinas is when it comes to attributing the production of biodiversity to intelligence. The good that is biodiversity consists in a number of diverse species, each of which has its own parts ordered to its survival and reproduction. Just as some deny that the latter is a work of mind, attributing it exclusively to blind causes, so too some attribute the production of biodiversity to blind causes alone. Aquinas thinks they lack insight:

> For those things to which nature can extend according to its proper essential principles do not need to be determined by another, but only those things to which proper principles do not suffice. Whence the Philosophers were not led to posit the work of nature to be a work of intelligence from the operations which belong to the hot and the cold in virtue of themselves; because those positing natural things to happen from the necessity of the matter were also reducing all works of nature into these [causes]. They were led, however, from those operations for which the power of hot and cold and things of this sort cannot suffice; as from the members in the animal body being ordered in such a way that the nature [of the animal] was preserved.[51]

[50] I agree that available niches have a quasi infinite character about them, which makes it seem that one could never determine whether or not there was a tendency for them to be filled. For example, the microorganism *Symbion pandora* lives part of its life cycle attached by an adhesive disc to the lips of the lobster. Many other sea creatures plainly have lips, yet most of them do not have microorganisms making their living there. This would seem to show that there is no tendency for living things to evolve to fill niches. However, the situation is similar to human job market. The possibility of creating jobs that piggyback on other jobs is endless. Yet this does not prevent us from distinguishing a society which is stagnant from the point of entrepreneurship and one that is not. Parasitologists tell us: "Beginning students are often surprised to discover how many different kinds of parasites can infect a single host species; parasitologists considering the rich opportunities provided by vertebrate bodies, however, might wonder why they are so few" (Gerald D. Schmidt and Larry S. Roberts, *Foundations of Parasitology*, 6th edition [New York: McGraw Hill, 2000], p. 9). At the same time, they also inform us that "there are far more kinds of parasitic than nonparasitic organisms in the world" (ibid., p. 1) So despite unoccupied sea animal mouths and non-parasitized vertebrate organs, it is possible to ascertain that evolution displays spectacular fecundity when it comes to filling niches, rather than being stagnant. Certainly nowadays, there are fewer niches than there were millions of years ago, so any such tendency would not be so readily observable. However, even now there is evidence that some species in our day are headed in the direction of becoming two species. See Schilthuizen, *Frogs flies & dandelions*, chap. 6, 'A Chronic Case of *Rhagoletis*'.

[51] *DP* q. 2, a. 3, ad 5. In another place, Aquinas, instead of arguing against the notion that natural necessity removes the need to posit an external governor, simply asserts the contrary as if it were evident: "The natural necessity inhering in things that are determined to one is a certain impression of God directing them to an end; just as the necessity by which an arrow is driven so that it tends to a certain target is the impression of the archer and not of the arrow. But it differs in this, that what creatures receive from God is their nature; what, however, is impressed on natural things by man outside their nature pertains to violence. Whence just as the violent necessity in the motion of the arrow

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Blind forces cannot account for the coordination of their activities requisite for forming the functional parts that insure the good of the animal, such as feet, teeth, and eyes, or DNA for that matter; an intelligent agent must be responsible for such order.[52] Here we seem to be back to Paley's argument, an argument which finally does not seem that different from the Fifth Way which says: "Those things which lack cognition do not tend to an end unless directed by someone knowing and intelligent, as the arrow by an archer." Paley would agree with Aquinas that the foot is a good example of something in which the parts are arranged in such a way as is suited to an end (namely, walking), and that this arrangement requires an intelligent cause to explain it. As the natural causes immediately responsible for the foot lack knowledge, this ordering of the foot's parts to an end must be traced back to a being that is intelligent and knowing.

This is exactly where Empedocles and/or his followers are going disagree with Aquinas: "Those things which lack cognition do not tend to an end unless directed by someone knowing and intelligent, as the arrow by an archer." Sure, there is a difference between something acting according to an innate tendency, "a program" as opposed to chance (e.g., the parts that result in normal fetal development are due to the DNA blueprint and other determinate factors in the cell, and not to chance), but the blind forces of nature are capable of doing the programming.

I think a person can say this, but he can't really think it. I think it is self-evident that where non-intelligent causes are coordinated to achieve an end, this must be the work of intelligence, and that all one can do is try to show the absurdities that follow from saying other.[53]

demonstrates the direction of the archer, so the natural necessity of creatures demonstrates the governance of divine providence" (*ST* I, q. 103, a. 1, ad 3).

[52] One might ask how is this argument different from Behe's? Again, Aquinas is not arguing that natural causes are unable to produce the effect (e.g., natural causes could not produce the first flagellum), but rather that they are not responsible for the ordering to an end in the effect (e.g., natural causes cannot account for a thing being so adjusted that it serves to propel an organism). In the words of Aquinas: "For material and agent causes, as such, are a cause of the being of the effect; they, however, do not suffice for causing goodness in the effect, as it is both suitable in itself, so that it can continue in existence, and in regard to other things, that it might help them" (*DV* q. 5, a. 2). The blind material and agent causes of evolution produce the features that allow organisms to survive, e.g., a flagellum, but they themselves do not account for why the feature (e.g., the flagellum) has an arrangement such that it is beneficial to the organism in question (e.g., the bacterium).

[53] One might object: how could it be self-evident that intelligence must be invoked to explain the ordering to an end of non-intelligent beings (e.g., why the bacterium's flagellum is organized in a way that allows the bacterium to propel itself through liquid) when so many people, including educated ones, deny it? It is the work of another paper to examine the reasons why people in general deny the obvious, and why they are prone to do so in this particular instance. One of the most widespread reasons is failure to

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This latter claim is borne out when one examines one of Richard Dawkins's arguments in *The Blind Watchmaker.* Dawkins is trying to convince us that the God that Paley argues to starting from his example of a watch is superfluous for explaining organs such as the eye or molecules such as hemoglobin. Dawkins first speaks of the statistical improbability of the hemoglobin molecule arising by pure chance (one chance in 10^{190}). To show us how a hemoglobin molecule could be arrived at by blind causes, he presents an analogy with a computer. Keep in mind he is trying to show how one can get something of "specified complexity" or a determinate complex order without any input from intelligence. He takes a target sentence, "methinks it looks like a weasel", and he admits that if he had his computer randomly generate a string of letters, that the chances of coming up with even such a short sentence are astronomical. He then asks, what if the computer retained those of the randomly generated letters that happened to fall in the right places, and then generated random letters only for the remaining places? He programs his computer thus, and indeed in a very short period of time his computer arrives at the target sentence. *Voilà* complex order without any input of intelligence, just random letter generation and the automatic retention of the correct letters. Dawkins goes on to say that blind forces in nature have set up a similar process, whence the hemoglobin molecules, eyes, etc.

How, though, was the computer able to retain the correct letters? Dawkins programmed it. The whole point of his analogy was to show that natural causes can produce hemoglobin and the eye without the input of intelligence. But what his analogy has in fact indicated is that intelligence is required in order to generate complex forms of order. Intelligent beings do programming; non-intelligent ones do not.

When something is self-evident, all one can do is show the absurdities in the positions of those who maintain the opposite. The failure of Dawkins' argument supports my thesis that it is self-evident that "those things which lack cognition do not tend to an end unless directed by someone knowing and intelligent, as the arrow by an archer."

So ultimately I think that people cannot fail to see that if it is unbelievable that a computer capable of word processing, showing DVDs, etc. arose by the action of blind forces that *a fortiori* the

grasp the distinction made in the preceding footnote. One might also object: it cannot be self-evident that intelligence is requisite in order to fully explain the ordering to an end of non-intelligent beings because one can give an argument to establish this proposition, namely, only an intelligent being is able to direct something to an end *because* it takes intelligence to know the end and the notion of the end, and the proportion between means and the end; indeed Aquinas says as much in *SCG* II, 23 and *DP* q. 5, a. 1. It seems to me, however, that this is simply to make explicit a proper accident of intelligence, and therefore the proposition would still be self-evident, granted perhaps only self-evident to the wise (for the latter distinction, see *ST* I-II, q. 94, a. 2).

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human body could not have so arisen. One can show the absurdity of the various scenarios concocted to get around this. One cannot make a person see the obvious by presenting an argument based on something better known. As Thomas Reid notes, the typical defense for reasoning from finality to intelligence is by reduction to the absurd. For example, people will point out the DNA of an organism contains more information than an encyclopedia. They go on to point out that if something like that arrived from outer space, everyone would acknowledge that this was the work of an intelligent extra-terrestrial. Whence the absurdity of denying that the ordering to an end in DNA must ultimately be traced back to some intelligent being.

We have seen then that St. Thomas's Fifth Way stands up to challenges posed in the name of evolutionary biology. We have also seen that the second syllogism contained therein is quite similar to Paley's argument from design. At this point, it is worth articulating from a Thomistic perspective the respective roles that the intelligent being and chance play in evolution. Ironically, examining Dawkins' computer analogy is helpful for understanding how an intelligent being can get something complex that is ordered to an end by using both chance and necessary causes. A shortcoming in Dawkins's computer analogy is that evolution cannot aim at future goals (the equivalent of Dawkins's target sentence). God does though. God then in principle can "program" the universe such that lucky combinations arise through chance, but then those combinations are retained due to causes acting from tendency that God has put in place to insure an evolving biosphere. It is sometimes overlooked that God needs to order the causes acting by tendency in such a manner that the sorts of chance events conducive to the origin of new species are possible. Chance causality is not independent of natural things acting in a determinate way.[54] Digging a hole for a tree can be the cause of finding lost treasure. It cannot be the cause of an eclipse of the moon. For the right sort of chance events to be possible, namely, for ones that lead to evolutionary novelty, there have to be specific tendencies present in natural things. In addition, God needs to set a balance between the chance events and ones proceeding from tendency. Chance is part of the design;[55] it is a way of getting novelty, but it must be held

[54] See *ST* I, q. 103, a. 5, ad 1: "The very fact that something chance is found in things of this sort [i.e., "things under the sun"] shows them to be subject to some governance. For unless corruptible things of this sort were governed by something higher, they would tend towards nothing, most of all those which lack knowledge; and thus in those things nothing could happen [that falls] outside of tendency which is what chance means."

[55] Chance events do not escape God's providence: "Divine providence imposes necessity on certain things, but not on all, as certain people believed. For it belongs to providence to order things to an end. However, after divine goodness, which is an end separate from things, the principal good existing in things is the perfection of the universe; which certainly would not exist if all the grades of being were not found in things.

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within certain limits. If chance were to run completely wild — if the biosphere was continually flooded with a variety of mutant beings such as Empedocles' "man-faced ox-progeny" — species would scarcely be possible, as it would only be the odd individual that would produce offspring like itself.[56] When one reflects that causes acting by tendency and those acting by chance need to be carefully orchestrated if they are to produce the amazing array of organisms that has evolved on our planet, it is obvious that the evolution of new life forms must have an intelligent cause; one either acknowledges this or one doesn't.

A distinction Aquinas makes when speaking of plans will help clarify what I mean by saying that chance is part of the design. There are two senses of "plan" or "design". To plan or design is to figure out appropriate means to achieve an end which one has fixed upon. A plan for a desk involves a writing surface, storage space, etc. In addition to this plan, one needs another sort of plan, namely, directions for how to bring about the desired arrangement. These two plans are not the same, as anyone who has put together ready-to-assemble furniture knows. Accordingly, Aquinas notes that for *understanding* a thing it suffices to know the order of its parts, whereas for *making* a thing one has to also know by what operations the parts can be so ordered.[57] When I say that chance is part of the design, I am speaking of design in the second sense. Chance is a means used by an intelligent being to get novelty.[58] It is not chance

Whence, it pertains to divine providence to produce all grades of beings. And therefore for certain effects it prepares necessary causes, so that they happen necessarily; for others contingent causes, so that they happen contingently according to the condition of the proximate causes" (*ST* I, q. 22, a. 4).

[56] See Ernst Mayr, *Towards a New Philosophy of Biology* (Cambridge, MA: Harvard University Press, 1988), p. 319: "The question is sometimes asked, Why are there species? Why do we not find in nature simply an unbroken continuum of similar or more and more widely diverging individuals? It is now clear that the isolating mechanisms of a species are a protective device for well-integrated genotypes. Any interbreeding between different species would lead to a breakdown of well-balanced, harmonious genotypes, and would quickly be counteracted by natural selection. Such counterselection against hybridization has been demonstrated in nature in literally thousands of cases, even though cases of successful hybridization, particularly in plants, have also been demonstrated."

[57] See *In Decem Libros Ethicorum Aristotelis ad Nicomachum Expositio*, 255, and *DV* q. 5, a. 1, ad 9.

[58] I do not mean to imply that I think that chance causes alone are a sufficient source of evolutionary novelty and that other non-chance causes are not operative. This is a matter for biologists to determine. A certain number of biologists see a need to look for natural causes other than chance causes in order to explain evolutionary novelty. For one view on this issue, seeM. Parter, N. Kashtan, U. Alon, 'Facilitated Variation: How Evolution Learns from Past Environments To Generalize to New Environments', *PLoS Computational Biology* 4:11 (2008): "The origin of the ability to generate novelty is one of the main mysteries in evolution. ... Recent decades saw breakthroughs in the depth of understanding of molecular and developmental biology. Many of these findings were

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that the intelligent being uses chance for this purpose, as by doing so it can involve secondary causes in the production of new species. Nor is it chance that there are other natural causes present that are able to channel chance so as to in some cases produce a viable new species. The design of new species in the first sense of design is a plan including features that make it possible for individuals of a species to occupy a given niche (e.g., the gills of fish). That chance is part of the design for getting this design means that the latter is often imperfectly realized (e.g., the inferior wiring of our photocells compared to those of mollusks) and includes features that are somewhat arbitrary[59] (e.g., the number of toes humans have), not to mention that it often produces organisms that are not viable. Notice how an evolving biosphere as opposed to one created *ex nihilo* requires two levels of planning rather than one, and thus two reasons to posit "*aliquid intelligens*", as opposed to one.

Aquinas says in one place: "It is necessary that the entire work (*operatio*) of nature be ordered from some knowledge, and this certainly must be reduced to God in an immediate or mediate way."[60] An explanation of the production of the diversity of life forms which calls upon natural causes, both those that operate by tendency and those which are chance causes, must ultimately be reduced to God's wisdom, but in a mediate way. God is the source of the ordering of natural things to their ends in such a way that the things acting by tendency both make it possible for chance causes to bring about novelty capable of leading to the develop of new species and provide a framework within which the novelty that arises by chance (and perhaps also from other natural causes) can be retained. He is thus not only responsible for the ordering of means to end in the parts of the rose, the frog, etc., which order he realizes through intermediary causes, he is also immediately responsible for the ordering of universe which allows the intermediary causes to continually tend to produce new organisms with their appropriate parts. The use of

unified in the theory of facilitated variation, presented by Kirschner and Gerhart, that addresses the following question: how can small, random genetic changes be converted into complex useful innovations? In order to understand novelty in evolution, Kirschner and Gerhart integrated observations on molecular mechanisms to show how the current design of an organism helps to determine the nature and the degree of future variation. The key observation is that the organism, by its intrinsic construction, biases both the type and the amount of its phenotypic variation in response to random genetic mutation. In other words, the organism seems to be built in such a way that small genetic mutations have a high chance of yielding a large phenotypic payoff."

[59] See *In Aristotelis Librum De Anima Commentarium,* 851: "Nature makes members for the sake of certain operations. But from this that members are of such a disposition, it follows that they may have some accidents, such having a certain hairiness or colors or corruptions, which are not for the sake of an end, but arise rather from the necessity of the matter."

[60] *SCG* III, 64.

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intermediary causes in the realization of the order to an end found in the diversity of life forms points even more strongly to the need for a governor. Again the parallel with a person who sets up an assembly line to produce some useful artifact is helpful here. Not only does such a person have to know how the parts of that artifact are ordered to the artifact's end, the person also has to know how to organize a group of people or things that lack knowledge of this ordering in such a way that they produce the artifact nonetheless. Thus, Aquinas says:

> But in this that a premeditated order is imposed on things, the providence of governing is so much more worthy and perfect according as it is more universal, and it unfolds its premeditated plan through more ministers, because even the disposition itself of ministers plays a large part in the foreseen order.[61]

The activity of ministers or secondary causes, including contingent ones, does not speak against the governance of providence, but bespeaks of greater wisdom on part of the governor. Thus, evolution through natural causes (including chance causes), far from being a refutation of the Fifth Way, offers pre-eminent evidence of its truth.

Marie George
St. John's University
georgem@stjohns.edu

[61] *SCG* III, 94.

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