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THOMAS' SECOND WAY: A DEFENSE BY MODAL SCIENTIFIC REASONING

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Two points need to be made about my defense of Thomas' Second Way.[1] First, it has been selected among the other four by virtue of exploiting a notion of "efficient causality" beyond that of Aristotle. Second, the words "A Defense" in the title denote the indefinite article since there are many other defenses. Mine involves modal logic as it relates mostly to interdependent phenomena in specific domains of both traditional science and self-organizing biophysical processes in chaos theory. But in addition to other well-publicized analyses, there might be an emphasis on similarities between a Thomistic knowledge simpliciter of Nature's "dependent nature" and recent philosophies of science where to accept historically-generated domains of theoretical truth, dependent on a uniformity of Nature, is to accept a broad concept of "cause" in a domain on which the others rest. Or another approach might even stress the dependence of physical things on a First Cause that is reminiscent of the Greek "aitia", e.g. a Cause that inspires, whose ultimate end is unknown.

Having acknowledged other possible defenses to which there will be further reference for clarifying and strengthening my own, let me begin by noting that a central issue in Thomas' Second-Way argument is its soundness; in particular, the truth of its conditional premise. I will argue that the premise involves modal logic since it specifies that necessarily if there is no First Cause qua God, there is no world. I shall seek to show that the conditional might be understood to have a significant epistemic status, lying between a necessity of logical truth and a truth deemed empirical or reasonable, that evidently renders the argument sound. The soundness, in this sense, might hinge on the notion that the conditional cannot be accepted as false when a modal reasoning of science is affirmed to be true; that affirming the truth of rudimentary scientific propositions, formulated as conditionals, proceeds pari passu with affirming the truth of Thomas' conditional. And interestingly, affirmation of his conditional avoids prima

[1] The second way in the *Summa Theologica* is less technical than the proof in the *Summa contra Gentiles* and is sufficient for my purposes.

facie a radical specter of Nature suddenly ceasing to exist or changing that is sustained in the imagination of neither scientists nor disbelievers.

I. *Necessity and the Conditional*

Thomas' thought does not seem to be expressed by the mere material conditional that "If there is no First Cause, there is no world", where the conditional is true if as a *matter of fact* it is not the case that "There is no First Cause" is true and "There is no world" is false. He seems to say that the falsity is impossible when there is not the Cause. Though his thought reflects important modes of scientific reasoning, contrasting it to current cosmologies may be helpful. Given various *uni*verse and *multi*verse cosmologies, astrophysicists might assert that if there had been no quantum fluctuation of a primordial black hole, the universe would not exist.[2] Whereas they would presumably acknowledge the possibility of the present space-time universe existing even if a particular "Bang" did not occur in terms of a given cosmology, Thomas' conditional seems to suppose that it is necessarily the case that without a First Cause *qua* God the universe could not exist.

Thomas' thought seems to be that *necessarily* if there is no God, there is no world, where our experience of the world leads ineluctably to this conditional. While the conditional permits such things as God not causing a quantum fluctuation, it does not allow for His nonexistence to be merely one of several possible sufficient conditions or for its being a condition that could obtain when there is a world. That is, for God's nonexistence to permit the valid inference to there being no world, it must be *impossible* for "There is no world" to be false when "There is no God" is true. "There is no God" entails "There is no world" *if and only if* "There is no God, therefore there is no world" is a valid inference: To assert that "There is no God" entails "There is no world" is to assert that "If there is no God, then there is no world" is not merely true but necessarily true. And in this very manner, Thomas' conditional falls within the domain of modal logic.

Certainly, his reasoning admits of distinguishing modal necessities from logical ones in terms, say, of conclusions following premises with logical necessity. But the premises often stem from a broad common-sense

[2] See physicist V.J. Stenger's "The Face of Chaos," *Free Inquiry* 13 (1993) 13-14.Stenger refers to the black hole prior to the fluctuation *qua* Bang as having maximum entropy or peak disorder, and as being a virtual "nothingness" devoid of space-time, structure, and governing laws of physics. On the peak-entropy scenario, the formation of any given universe would be unpredictable. The words "Universe" and "world", in my discussion, will generally be used interchangeably.

(*sensus-communis*) experience, reminiscent of Aristotle's "experience of ages", by which they might be understood to have a modally necessarily truth. The truth conceived by Thomas was, surely, influenced by Aristotle. The breadth of Aristotle's reasoning may be why some eminent Anglo-American philosophers, despite an antimetaphysical indebtedness to logical positivism, view Aristotle as one of the great forerunners to analytic philosophy.[3]

Aristotle's analyses, of course, were frequently concerned with modalities of propositions that ranged from "It is necessary indeed, if animal follows man, that it should follow all these also [subjects of the predicate 'man']", in the *Prior Analytics* 43b, to the sort "*A* cannot inhere in *B* when *B* inheres in *C*, with the resulting inference that *A* inheres in *C*, and this is a known and admitted impossibility" in the *Posterior Analytics* 87a. However, modal language concerning efficient causality would designate one thing for Aristotle and another for Thomas. Whereas Aristotle's notion of the causality involved only the cause of change, the "cause of form informing matter," Thomas' Second Way included this cause and the cause of existence as well. In being preceded by "...in efficient causes it is *not possible* to go on to infinity," the last half of the Second Way states (I,2,3):[4]

> ... if there be no first cause among efficient causes, there will be no ultimate, nor any intermediate cause. But if in efficient causes it is possible to go on to infinity, there will be no first efficient cause, neither will there be an ultimate effect, nor any intermediate efficient causes; all of which is plainly false. Therefore it is necessary to admit a first efficient cause, to which everyone gives the name of God.

Thomas' Second Way goes beyond his First Way inasmuch as the First proved merely that God was the cause of universal change and the Second that He caused the world's existence *qua* ultimate effect and all intermediate (second) efficient causes. Still, the last half of the First Way is similar to this argument insofar as both arguments might be expressed by what is today called a *modus tollens* syllogism. The syllogism, apart from modal considerations in the Second Way, specifies that if there is not an uncaused

[3] For instance, see R. Trundle's *Ancient Greek Philosophy: Its Development & Relevance to Our Time* (London: Ashgate Publishing Co., Avebury, 1994), p. 8. It discusses an eminent analytic philosopher who, though once calling himself "a 'not naive logical positivist'... [declared] that Aristotle was one of the great 'analytic philosophers'."

[4] St. Thomas Aquinas, *Summa Theologica* I, 2, 3 (emphasis added), in A Shorter Summa, Ed. P. Kreeft (San Francisco: Ignatius Press, 1993). Future reference is to this edition.

First Efficient Cause ($\sim F$), then there are not second efficient causes ($\sim S$); there are second efficient causes (S); therefore, there is a First Efficient Cause (F) that we name God: $\sim F \rightarrow \sim S / S // F$. Now it is by reference to our experience of second causes in the Second Way, before this argument occurs, by virtue of which Thomas' first premise is formulable as Necessarily ($\sim F \rightarrow \sim S$). Without articulating the reasons for the formulation at this time, several things may be reiterated and noted about the syllogism.

First, the modal necessity in the first premise may also be expressed: "It is impossible for $\sim S$ to be false when $\sim F$ is true". Thomas holds that our experience of the very nature of second causes (S) is such that we are led inextricably to hold that without a First Cause (F), they cannot exist. Modern logicians know that the syllogism has a valid form. A central issue concerns soundness - the truth of the premises. An apparent truth of the conditional premise, that renders noncontroversial the second premise "S", is addressed shortly in terms of the "later" Wittgenstein's insights.

Second, a modal fallacy is not committed in Thomas' *modus tollens*, regarding the conclusion: "Necessarily if $\sim F$ then $\sim S$, and S, therefore *necessarily* F". The fallacy also draws attention to the fact that $\Box(\sim F \rightarrow \sim S)$ is not equivalent to either $-\Box \sim F \rightarrow \sim S$ or $\sim F \rightarrow \Box \sim S$, where, for convenience, "$\Box$" means "Necessarily". For example, we have seen that "Necessarily, if there is no God, there is no world" means that it is *impossible* for "There is no world" to be false when it is true that "There is no God". However, in "If necessarily there is no God, there is no world", it is *possible* that "There is no world" is true or false even though "Necessarily there is no God" permits only true truth-values. Though the antecedent of the latter conditional is "stronger" than that of the former, the latter conditional is weaker than the former in the sense that the former does not allow for there being a world when there is no God.

Third, $\Box(\sim F \rightarrow \sim S)$ is not, of course, equivalent to $\Box(F \rightarrow S)$. Given that "Necessarily, if there is no First Cause, there are no second causes," we cannot validly infer that "Necessarily, if there is a First Cause, there are second causes". This fact may not weaken Thomas' general theology because a First Cause *qua* God need no more have created the universe than a universe that is finite as opposed to infinite. (However, when he says that the union of a lover and beloved involves both the presence of the lover and union of affection (I-II, 28, 1), he does not merely indicate his understanding of the significance of the sacraments. Thomas understands, from a theological perspective, that the nature of God *qua* Love is such that He would inevitably have created the beloved. His thought suggests that the proper use of will, sensation, and intellect, in view of modal notions other than epistemic ones [explained shortly], enable the "beloved" to understand the disingenuousness of the world's possible nonexistence.)

Some points relevant to a revealed "God" may be briefly summarized as a prelude to discussing a First Cause. A brief comparison of the First and Second Ways may be helpful in this respect.

The First Way may underscore that experience and reason need to be complemented by revelation for grasping the beginning of the universe in time with time, in contrast to Aristotle's "pagan thought" in which there was no beginning. Still, although eminent scholars such as *F.* Copleston note that Mohammedan believers were being addressed and that "God is recognized... to be the first Cause",[5] it needs to be stressed that this Cause causes universal change and not existence. Thus the Cause might be akin, philosophically, to an eternal Unmoved Mover that exists as an inseparable unity with the things it moves.

Now the Second Way does not establish the existence of the Judeo-Christian God. But in going beyond God merely causing universal change to causing the existence of the world, Thomas seems to have intended his Second Way to be linked modally to a divine Agent *qua* Creator as opposed, say, to anything interpretable as an Unmoved Mover that is an inseparable "form of the world's substance". And undoubtedly, in proving a Cause or Creator of existence, the Second Way in conjunction with revelation suggested to Thomas that creation would *have had* to obtain by virtue of a God qua Love who by His nature wills reciprocated love in order to be in complete union with His beloved.

Given the connection of Love (*agape*) to God's holiness and notions that He "cannot deny Himself", talk about creation having had to obtain may reflect a deontic modality of "spiritual" necessities or impossibilities as opposed to the ones most frequently associated with modal reasoning about physical events. On the one hand, if the proof is a short step to accepting the revealed God, then a scholar who had not been a believer but who takes the step might embrace $\Box(F \rightarrow S)$ in a *modus ponens* for proving to other believers that it is impossible for "$\sim S$" to obtain when there is a God *qua* Love who *must* be with His beloved. On the other, if "*S*" is understood in terms of a "cupidic dependency", then the proof of "*F*" in a *modus tollens* could be of a loving creator who is actually reminiscent of Aristotle's *Metaphysics* 1072a in which his theology has God produce motion "as being loved".

My reference to possible "theologico-deontic" modalities is significant since they indicate, perhaps contrary to Thomas' own distinction between faith and reason, that reason may be more entangled with theology, if not faith, than he supposed. Whatever may be their relationship, I shall be primarily concerned with physical reasoning as it relates to "alethic" and, to

[5] F. Copleston, *A History of Philosophy* 2, Med. Phil. II (NY: Image Books, 1962), p. 62.

some degree, "epistemic" modalities. They are connected respectively to sentences involving such words as "necessary", "possible", "impossible" and "knows" or "believes".

The Second Way, as the other proofs, suggests that openness to revelation may come from reason and experience. Yet, however modal notions pertain to them, I will argue that the conditional in this Way is not intended to merely involve reasonable belief in an existing divine Being. It involves a Being whereby knowledge of the conditional's truth is stronger, epistemologically, than what is both reasonable to believe and empirically verifiable. Though modal reasoning has been most notably applied to Aristotle's *De Interpretatione* IX among ancient and medieval literature,[6] the Second Way is the first proof in which the notions, in addressing existence as well as change, seem to have the most significance.

Moreover, among the "four causes", efficient causality alone involved a transformation from explanatory agencies into invariably succeeding events in modern philosophies of science. A reappraisal of the succeeding-event causality, often understood to underlie modern science, is important by virtue of various epistemic difficulties. The difficulties invite second thoughts about modern causality wholly superseding the previous one. Efficient causality may conceptually not only accommodate the modern notion but render coherent its assumption; a point discussed shortly. Difficulties of the assumption range from Kant's attempt to save the "*a priori*" status of the modern causal principle from Hume's criticism by grounding the status in an *a priori cognition* -—a psycho-logical, as opposed to a logical, response that is often disregarded— to Kant's *synthetic a priori* causal principle being neither logically nor empirically true and a "K-K Thesis" whereby "if skepticism is to be avoided [about *K*nowing one *K*nows], the exploitation of... 'causal' regularities in obtaining a posteriori knowledge must not require prior knowledge of those regularities".[7]

Post-Kantian physics and metaphysics are later related to efficient causality as well as to Thomistic notions of modal truth. Let me now try to clarify how Thomas begins with experience for inferring the truth of his conditional premise by initially contrasting his approach to one that begins with modal truth-claims. The contrast is illuminating since, as soon elabo-

[6] See J. Hintikka's "The Once and Future Sea Fight," *Philosophical Review* 73 (1964) and R. Trundle's analysis of Hintikka and a traditional modal interpretation in "De Interpretatione IX: Problem of Future Truth or Infinite Past Truth," *The Modern Schoolman* LX (1981).

[7] F. Suppe, *The Structure of Scientific Theories*, 2 ed. (Chicago: University of Illinois Press, 1977), p.722. This seminal work is the outgrowth of an international symposium on the philosophy of science at Chicago Circle.

rated on, it aids in distinguishing various epistemological approaches in the history of philosophy such as one taken by the "first metaphysician" Parmenides; it being generally said that his thought was the first to collide head-on with our common-sense experience.

In beginning with modal truth-claims apart from experience, we might claim that a person named Boethius necessarily exists. What is inferred from the necessity of his existence is that he does exist. Modal necessity in this sense means that from our assertion that something *must* either exist or be a certain way, e.g. large or small, it follows that it exists or is that way. The modal supposition and inference may be unusual and unsubstantive, but the reasoning can obtain.

Thus, similarly, we might reason from the claim that the existence of Boethius is impossible. The impossibility might be expressed by saying that he cannot exist, and what may be inferred is that he does not exist. That is, this modal impossibility means that from our assertion that something *cannot* either exist or be a certain way, it would follow necessarily that it does not exist or is not the way it is purported to be.

Finally, in claiming that the existence of Boethius is possible, there is no implication for either his existence or nonexistence per se. To say he possibly exists leads simply to the inference that he *might* or *might not* exist, but not to the inference that he *does* or *does not*. Even beginning with the assertion "Boethius does in fact exist *and* possibly might not exist", apart from other experiential or modal considerations, does not lead to any significantly stronger inference since the assertion cannot be bifurcated from his possible nonexistence.

That is, in terms of propositional logic, both conjuncts in the assertion must be true for its truth in terms of its status as a conjunctional compound sentence. Given the sentence's truth, whatever is inferred to *be* might *not be* as well. This point is important because the notion "whatever is might *not be*" often seems to be understood as expressing a fundamental contingent truth: The believer, for example, looks at a blade of grass and concludes there must be a God; the secular logician responds with the "contingent truth" that there need *not be* God or grass necessarily, where "necessarily" refers to a logical (*analytic*) necessity.[8]

Though modal claims of necessity or impossibility may in themselves yield inferences that things exist or do not exist, a modal claim of a possibility *per se* does not lead to a definitive claim of something existing, or of its existing apart from possibly not existing when coupled with the mere

[8] I am indebted to Professor Terry Pence for this example of how it is often thought that an uninferred notion of "contingent truth" applies to over-simplified Thomistic inferences to God.

fact of its existing. Let us consider modal claims that stem from experience after considering an ordinary experiential context in which an epistemic notion of "reasonableness" might obtain.

An important notion in which it might obtain is articulated in Wittgenstein's *On Certainty*. After noting that "only in such-and-such circumstances does a reasonable person doubt...," Wittgenstein asserts:

> The procedure in a court of law rests on the fact that circumstances give statements a certain probability. The statement that, for example, someone came into the world without parents wouldn't ever be taken into consideration.[9]

What can be meant other than there are no circumstances that could give the statement an improbability inducing *mere* doubt? Wittgenstein adds: "There are cases where doubt is unreasonable, but others where it seems logically impossible. And there seems to be no clear boundary between them".[10] That this former icon of positivism —who later inspired the dictum whatever can be said can be said clearly— could see that the boundary is unclear, further underscores his uniqueness in a positivist Anglo-American tradition in which empirical (*synthetic*) truth is still often bifurcated from truth of a logical (*analytic*) sort.

Furthermore, an understanding in the neo-Kantian tradition of what lies between logical impossibility and straightforward empirical falsity was articulated in the late W.H. Walsh's *Metaphysics*.[11] In struggling against a Humean-influenced positivism, he argued that a "categorial mistake" of supposing that a dropped quarter simply disappeared, in the sense of going clean out of existence, lies between a "material mistake" of thinking it rolled to the left when in fact it rolled right and a logically impossible "formal mistake" that it rolled both right and left.

I am suggesting that there is a strong resemblance of "categorial mistakes" to modal impossibilities and necessities in terms of which also empirical truth, e.g. the quarter rolled right, involves epistemic parameters of what is reasonable to claim. The parameters might be understood in terms of various modal necessities such as "Necessarily if a thing ceases to exist, it does not disappear in the sense of becoming 'nothing'" and "Necessarily

[9] Ludwig Wittgenstein, *On Certainty* (NY: Harper & Row Publishers, 1972), p. 42e, #335.

[10] Ibid., p.59e, #454.

[11] See W.H. Walsh's *Metaphysics: An Exposition and Defense of A Controversial Branch of Philosophy* (NY: Harcourt, Brace & World, 1962), pp. 154-58.

if a thing comes into existence, it does not come from 'nothing' and out of 'nowhere'." Such necessities, in point of fact, reflect Thomas' notion of the dependent and inter-related nature of things, and the question ensues of how they can be any less reasonable or true than the truth-claims for which they set parameters.

Indeed, it is untenable prima facie to ascribe "truth" to empirical statements and not to such modally necessary ones whose denials would, for Walsh and Wittgenstein, be more seriously mistaken than denials of empirical truth and reasonable truth-claims respectively. And although no particular circumstances count against the necessities, say in terms of a liberal verification principle, they are not only not meaningless or senseless in the sense of a speculative metaphysics without perennial points of contact with our fundamental experience but have a greater epistemic status than empirical truth or truth deemed reasonable to believe.

We have thus far considered, generally, the peculiarity of reasoning from a modal claim per se to existing things and, yet, how in the context of experience a modal claim may nevertheless set parameters of reasonableness. Let us now consider reasoning from experience to modal claims as well as such claims in broader experiential contexts; Thomas' approach for his first premise, to be explicitly examined shortly.

Thus, if we begin with our experience of the world, we can appreciate how Thomas inferred modalities relevant to his *modus tollens* from various claims. Importantly, beginning with such claims may be taken with other experience in a way that eludes starting with a modal claim *per se* since, for example, starting only with someone's necessary existence is incongruous with our experience of its dependence on human reproductivity. In terms of such experience we may claim that Boethius exists. Though we would not infer that his existence is logically necessary, we might infer the modal necessity —in light of our experience of the reproductive nature of persons— that it is necessary that if Boethius exists, he has two biological parents. The necessity might be construed as giving one sort of specific expression to the modal notion that things do not come into existence out of 'nothing'.

The significance of this kind of specific necessity is reflected by the religious notion that Jesus had only one biological parent. As disbelievers do not appeal to the logical impossibility of Jesus' divine conception, for instance, but to its conflict with their experience of our reproductive nature, they do not hold that the nature is understood in terms of a logically necessary truth. Having noted an apparent truth of a modal necessity whose denial would be deemed physically impossible *by disbelievers*, let us note that it is presumably inferred from experience and that Thomas does not appeal to experience for what is only known by faith.

In considering a more everyday modal inference, we might consider claims that a person named Boethius does not live in a small remote vil-

lage. Though it would not be inferred that his residency is logically impossible, there might be the inference to an impossibility in the context of a census official who initially insists otherwise. The lifetime residents might infer, and proclaim, that his residency is impossible in terms of their never having heard of such a person. The notion that his residency is impossible may be more formally expressed: It is impossible for the statement "Boethius does not reside in the village" to be false when "The lifetime residents never heard of him" is true. Surely, in a remote village without reliable vital statistics, the census official would concede that it is *more* than merely likely he was wrong; that, in fact, Boethius does not reside in the village. What about inferences with respect to uncertainties and possibilities?

In uttering assertions about how things are, we might say that we are uncertain about them, say whether or not Boethius exists. But his possible existence is ordinarily expressed in the context of modal knowledge, based on experience, which enables us to infer other knowledge.

Though we may assert that we do not know whether or not Boethius is alive now, we might infer the impossibility of his previous existence in circumstances in which there was no pertinent parental union: Necessarily if there was no pertinent parental union, he did not previously exist. The objection that we have no experience for formulating modally necessary conditions on which existence depends would mean that our assertions about existence allow us to reasonably entertain the possibility of someone coming into the world without parents; a notion contrary to Wittgenstein's own analysis and one collapsing the very distinction between experience and faith that disbelievers would themselves wish to retain.

Modalities of necessity and impossibility are complemented by ones that refer to possibilities. For example, from Boethius' possible existence and our knowledge of reproductive dependency, we might infer that necessarily if a relevant union occurred, he did *possibly* exist.

In sum, whereas beginning with a possibility per se does not yield inferences to how the world is, assertions about how it is permit inferences to modal conditionals of necessity and impossibility. Even when there are assertions about something possibly existing, they ordinarily arise in a context of modal knowledge, say in terms of the dependency of human existence, and inferred conditionals do themselves express modal knowledge. Can such knowledge be more generally related to a Thomistic dependency ranging from inorganic physical phenomena to biological organisms and geological formations?

II. *The Conditional and Scientific Reasoning*

Geologists would naturally suppose the conditional that necessarily if certain metamorphic processes do not occur, marble is not produced. If geology students filed a field report that marble was produced without the processes, their professors might respond validly that "It's impossible it was produced!". Their response indicates a modal reasoning in which, given marble's metamorphically dependent nature, they would not consider the possibility of its production apart from the processes. Though the conditional and an empirically true statement "Marble was produced" do not yield the conclusion "Necessarily the processes occurred", they do the conclusion "The processes occurred"; a point whose patency should not obscure that the conclusion's truth follows validly if and only if both premises are true, where the conditional's truth is a rudimentary sort of scientific one.

How may the geology example be tied more concretely to Thomas' reasoning? Let me reiterate the significance of his notion of efficient causes. An efficient cause *that is other than* the First Efficient Cause does not refer to a cause which brings into *being* the matter, material, or substance (*ens*) of something, e.g. of the marble. Rather the notion of "efficient cause" refers to a cause, in this context, that changes the form or essence (*essentia*) of substance wherein, for instance, the substance is changed from one mass of rock to another such as marble. Consider a case of teleological, as well as modal, reasoning in medical research.

When researcher S. Levy at Tufts University School of Medicine stated that a new antibacterial drug should be used judiciously because it is "*not possible* that resistance won't occur",[12] he was giving both modal and teleological voice to a medical-research reasoning in which it is in the nature of "Bacteria [to] use a variety of evolutionary tricks to outwit antibiotics".[13] Anyone who has even a perfunctory familiarity with medical news knows that the medical community acknowledges the virtual impossibility of there not occurring bacterial resistance ($\sim R$) when there is a new antibiotic drug (D): $\Box(D \rightarrow R)$.

[12] See interview with researcher S. Levy, Tufts University School of Medicine, in response to Dr. Sharon Nachman's public report that fatal infections caused by mutant strains of a common enterococci bacterium were healed by the new antibiotic Synercidin, in L. Garrett's "Drugs Barely Keep Ahead of Bacteria," *Newsday-KY Enq.* 13 March 1995, No. 338 (emphasis added). Levy's reasoning may be expressed as a *modus ponens*, when the impossibility is reformulated as a conditional, in light of the conclusion that there will occur bacterial resistance, e.g. as manifest in his statement that "Thinking Synercidin will save us is wrong."

[13] Ibid., No. 338.

A more mundane modal reasoning is evidenced by biologists who will naturally suppose, by virtue of their experience of the reproductive nature of organisms, that it is *necessarily* the case that if there are no organismic parents ($\sim P$), then a given organism does not exist ($\sim E$). Thus when they come across a given organism (E), they will not merely infer that there are organismic parents (P) but that it is *impossible* that the organism exists and has no parents. The impossibility may be formulated in terms of $\Box(\sim P \rightarrow \sim E)$.

Now, in this context, Thomas' conditional, $\Box(\sim F \rightarrow \sim S)$, does not suggest that without a pair of original first parents created by God there could be no secondary offspring since, apart from revelation, there is no way of knowing whether or not the offspring consist of an infinite series. His conditional specifies that an infinite or finite series, given our *experience* of the world, depends ontologically on something which is not itself dependent on pain of inferring that dependent things might not exist and ultimately that they would not exist. *Hence, given our experience of the world, if philosophers say that existence is contingent in defense of anything's possible nonexistence, they paradoxically acknowledge the experienced dependency —though they evidently reason from it to a modal possibility* of not being *in terms of considering the possibility both in the absence of any modal understanding and as a more primordial fact than the dependency.*

Now those who are familiar with Thomas' Third Way, his proof of a Necessary Being from possible beings, may object that this Way does not begin with dependency but rather with a modal possibility of beings *not being*. Therefore, they may object, a modal possibility per se *does* give expression to our primordial experience since it is with such experience that Thomas, characteristically, begins his arguments. In response to this objection, it needs to be noted that Thomas does not reason from a modal possibility of beings possibly *not being* to Necessary Being. He begins with experienced beings coming into existence and perishing to infer possible beings; arguably reflecting a modal impossibility of possible beings (P) existing when there is no Necessary Being (N): Necessarily if $\sim N$, then $\sim P$.

The point that needs to be emphasized is that if the possibility of *not being* is understood by post-positivist philosophers in the Humean-Kantian tradition as a "contingent truth" per se in terms of which whatever exists might not exist, then they may not only confuse an inference with its experiential origin but commit a False-Dichotomy Fallacy in disregarding modally necessary truth lying between empirical (*synthetic*) and logically necessary (*analytic*) truth. These errors would lead to an underestimation of Thomas' Proof as merely valid, but not sound, and to an overestimation of radical possibilities such as the world suddenly going out of existence. One need only recall that Hume, in a moment when he took his empiricism too seriously, checked frantically to see if the world was still there!

How can the odd behavior be tied more precisely to a questionable rationality of rejecting the soundness of Thomas' argument? The major issue is not its validity but the truth of the conditional.

To acknowledge the conditional $\Box(\sim F \rightarrow \sim S)$ *as the impossibility that "There are no second causes" is false when "There is no First Cause" is true is to acknowledge the following: It is impossible for* $\Box(\sim F \rightarrow \sim S)$ *to be false when "There are second causes" (S) is true. That is, the conditional* $\Box(\sim F \rightarrow \sim S)$ *is logically equivalent to "Necessarily if S, then* $\Box(\sim F \rightarrow \sim S)$*". And when "S" is understood in terms of the modal impossibilities that give expression to it, there is the impossibility of Thomas' conditional being false when the modal impossibilities are true. Given that the denials of their truth lie between logical impossibility and either empirical truth or unreasonableness, the claim that they are false would not seem merely unreasonable but irrational. Thus to avoid an evident irrationality is to affirm the truth of the modal impossibilities and, therefore, the truth of Thomas' conditional.*

Specifically, since "*S*" finds expression in modal impossibilities, we may let "S_m" designate this understanding in Thomas' conditional without skewing its meaning. The conditional becomes "$\Box(\sim F \rightarrow \sim S_m)$" whereby it is true if and only if it is impossible for "$\Box(\sim F \rightarrow \sim S_m)$" to be false when "$S_m$" is true. When the latter impossibility is transposed into "Necessarily if S_m, then $\Box(\sim F \rightarrow \sim S_m)$" and it into "$\Box\left[S_m \rightarrow \Box(\sim F \rightarrow \sim S_m)\right]$", the logical equivalence between it and "$\Box(\sim F \rightarrow \sim S_m)$" is manifest in simple truth tables:

$\Box(\sim F \rightarrow \sim S_m)$					$\Box\left[S_m \rightarrow \Box(\sim F \rightarrow \sim S_m)\right]$				
F	T	$\mathbb{T}$	F	T		T	$\mathbb{T}$		T
F	T	$\mathbb{T}$	T	F		F	$\mathbb{T}$		T
T	F	$\mathbb{F}$	F	T		T	$\mathbb{F}$		F
T	F	$\mathbb{T}$	T	F		F	$\mathbb{T}$		T

However, despite the irrelevance of an infinite temporal regress, there might be a supposed dilemma of knowing that a possibly infinite number of modal impossibilities are true. In terms of sentential logic, the falsification of one conjunct falsifies any conjunction. Thomas' reference to "no case known", examined momentarily, invites the response of an atemporal knowledge *simpliciter* of the impossibilities or interrelated conditionals.

An example in current philosophy of science may be helpful for strengthening the notion of such knowledge. Cornell physicists F. Rohrlich and L. Hardin suggest a knowledge *simpliciter* of the approximate truth of

theories of physics in given domains of a historically-generated sequence of interrelated "nested domains".[14] Their approximate truth is typically so well tested, they argue, that it could only turn out to be wholly false on the *more* than unreasonable supposition that Nature itself could change. Is to accept the nested domains of truth to accept the truth of a modal necessity that might be common to them, say in terms of a broad concept of "cause" applicable to a "nest" that nests the others? Interestingly, Thomas asserts (I, 14, 9) that "as the natural objects of knowledge are prior to our knowledge..., so, the knowledge of God is prior to natural things, and is the measure of them" .

In causing second causes that include our existence as rational efficient causes who obtain knowledge of which we are not the mere "measure", God as First Efficient Cause renders coherent objective scientific knowledge apart from what we will, wish, or think. It will be shown, momentarily, that a modern causal determinism would not only permit no objective "measure" but evoke the notion that there are causes of our truth-claims with no rational way to assess which claims were in fact true since even the assessments would be caused. It is also important to note that the eminent medieval scholar P. Kreeft draws attention to the same passage for arguing that the medieval worldview includes and surrounds the modern "positivistic-materialistic-empiricistic-scientific-secular one".[15]

There is a difficulty in seeing how knowledge *simpliciter*, in the Thomistic sense, could be seriously challenged apart from the specter of Nature itself either ceasing to exist or radically changing. An instance of considering such change might be exemplified by biologists who express astonishment over an organism's existence *per se* - as if an "attribute" of possible nonexistence was as rational and natural to suppose as existence stemming from the reproductive nature of living things.[16] Such a rudimentary supposition about living things, made in the context of science, underscores the need to briefly address a theory of knowledge.

It is beyond my purpose to elaborate on Thomas' epistemology. Suffice it to say that it involves a metaphysics of the universal (*eidos* or "form") be-

[14] Cf. Cornell physicists F. Rohrlich and L. Hardin, "Established Theories," *Philosophy of Science* 50 (1983) 603-17.

[15] See P. Kreeft, *Summa of the Summa* (San Francisco: Ignatius Press, 1990), pp. 139-140.

[16] Martin Heidegger, for instance, speaks of an "attribute" of potential nonexistence in his *Einfuhrung in die Metaphysik* (*An Introduction to Metaphysics*), Tr. R. Manheim (NY: Doubleday & Co., Inc., 1961), p. 25. The reference to Heidegger does not ignore his many profound insights but rather underscores the significance of those of Thomas in this context.

ing "in" individual organisms (unities of form and matter, or *hyle*) that may permit an Aristotelian-like *epagoge*. There is no formidable problem prima facie in understanding that perception together with memory and intellect enable the biologist, for example, to inductively "abstract" universals in an "intellection process"; to grasp intuitively the dependent nature of phenomena and related modal conditionals. The conditionals of different disciplines have in common the dependence of things and Thomas' conditional, in this sense, is a conditional "writ large".

This is not a broadside defense of an intuited first-principle (*archai*) methodology that was properly superseded by subjecting complex, often counter-intuitive, theories to empirical tests that might count against them. Rather, my remarks underscore that theories are coordinated with perception and with a broad experience that often fruitfully issues in modal claims resting on a teleological metaphysics —acknowledged or not. Given that a modal reasoning from physics to biology often reflects an understanding of observational things in formalized or unformalized theories, one might gather that the applied logic of a "contingency" per se, whatever *is* might *not be*, compares unfavorably and seems unnatural. And we need to keep in mind that modern philosophies from pragmatism and positivism to linguistic analysis and phenomenology have been *aggressively* exploited, often naively and without due epistemic caution, for criticizing Thomistic metaphysics in general and a teleological causality in particular.

Furthermore, that a teleological metaphysics is increasingly applicable to chaos interpretations of biophysical processes is indicated by, among others, astrophysicist Victor Stenger. In reference to recent COBE-*Satellite* data corroborating an inflationary Big-Bang theory, Stenger's "The Face of Chaos" notes that the "currently existing structure of the universe, including the laws of physics, could very well have been spontaneously generated after Planck time..."[17] Notwithstanding an apparent inconsistency of the spontaneity with a Thomistic "dependency", our experience of Nature would lead us to suppose that a spontaneous fluctuation depends on a black hole whose existence is itself dependent. And the further notion that the spontaneity leads to "natural processes of self-organization and even to a kind of Darwinian natural selection among... possibilities"[18] is linked teleologically with formations of sub-cosmic systems and their subsystems; each system being caused by previously evolving systems and each having an equilibrium dependent on its adaptation to parameters of possibilities caused by other systems —as solar systems cause planetary

[17] See Stenger, "The Face of Chaos", p. 14.

[18] Ibid., p. 14.

ones that continually adapt to the evolving solar systems and biophysical subsystems in terms of a "purpose" to maintain equilibrium.[19]

Such purposive adaptability, much more choices endemic to human biological systems, in fact, have both found general expression in the family of quadratic maps,

$$Fu(x) = ux(1-x),$$

whereby programming a computer to iterate the function $f(x) = 4x(1-x)$ with input of random numbers between 0 and 1 yield dramatically different behavior in which values unpredictably repeat and do not repeat as well as "wander aimlessly about the unit interval with no discernible pattern".[20] While noniterated systems also produce unpredictable results, researcher P. Berge prescribes a simplification of systems in which not only the equation $f(x) = 4ux(1-x)$ describes a period-doubling cascade "but... any nonlinear function of x... ".[21] Thus from planetary systems within parameters of solar and biological systems, adaptive biosystems may find expression in terms of a difference equation $P_{n+1} = kP_n(1-P_n)$ for populations where P_n = population after n generations, k is a constant, and a limiting value (L) of overcrowding and limited food is 1 ($L = 1$). Recast as a function in which $x = P_0$ (initial population) and $f(x) = kx(1-x)$,[22] there results $P_1 = f(x)$, $P_2 = f(f(x))$, $P_3 = f(f(f(x)))$ and so on whereby, while a population's fate is subject to interacting stimuli, a given constant k involves the unpredictable behavior $kx(1-x)$.

Understood in teleological terms of self-organized adaptations and even notions of purpose or choice by biologists and biophysicists, such unpredictable behavior in not to be confused with an "indeterminism" of quantum mechanics that -—besides being challenged by recent quantum cosmologists[23]— is distinguished by physicist R.V. Jensen. He lectures on the

[19] For discussion of solar systems, planetary systems and biophysical systems alike having self-organizartion and purposes of maintaining equilibrium, see R. Trundle's "Quantum Fluctuation, Self-Organizing Biological Systems, and Human Freedom," *Idealistic Studies: An Interdisciplinary Journal of Philosophy* 24 (Fall 1994), p. 272.

[20] See R.L. Devaney, *An Introduction to Chaotic Dynamical Systems* (NY: Addison-Wesley Publishing Co., 1988), p. 3.

[21] See Pierre Berge's assertion in the seminal work *Order Within Chaos* (New York: John Wiley & Sons, 1984), p. 287, coauthored with Yves Pomeau and Christian Vidal.

[22] Devaney, *An Introduction to Chaotic Dynamical Systems*, p. 8.

[23] See, for example, the work of quantum physicist David Deutsch and philosopher of science Michael Lockwood, e.g. "The Quantum Physics of Time Travel," *American*

"interface between the microscopic and macroscopic world (... where nonlinearities are large and perturbation theory fails, classical theory exhibits chaos, and quantum mechanics is complicated)."[24]

The connection of the human sciences to physics has been strengthened. If physical systems of physics are construed as self-organizations involving a teleological adaptability to various possibilities, then scientists are warranted *a fortiori* in construing biological systems in the same way since physical systems are their ontological-evolutionary origin and physics their methodological model. The model is acknowledged in biosocial models that involve a *telos* —a purpose and choice of persons— when it is stated by biosocial researchers that a "person is not a... passive recipient of social forces" but part of dynamic-impact models whose analysis in "physics can be found in... 'Statistical Mechanics of Social Impact'."[25]

Dynamic-impact models, no more than a primordial quantum fluctuation corroborated by *COBE*'s detection of a microwave background whose formation is a function of random statistical fluctuations, is related to efficient causality and not to a modern mechanistic determinism of exact or even inexact measurement. Their Aristotelian-Thomistic paradigm, that does not diminish its complex applicability, was the "sculptor" of marble or "maker" of the house in terms of which "causes" may be broadly understood to embrace *inter alia* purpose, self-organization, and an adaptability over vast expanses of time. Though the latter undoubtedly go beyond the anticipation of Thomas, this fact does not obviate a new-found significance of his concepts any more than various interpretations of art, unforeseen by the artist, prevent their tenability.

Today, we tend to forget that the word "technology" has its roots in the Greek concept "*techne*" in which the "arts and sciences" were not only entangled but an unclearly divided *continuum*; painting, poetry, and sculpture at one end and geometry, physics, and astronomy on the other. The kosmos they depicted was no less crafted in terms of a principle of causal efficiency

Scientist 270 (Mar 1994) 68-74, in which "multiverses" involve deterministic universes within our universe that cause so-called indeterministic (random) behavior of submicroscopic phenomena. Their position is consistent with quantum physicists who generally associate an "indeterminism" with limitations of experimental set-ups and not with either an inherent randomness or unpredictable *telos* of a microscopic world.

[24] See R.V. Jensen's remarks in "Sigma Xi National Lectures 1994-1995," *American Scientist* 81 (Nov-Dec 1993), p. 603. Jensen is a physics professor at Texas A & M University where he does research in the interdisciplinary field of nonlinear dynamics.

[25] See D. MacPhee's reference to "Statistical Mechanics of Social Impact" in the *Physical Review* A (1981) 45, in his article "Directed Evolution Reconsidered," *American Scientist* 81 (1993) 554.

than the artistic-scientific works shaped by persons —persons being understood by Thomas as "voluntary second causes". All of the foregoing considerations are in general concordance with the pre-syllogistic sentences of Thomas' Second Way that proceeds from our experience of the world to substantive modal claims (I, 2, 3):

> In the world of sense we find there is an order of efficient causes. There is no case known (neither is it, indeed possible) in which a thing is found to be the efficient cause of itself; for so it would be prior to itself, which is impossible. Now in efficient causes it is [also] not possible to go on to infinity...

In starting with how the world is in terms of an experienced order of efficient causes, Thomas not only appeals to our knowledge of particular cases (e.g. to "no known cases") but infers several modal impossibilities.

First, he infers the impossibility that a thing can be its own efficient cause. That this impossibility is an inference is indicated by a standard logical interpretation of ordinary language in which the next sentence, in beginning with the premise-indicator word "for", functions as a premise or reason for why a thing cannot possibly be found to be the efficient cause of itself. Second, though this reason in the next sentence suggests that a thing prior to itself is logically impossible since it would have to both exist and not exist at a prior time, intrinsic to the general integrity of the sentences is a modal understanding that is inferred from our experience. That is, given our experience of an order of efficient causes by which we grasp that it is in the nature of a thing to be caused by a prior thing, we infer various modal necessities and impossibilities that are specified in various assertions.

For instance, in asserting that "A thing must have a prior cause" or that "It is impossible for it to be uncaused", we are not asserting what is logically necessary or impossible but rather what is impossible in light of the way the world is. If Thomas' notion of the impossibility of a thing being *prior to itself* is not understood in terms of such inferred modalities, then we could equally understand the impossibility in terms of Parmenides who would reject its inference from experience and would argue for it on the sheer logical basis that a thing *qua* being can come from neither being nor nonbeing: Not from being because it would already have to be (be prior to itself) and not from nonbeing because there would be nothing to come from.

Third, and most importantly, the impossibility of efficient causes issuing in an infinite regress without a Creator is an inference prima facie from our first-hand experience of ourselves as productive intellects whose choices, in being origins of our activities, are the origins of our ability to initiate "change" in matter. We change matter in the senses both of initiating

change in its constituents and imposing new forms on it, and we experience ourselves in these senses as creators *qua* first efficient causes. Moreover, our incontrovertible experience of ourselves as such causes reflects a general Aristotelian-like methodology in science wherein scientific investigation should commence with the most familiar things (*ourselves)* and proceed to less familiar organisms and entities (per Aristotle's *Physica* 184a15 sqq, *Historia Animalium* 588a 20-5, and *De Partibus Animalium* 641b 10-15).

The modern objection that this methodology imposes anthropocentric conceptions on the world is not only challenged by recent chaos theory but by a scientific-philosophical environmentalism. In *Environmental Philosophy,* Val Plumwood traces environmental destruction to Nature being construed as "bereft of qualities appropriate to the human side."[26] Nature, she says, should not be viewed as "passive and lacking in agency and teleology... So what is called for here... [are] alternatives to mechanistic ways of viewing the world".[27] There is, here, a contrast between viewing the world mechanistically and a naturalism in which Nature and human nature are bound together both morally and scientifically. The human and social sciences provide for more than mere descriptions of our behavioral agencies and nature. The descriptions are the basis for prescriptions regarding how our nature ought to be fulfilled and for insights into Nature itself. The objection to anthropocentrism, having become a banal truism, also begs for a response regarding apparent incoherencies of a mechanically-determined universe composed exhaustively of material mass particles.

In disregarding immaterial realities such as freedom and thought, a coherent concept of "truth" would collapse prima facie since we do not ascribe truth to material things but rather to thoughts or statements about them. And if everything is determined in terms of the transformation of efficient causes into an invariable succession of mechanistic events - as understood by Newtonian-Einsteinian equations deterministic of exactly measurable events or by equations of quantum mechanics deterministic of probabilities, then even our claims that theories are true would themselves be causally determined with no "*freedom from*" the deterministic spatiotemporal realm to rationally assess which claims were in fact true.

[26] Val Plumwood, "Nature, Self, and Gender," *Environmental Philosophy,* Ed. M. Zimmerman, J. Callicott, G. Sessions, K. Warren, and J. Clark (Englewood Cliffs, NJ: Prentice Hall, 1993), p. 299. However, see criticism of Plumwood in Trundle's *Ancient Greek Philosophy* (p. 278). A self-avowed feminist, Plumwood fails to note how many academic feminists have gone full circle from viewing Aristotle's thought as a paradigm of "sexist rationalism" to insights reminiscent of his sciences.

[27] Ibid., p. 299.

This is not to say that the modern assumption of such a realm is wholly inapplicable to spatiotemporal domains modest in comparison to vast ones addressed by chaos physics. Though physicists acknowledge chaos phenomena in the more classical domains, the assumption might be viewed as reflecting a truth about them by virtue of the irrelevance ceteris paribus of unpredictable self-organizations to short-term cosmic considerations. This suggestion brings us back to a modern dilemma whereby "if skepticism is to be avoided, the exploitation of... 'causal' regularities in obtaining a posteriori knowledge must not require prior knowledge of those regularities".[28] The skepticism stems prima facie from a falsely-dichotomized positivist notion of there being only immediate empirical (synthetic) and logical (analytic) truth that may be ascribed to a received-view causal principle, e.g. "all events have exactly or inexactly measurable causes".

What has been overlooked is that the skepticism is logically and conceptually connected to the fact that empirical truth cannot be ascribed straightforwardly to scientific theories either. On the one hand, the notion that theoretical truth is known analytically would both mean it is trivial and defeat the purpose of testing theories by predictions. On the other, by the logic of implication $(p \rightarrow q)$ where the truth of "q" does not imply that of "p", predictions implied by theories when they obtain do not imply the empirical truth of theories. The skepticism in question may find an answer by a response to this problem of theoretical truth: Arguably, as it would be *more* than reasonable to ascribe empirical truth to theories by virtue of their systematic predictive and manipulative success, since the success could not be explained rationally unless the theories were true in the sense of reflecting what physical reality is approximately like, it would be *equally* reasonable to affirm that a modern causal principle is true since its truth is a *necessary condition* for the coherence of the accepted truth of the theories.

How could we coherently *affirm* that theories approximately describe properties, processes, and relationships of phenomena and *deny* a continuity of past and future, to which such relationships and processes are conceptually connected, in terms of causal regularities expressed by the causal principle? Since it seems *more* than unreasonable to reframe from ascribing truth to the principle when it is to theories, may we not specify "Necessarily if theories are true, the causal principle is true"? Though the principle may be *insufficient* for a coherent notion of scientific "truth", it does not beget incoherence when it is understood as a limited expression of a Thomistic causality in which we are freely-choosing (voluntary) efficient causes among dependent second causes. If there were no relationship between such causes and modern causality, there could have been no intelli-

[28] Suppe, *The Structure of Scientific Theories*, p. 722.

gible transformation, in the first place, of efficient causes qua explanatory agencies into invariably succeeding events as understood in a Humean-Kantian scientific tradition.

A brief point about this tradition may be made in terms of Hume's challenge to inductively assuming that the future will behave as the past. Besides his actually assuming a continuity of past and future for counting on a future to which his philosophical skepticism is applicable, Stephan Korner has cogently responded that inducing the future's behavior may be based simply on our "expectation" without falling into a regress of question-begging justified justifications, e.g. the future will behave as the past because it has in the past and so on.[29] What may be added is that our expectation is itself grounded on an experienced dependent nature of phenomena in terms of which it would be *more* than unreasonable to challenge the expectation without *more* than unreasonably challenging theoretical scientific truth —much more the truth of rudimentary scientific principles. A way to make sense of such principles and a principle of causality is to reconsider a classical-medieval reasoning that, in the name of a Humean "critical thinking" used for titles of logic books, has been thoughtlessly relegated to an archaic methodology.

The Aristotelian methodology of beggining with ourselves for understanding the world, that influenced Thomas, cannot be glibly dismissed as a pejorative pre-Copernican anthropocentrism beyond which we have "truly forged ahead".

Thomas may, in fact, adhere to the methodology in a way more consistent with human agency than Aristotle's own conception. Aristotle held in the *Nicomachean Ethics* 1139a that "The origin of human action —its efficient, not its final cause— is choice". Yet he argued that the Unmoved Mover as a divine final cause was not only an efficient cause by inspiring the striving (*entelechy*) of all things towards natural ends with infinite time but, as a formal cause, an *impersonal* form of the world's substance.

Thomas concedes that since it is not logically impossible that the world could have been created by God with infinite time co-eternal with Himself,

29 Stephan Korner, *Experience and Theory* (London: Routledge & Kegan Paul, 1969), p. 194. Another way of coordinating Korner's anti-Humean "expectation-argument" to our ordinary experience might be as follows: Hume's skepticism may conflate *philosophical* and *everyday* skepticisms that expose its disingenuous, e.g. whereby Hume's writing his "skeptical reasoning" belies paradoxically a lack of genuine skepticism since he must assume that his own reasoning and writing, not to mention the paper and table on which he writes, will perdure in future moments in a manner continuous with ones present and past. A continuity of past and future would only be actually doubted when not doubted philosophically and philosophically when not actually. This criticism uses against Hume his own "philosophical doubting-nondoubting practical man" distinction.

it is "By faith alone we hold... that the world did not always exist" (I,46, 2). But when he reasons that "by his free will man moves himself to act [voluntarily]" and that a "first voluntary Agent" causes both voluntary and natural second causes (I,46,2; 83,3), his stronger anthropocentric approach suggests an "existential connection" to a divine personal Agency *qua* Cause in which to accept ourselves as second causes is to accept the Cause, not of our action, but, of our dependent existence. We exist as both voluntary and natural second causes by virtue of having bodies in which our free will is situated (as part of a rational soul that is the body's form) and through which our action is physically effective. Thus a voluntary First Cause causes both voluntary and natural second causes that are logically and ontologically prior to, and have more power or potency than, mere natural second causes they cause. And hence Thomas invites the idea that from our incontrovertible experience of ourselves as *potent* voluntary causes among dependent second causes we do not merely reasonably infer that if there are such second causes (S), there is an *omnipotent* voluntary First Cause that is not dependent (F). We infer $\Box(S \rightarrow F)$.

Interestingly, in arguing for our awareness of "both sight and its object" in *De Anima* 425b, Aristotle layed a conceptual foundation for an incontrovertible experience of ourselves as voluntary creative causes of phenomena. For a strong *analogical* relationship of our creativity to a Creator, we might consider further suggestive research in physics such as E. Farhi's, A. Guth's, and J. Guven's "Is it Possible to Create a Universe in the Laboratory by Quantum Tunneling?"[30]

Ceteris paribus, $\Box(S \rightarrow F)$ is, in any case, logically and modally equivalent to Thomas' conditional $\Box(\sim F \rightarrow \sim S)$. $\Box(S \rightarrow F)$ and $\Box(\sim F \rightarrow \sim S)$ have a sentential-logic analogue in the replacement axiom of Transposition. In terms of modal language, the equivalence may be more evident in "Necessarily if there *are* second causes, there is a First Cause" and "Necessarily if there is *not* a First Cause, there *are not* second causes".

Though all things may not be exactly equal in this case insofar as "$\sim F$" and "$\sim S$" do not distinguish both sorts of second causes, the question ensues of why Thomas used the "less anthropocentric" conditional rather than $\Box(S \rightarrow F)$ in a more straightforward *modus ponens*. Inasmuch the argument refers to second causes, there would be a similar second premise "S" and conclusion "F".

The answer may be that, while Professor Copleston is correct about a First Cause identified with God because Mohammedan believers were addressed, Thomas may have been burdened on the other extreme by nonbe-

[30] See E. Farhi, A. Guth, and J. Guven, "Is it Possible to Create a Universe in the Laboratory by Quantum Tunneling?," *Nuclear Physics B*, B 339 (1990) 417-90.

lievers for whom an inference from second causes to a voluntary First Cause would have been uncomfortably close to a personal Creator.

A voluntary First Cause brings to mind a freely-choosing Creator whose omnipotence involves absolute power for exercising creativity. And if such creativity is substantively tied to *analogical* powers of which we are immediately conscious in our own creative existence, then by *symmetry* our voluntary and intellectual powers are tied to a Creator (whose existence is inferable prima facie and in whose image we are made in terms of St. Augustine's notion of our limited free will [*liberum*] resembling His unlimited freedom [*libertas*]).

The mean between extremes, so characteristic of Aristotle himself, may find tacit, but novel, logical expression in Thomas' mediation between Mohammedan believers and nonbelievers. The believers would have embraced either a Creator or First Cause as God but nonbelievers an impersonal Cause, at best, as nothing more than that without which there could be no world. At the same time, affirmation of the world, and therefore the Cause, would be a short step to a revealed personal God.

Importantly, Thomas does not merely follow through more than Aristotle with Aristotle's own scientific methodology. His experiential orientation to how the world is leads prima facie to substantive modal assertions with, among other things, the following import: There are necessities and impossibilities concerning both scientific natures of things and our awe of a First Efficient Cause by virtue of its uniqueness among causes, e.g. its potency or power, eternality in virtue of not being dependent, and that on which all other things depend; a Cause that ameliorates various twentieth-century moods of "angst", most notoriously associated with Martin Heidegger but also to some degree with Wittgenstein - providing a possible answer to the question "Why there is a world rather than 'nothing'?"[31] ; and a reasoning that Thomas supposes may induce openness to Biblical revelation.

In conclusion, let me stress that attempts to understand science and philosophy from a Scriptural standpoint have sometimes been overzealous. At the same time, efforts to use philosophy and science to disparage arguments sympathetic to Scripture have also led to a neglect of helpful epistemological insights. Thomas has intriguing insights that bear on reasoning from how the world is to modal claims. Certainly he does not make claims

[31] For example, see Heidegger's *Einfuhrung in die Metaphysik*, p. 3, in which he says that the most fundamental question is "Why are there essents [existents] rather than nothing?" and Norman Malcolm's *Ludwig Wittgenstein: A Memoir* (NY: Oxford University Press, 1984), p.59, where Wittgenstein is quoted as saying that he had a certain experience whereby: "When I have it I wonder at the existence of the world. And I am then inclined to use such phrases as 'How extraordinary that anything should exist!'"

and a reasoning that Thomas supposes may induce openness to Biblical revelation.

In conclusion, let me stress that attempts to understand science and philosophy from a Scriptural standpoint have sometimes been overzealous. At the same time, efforts to use philosophy and science to disparage arguments sympathetic to Scripture have also led to a neglect of helpful epistemological insights. Thomas has intriguing insights that bear on reasoning from how the world is to modal claims. Certainly he does not make claims that are known only by faith. Though many philosophers may not be concerned with faith, this way of defending his Second Way may hopefully evoke some interest between it and current scientific developments. But, beyond these developments, Thomas' argument seems to exemplify an overlooked modal reasoning relevant to general science as well as to the traditional *science* of science of metaphysics.

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