

# Against the Anthropic Principle

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## Abstract

The Anthropic Principles are a collection of principles that deviate from the established, empirical process of law-producing science as established in the 15<sup>th</sup> and 16<sup>th</sup> centuries. This paper details standards of law-producing science in terms of correspondence theory and traces the Anthropic Principles' divergent motion. Once contrary movement is illustrated, the Anthropic Principles are evaluated as philosophical concepts in terms of coherence and explanatory utility and are found lacking. Based on the Anthropic Principles' failure to follow the traditional scientific path and their lack of philosophical utility, the Anthropic Principles are recommended to be deprecated within the scientific lexicon. Lastly, a warning is given as to the dangers of tolerating the Anthropic Principles under the category of "scientific."

## Introduction

Since the rise of neo-Platonic, law-producing science in the age of Galileo and Newton, scientific discovery operated under a rubric of hypothesis-formation, trial experimentalism, and empirical measurement.<sup>12</sup>

Around the mid-1970s, cosmologists such as Carter and Hoyle diverged from this *modus operandi* and presented a collection of principles collectively known under the portmanteau: "The Anthropic Principle" (AP,

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<sup>1</sup>This essay originally appeared in Volume 4 of *Ex Nihilo* [Harms, 1999] as the Matchette Essay Contest winner under the title "An Analysis of the Anthropic Principle and its Place in Modern Science." The work appears here, edited in form and typeset for L<sup>A</sup>T<sub>E</sub>X. Further, the conclusion has grown stronger: while in the original draft the WAP was tolerated, no form is tolerated in this current draft.

<sup>2</sup>The movement from the Aristotelian-patristic data-collecting to law-constructing science, which has, at its heart, a Platonist belief in extra-phenomenal *laws*. For more, see: Gay [Gay, 1995].

henceforth). Generally, these principles share as common ethos:

#### THE CORE ETHOS OF THE ANTHROPIC PRINCIPLE

Knowing that I am here, the Universe must have already had properties that allowed a life form such as myself to develop.

These principles are distinct in that they are philosophical, not empirical, in their method. This essay demonstrates the AP's divergence from scientific tradition, its limited explanatory power, and then explains how arguing in its style is deleterious to the scientific endeavor.

## The Mechanics of Law-producing Science

The Anthropic Principle marks a departure from the historical process of trial experimentalism that has come to be called "The Scientific Method." To demonstrate the AP's divergent motion, a characterization of the normative scientific process and its mechanics is first required. A basic vocabulary is needed wherewith to define the scope and work of scientific research consistently.

The Universe is defined as the closed system in which humans and matter are located. Phenomena, the reactions between matter in the Universe, are governed by Laws of Nature.<sup>3</sup> Assuming a world aligned with Kantian ontology, then Laws of Nature exist in the Noumenal world. If Plato's model be right, these Laws of Nature would exist in the realm of the Forms. The Universe's Laws of Nature are quantified by human scientists into laws. These laws are commonly rendered as mathematical expressions, called "equations." In accordance with the groundwork of correspondence-epistemology laws are expected to map truthfully to Laws of Nature. "Truth... is a property... that means their [propositions]' 'agreement', as falsity means their disagreement, with 'reality' [*i.e.* Laws of Nature] [James, 1907]." An attempt to describe the correspondence between a Law of Nature and its modeling law is called a "hypothesis."

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<sup>3</sup>A typographical note: In line with the syntactical behavior of many programming languages, *e.g.* Ruby [Thomas et al., 2006]. The *class* "Law of Nature" has its name capitalized, the *instance*, "a law" does not.

With theoretical work done, experimental testing is performed and observations are made. For a hypothesis to be elevated to law status, it has two obligations that when satisfied establish the truth-conferring correspondence described by William James:

OBLIGATIONS OF LAWS

1. The proposed hypothesis must be upheld in comparison to phenomena historically observed in the Universe.
2. The proposed hypothesis must demonstrate predictive power prior to a measurement i.e. an experiment or observation.

If these two tests of the hypothesis are consistently upheld, the hypothesis establishes a correspondence to a Law of Nature and can be granted law status. In their purest essence, both of these “law obligations,” require that a hypothesis assert a conditional statement, the “hypothetical conjecture,” an “if-then” assertion. When this statement’s protasis is applied to documented events in the past, the contention defined by the statement’s apodosis matches the historical, observed state. When the condition’s protasis is applied to a state in the future, a prediction is staked that either matches the observed result value, thus substantiating the conditional, or does not match the observed result value, thus invalidating the conditional.

As an example, consider a trivial case. In a closed system of virtual reality, the programmer codes a rule such that when it rains all citizens will carry umbrellas.<sup>4</sup> This corresponds to the Law of Nature in the sense that it is a rule perceptible to an entity *outside* the closed system that animates the phenomena *inside* the closed system. A new entrant into the simulation notes that on days when it rains, the citizens seem to, without fail, carry umbrellas. Thus she posits a law of universal umbrella-coverage that observes “when [if] it rains, all citizens carry umbrellas.” This is the condition statement, the hypothetical proposition that bears the protasis “when it rains” and the apodosis “all citizens carry umbrellas.” Per the first obligation,

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<sup>4</sup>This example is easily adapted to Descartes’ “Evil Genius” hypothesis or any of a plethora of “brain-in-a-vat” scenarios.

the researcher could examine meteorological records and conjecture that on the 14th of October, a day on which rain was recorded, all citizens carried umbrellas. The researcher's data for the day in question (photographs, video, etc.) *must* then show that all citizens carried umbrellas. Since the expected condition in the protasis was found and the staked result of the apodosis was confirmed, the first obligation is met. The second obligation requires conjecture into the future. Namely, the researcher should be able to assert: "The next time it rains, all citizens will carry umbrellas." Given a situation where the protasis is matched ("it is raining"), the stake of the apodosis must be borne out ("all citizens are carrying umbrellas"). Provided that this happens, the second obligation is met. With both obligations met, the conditional hypothesis may then be elevated to law status.

Characterizing these conditionals, or hypotheses, in the qualitative expressions of our various human languages tends to lack quantitative rigor and is prone to vagaries.<sup>5</sup> Consequently, the hypothesis and its integral conditional utterance have come to be presented in the quantitatively rigid utterance of the *lingua mathematica*: The equation.

How an equation captures the nature of scientific conjecture is so essential that it is worth identifying the atomic entities of an equation and then explicitly understanding how these elements capture the hypothetical conjecture, which when having passed the scrutiny of the Obligations of Laws, may allow the hypothesis to become a law.

## The Nature of Equations as Conjecture Statements

An equation is a hypothesis rendered in the grammar of mathematics. Like all hypotheses, it carries a hypothetical conjecture within it, *vide supra*. Hypotheses and validated hypotheses, *i.e.* laws, are composed of constants, variables, and operators. Constants and variables take values, and operators define relationships between value-assigned constants and variables. The nature of these atoms is explored presently.

A mathematical equation will be most instructive in the consideration of these roles. Consider The

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<sup>5</sup>The difficulty of communicating this simple truth and its necessitating the prolix "law of universal umbrella-coverage example" shows the fallibility of natural language in expressing predictive conditionals.

Inverse Square Law:

$$F = k \cdot m_1 \cdot m_2 \cdot r^2 \tag{1}$$

[Goodman and Russell, 1991].

There exists a finite, albeit possibly inconceivable, number of constants. The number of available constants and their values are determined by the Universe’s Laws of Nature, and constants take on values. In the Universe, the assigned value for a constant is permanently fixed: examples include  $\pi$ ,  $k$  as presented above, or Euler’s constant,  $e$ . In cosmological modeling, there is no difference between constants and variables – the cosmologist performing the operation can freely assign whatever values deemed appropriate within the constraints explained below.

Variables are “temporary constants.” Variables take on values as well. In the example, variables are  $F$ ,  $m_1$ ,  $m_2$ . The distinction between the dependent variable,  $F$ , and the independent variables,  $m_1$  and  $m_2$ , will be examined further, *vide infra*. While constants and variables are identical for purposes of modeling laws mathematically; in the Universe, their difference is striking. Constants in Laws of Nature *do not* undergo situational value change. That is, the mass of  $m_1$  may change, but  $G$ , the gravitational constant, or  $\pi$ , as *constants* fixed by Laws of Nature, do not.<sup>6</sup>

Operators are notational glyphs that express relationships between constants and variables. The most critical of these glyphs is the equivalence operator, or seen from a programmer’s view, the assignment operator “=”. A vast assortment of operators, or operational glyphs, exist ( $\div$ ,  $x^2$ ,  $\Sigma$ ,  $=$ , et al.). It is the “=” operator that captures the conjecture activity of law-forming science. Before explaining how the “=” operator is at the heart of the mathematical formulation of laws, the term “value” must be defined.

Values are represented by a number on the number line from  $(-\infty, \infty)$ . In the example,  $k$  is a constant that possesses a numerical value located in the infinite domain. Neither constants nor variables have any  $a$

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<sup>6</sup> $G = (6.67428 \pm 0.00067) \times 10^{-11} m^3 kg^{-1} s^{-2}$

*priori* reason for preferring any given value over another.

These atomic entities identified, the equivalence operator (“=”) and its role of assigning variables values so as to create the machinery of hypothetical conjecture, can be characterized. The equivalence operator, “the equal sign,” or =’s essential use is to express identity. In identity, it expresses equivalent quantification. Tacit in this assertion of identity is the implication of conjecture. For the researcher, the ability to assign arbitrary values to *independent* variables ( $m_1, m_2$ ) and see a change, or to stake a predicted result in the *dependent* variable ( $F$ ) on the other side of the “=” glyph, is where the explanatory power of a mathematically formulated law, or law under testing, i.e. a hypothesis, lies. Only a dependent variable is able to reflect, through the changes of the values in independent variables, the phenomenon the law seeks to mirror.

Given the cross-situational, rigorous ability of an equation to capture hypothetical conjecture via the independent / dependent variable interaction, it is apparent why it is an essential tool for validating the Obligations of Laws: *post facto* (1) explanation and *ante facto* (2) prediction. The hallmark of law-producing science is the production of predictive, quantitatively rigorous models that include verified values for constituent constants and variables.

As an example, consider the Law of Nature “Gravitation” and its reification into the law “The Inverse Square Law.”

### THE EMPIRICAL, SCIENTIFIC PROCESS (AS APPLIED TO “GRAVITATION”)

1. Law of Nature: Gravitation, a function of mass and distance, permeates the Universe and holds the moon in orbit around the Earth.
2. Observation: “The moon orbits the Earth.”
3. Hypothesis: “I believe that the gravitational force exerted between two bodies in a vacuum is inversely proportional to the square of the distance between them.”
4. Conjecture Formulation:  $F = k \cdot m_1 \cdot m_2 \cdot r^2$
5. Testing by the Obligations of Laws:
  - The proposed hypothesis must be upheld in comparison to phenomena in the Universe.
  - The proposed hypothesis must demonstrate predictive power prior to a measurement i.e. an experiment or observation.
6. Correspondence: The hypothesis satisfies the Obligations of Laws. Thus, a correspondence between this hypothesis and a Law of Nature is established. The hypothesis can now be termed a “law.”
7. Validation: The law correctly models a Law of Nature.

## Law-forming Science as Applied to the Anthropic Principle

The preceding discussion presents the model of scientific explanation used since the neo-Platonic / Galilean model of law-forming science was ushered in. This is the norm of empirical scientific discovery that the Anthropic Principle *does not* follow. To demonstrate the divergence of the various “flavors” of AP from the empirical, scientific tradition, the AP must be compared to the empirical, scientific process.<sup>7</sup> Here we run into difficulty. Formulation of these flavors, to date, has been imprecise, leading to confusion — specifically around the strength of the word “must” in several of the formulations. This may lead to use of a strong assertion of “must” when the argument is on the offensive, and using a more-slippery weak “must” when on the defensive. Therefore, before making the judgments, a journey must be traced from the original formulations of the AP’s flavors, as provided by Barrow and Tipler in 1986 [Barrow and Tipler,

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<sup>7</sup>Use of the term “flavor” seems to be the common usage within the community writing on the topic.

1986] towards a more precise formulation. Consequently, these various flavors' formulations can be fixed and evaluated more fairly against the Obligations of Laws.

## **The Anthropic Principle: Primary Categories**

The Anthropic Principle in its most general formulation states: “Knowing that I am here, the Universe must have already had properties that allowed a life form such as myself to develop.” Barrow and Tipler [Barrow and Tipler, 1986] bifurcate this ethos into two primary sub-classes: The Weak Anthropic Principle (WAP) and the Strong Anthropic Principle (SAP). The SAP is further divided into four sub-classes: The teleological model, the theological model, the Participatory Anthropic Principle (PAP), the Participatory Anthropic Principle - 2 (PAP2), and the Final Anthropic Principle (FAP). These latter three are ‘sub-flavors’ of their super-classification—the SAP. For the purpose of demonstrating the AP’s divergence from the scientific, empirical tradition, we need not compare each sub-formulation of the SAP to the tradition because they follow their parent proposition in reasoning. Demonstrating the SAP-in-general’s divergence is sufficient to taint all sub-formulations.

The following are direct citations from Barrow and Tipler’s [Barrow and Tipler, 1986] book The Anthropic Cosmological Principle, which define the forms of the Anthropic Principle.

BARROW & TIPLER'S "FLAVORS" OF THE AP AS PRESENTED IN  
THE ANTHROPIC COSMOLOGICAL PRINCIPLE

1. WAP: The observed values of all physical and cosmological quantities are not equally probable, but they take on values restricted by the requirement that there exist sites where human life can evolve and by the requirement that the Universe be old enough for it to have already done so.
2. SAP: The Universe must have those properties which allow life to develop within it at some stage in its history.
  - (a) Teleological / Theological / Design Argument: The Universe was built for the purpose of human life.
  - (b) PAP: Observers are necessary to bring the Universe into being.
  - (c) PAP2/Many Worlds: An ensemble of other different universes is necessary for the existence of our Universe.
  - (d) FAP: Intelligent information processing must come into existence in the Universe, and once it comes into existence, it will never die out.

The critical deciding factor when evaluating an AP formulation of the weak or strong class is the strength of the "must." This is much like the difference in strength between logical disjunction ("OR") and exclusive disjunction ("XOR"). A "weak must" asserts that values in the hypothetical's protasis have values *consistent with* bringing about the condition staked in the apodosis. A "strong must" asserts that the values in the hypothetical's protasis *could not be other* than the values possessed *and* asserts that these values bring about the situation as expressed in the apodosis.

Given this understanding, based on the strength of that "must", the AP can either be posited weakly:

WEAK ANTHROPIC PRINCIPLE

In cosmological modeling, values for physical and cosmological constants may be freely chosen; however, the laws and models composed of said constants must yield a universe such that human life evolves and that the Universe be old enough for such a universe to have already done so.

or strongly:

### STRONG ANTHROPIC PRINCIPLE

In cosmological modeling, the physical and cosmological constants **are required to be** such that human life evolves therein at some point in history. Conversely, these values **may not take** values that preclude the existence of man.

Henceforth, references to WAP or SAP will refer to the preceding definitions presented within the scope of this work and not to those of Barrow and Tipler.

### **The AP: A Break from Empirical, Law-forming Science**

With both the AP and the empirical, scientific tradition characterized, it is now possible to discern whether they follow the scientific tradition or diverge from it.

#### **Procedural Problems with the AP**

The empirical, scientific process describes a process whereby observation leads to hypothesis, hypotheses are tested by the Obligations of Laws, and validated hypotheses are elevated to law status. Laws, in turn, correspond to Laws of Nature. Hypotheses are required to produce a stake that can be affirmed or denied.

The AP starts with an observation: “Human life exists.” Yet, it never casts this conclusion into the apodosis of a conjectural statement that elucidates a relationship. Neither Barrow and Tipler’s formulation nor this work’s attempt at reformulation offer an “if-then” relationship, a conjectural stake.

Absent a conjecture, obviously, it cannot be tested by the Obligations of Laws to verify historical accountability or predictive capability. Lacking a hypothesis or testability by the Obligations of laws, it is therefore untenable to promote its non-existent hypotheses to laws. The AP cannot be called scientific due to flaws in morphological construction.

## Logical Problems with a Hypothetically Reformulated AP

To counter the concern that the dismissal of the AP from the ranks of “scientific” precepts was based solely on form, hypothetically structured versions of the AP should be attempted.

Working from the given consequent, “man exists,” the WAP in a hypothetical phrasing can be rendered as: “if one models the Universe, the values of the constants and variables must be such that man exists.” The SAP, similarly, could be re-formulated as: “if one models the Universe, the values of the variables and constants must take the values to produce man.” Yet, something is amiss with this formulation; it is insufficiently general. As just restated, both protases assert *the* Universe, meaning the one in which humanity *happens* to find itself. Just as Gravitation applies equally to bowling balls and solar systems, so too must the AP be made general. To counter this complaint, the protases can be modified to say, “if one models *a* Universe . . . man exists.” When this alteration is made, it is clear that the AP is wanting logically. Simply because there exists an  $x$  such that ( $x$  is a Universe) and ( $x$  produces man), *i.e.*  $((\exists x)(Ux \wedge Mx))$ , it does *not* follow that for all  $x$ , if  $x$  is a Universe, then  $x$  contains man, *i.e.*  $((x)(Ux \supset Mx))$ .

A logical retreat may be pursued where the formulation is changed such that “if one models the Universe *in which man exists*, man exists.” This retreat leads directly into tautology of the hoary form, “the soporific drug is the drug that aids sleep.” Again, the AP fails to be sufficiently general. Casti notes that numerous critics charge that the AP “smacks of tautology” [Casti, 1989]. When a rigid formulation is applied to the AP, it does not merely “smack”, it *is*, in fact, tautological.

The AP is a divergence from the empirical, scientific tradition. It does not offer its contentions in the form of the testable hypothesis and its formulations are over-specific as well as non-portable. Therefore, appellations such as “scientific” or “cosmological,” as in the title of Barrow and Tipler’s work *The Anthropic Cosmological Principle*, ought to be stripped.

Philosophical principles are evaluated in terms of clarity, coherence, and explanatory power. If these principles are no longer *scientific* they could be viewed as *philosophical*, offering guidance to the results produced by proper, empirical scientific endeavor. Having shown the AP to be bankrupt as a scientific principle, its explanatory utility and coherence as a philosophical principle must be explored.

# Evaluation of the Weak Anthropic Principle from a Philosophical Perspective

## WEAK ANTHROPIC PRINCIPLE

In cosmological modeling, values for physical and cosmological constants may be freely chosen; however, the laws and models composed of said constants must yield a universe such that human life evolves and that the Universe be old enough for such a universe to have already done so.

From a philosophical perspective, the WAP contends that the values that may be chosen for the constants and variables in cosmological modeling may not be freely chosen from  $(-\infty, \infty)$ , but rather, they must, when combined, result in a universe that allows human life to come into being. Secondly, it contends that the values chosen for the age of the Universe be such that human life has already arisen.

This formulation of AP is true in all cases, but is entirely unsatisfying. If it were not true, then we would not be here to ask the question. Given that humans *are* here, we must concede that the Universe in which we find ourselves has Laws of Nature whose constants take values such that human life can form. As noted above, due to formal defects, this argument lacks and indeed seems entirely unconcerned with, predictive power.

Its formal flaws aside, the WAP seems to retain a modicum of explanatory utility. It has dismissive power and thereby seems to have use as a check on scientific research. Proponents assert that it can act as a razor; it can trim incorrect explanations away while preserving the correct explanation. As an example, these proponents point to Robert Dicke's use of the WAP as a confirmation of Paul Dirac's value for the age of the Universe [Casti, 1989]. Dicke knew that the age of a universe is represented by a value, and thus, could possess any value from the domain of numbers. The choices from  $(-\infty, 0]$  were ruled out as the time value would necessarily be positive because the universe's age is measured from  $(0, \infty)$ . Dicke took the WAP and asked, "since humans are here, what values are not permissible for the constants in our Universe's Laws

of Nature to have taken?” Research suggests that heavier, life-necessary elements are cooked into existence within the nuclear furnace of stars or supernovae [Casti, 1989]. Knowing this, Dicke was able to establish a bottom boundary value,  $\approx 10^{10}$  years. Having established this, all cosmological models could be built in such a way that the age of the Universe would have to be greater than  $\approx 10^{10}$  years.<sup>8</sup> At the other extreme, a time could also be found at which all stars would be burnt out. In such a frosty universe, there would be no cosmologists to discuss the matter. This observation establishes the top boundary for the age of the Universe.

Thus, Dicke found an acceptable and fruitful zone for experimentation as determined with aid from WAP. A large number of values were dismissed by use of this AP and a boundary on the range of values was established:

$$\approx 10^{10} \leq \textit{age of the Universe} \leq \textit{time that all stars burn out} \text{ has been established.}$$

Dicke’s example provides a case that seems to suggest that the WAP has value as a philosophical winnowing tool that trims away bad explanations. However, this modicum of explanatory power need not be *anthropic* per se. The winnowing tool effect, the pragmatic benefit of the WAP, could just as easily be achieved by:

1. Weak Horse-head Nebula Principle: In cosmological modeling, values for physical and cosmological constants may be freely chosen. However, the laws and models composed of said constants must yield a universe such that horse-head nebulae evolve and that the Universe be old enough for such a universe to have already done so.
2. Weak Leporidic Principle: In cosmological modeling, values for physical and cosmological constants may be freely chosen. However, the laws and models composed of said constants must yield a universe such that Leporidic mammals evolve and that the Universe be old enough for such a universe to have already done so.

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<sup>8</sup>The approximate time required for organic molecules to be made in, and freed from, their stellar incubator.

3. *etc.*

Dicke's proof could have been performed just as well with the Weak Leporidic Principle as the Weak Anthropic Principle.<sup>9</sup> The winnowing effect is *not* an insight inherent to the genius of the WAP, but rather a feature of all tautologies “*x*, a property of Object *O*, is found Object *O*s with property *x*; thus, when modeling Object *O*s, theoretical *O*'s that lack property *x* must be rejected.” The WAP asserts something that most cosmologists (and likewise janitors, computer programmers, et al.) would readily admit: that “when... measuring anything, [it is] necessary to take into account the particular properties of the measuring instrument [Casti, 1989].” Thus, the WAP fails as a means both for scientific *and* philosophical explanation.

## Evaluation of the Strong Anthropic Principles from a Philosophical Perspective

### STRONG ANTHROPIC PRINCIPLE

In cosmological modeling, the physical and cosmological constants **are required to be** such that human life evolves therein at some point in history. Conversely, these values **may not take** values that preclude the existence of man.

Where the WAP seemed to offer some utility, the SAP finds itself much more challenged owing to the strength of its “must” obligation. The rigid formulation of the SAP was proposed in 1974 by Brandon Carter. A short citation establishes the strength of the “must” required by this category:

“Suppose the gravitational constant *G* were a million times larger than it actually is. Then the lifetime of a star in its light-giving phase would be about a million times less...if an observer exists in such a universe, he would see a universe whose mass would be a trillion times smaller

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<sup>9</sup>“Leporids” are more commonly called “rabbits.”

than ours. Question: would life arise in such a vastly accelerated universe? The WAP is totally silent on this issue; the SAP says no, life can exist only if the fundamental constants have values very close to their observed [current] levels [Casti, 1989].”

The guiding question is, “why *must* the values of  $c$ , the speed of light, or  $G$ , the gravitational constant, be so?” The varying answers to that question are the source of the radically different interpretations that comprise the different subclasses of the SAP. Two answers hinge on quantum mechanics, while the others hinge on a teleological / theological / design argument basis.

## Teleological / Theological Explanations

### Teleological Response

The first teleological answer to the guiding question is: “The Universe’s constants must have such values because it is the Universe’s *purpose* to create human life and its constants’ values must accordingly produce and sustain human life.” Teleology asserts that everything in the Universe has a final cause or a higher purpose. Everything possess a *telos* or a goal, which is that thing’s reason for existence. This style of reasoning finds its origin in Aristotle’s *Metaphysics*, which stated that all things have a higher purpose that they seek to fulfill. Accordingly, in its desire to fulfill its *telos*, the Universe assigns its composite constants values compatible with the production and sustenance of its *telos*-fulfilling end: Human life. This is a dated attitude that has no place in modern science. This answer to “why the values must be such to produce life” is unsatisfactory. There is no metaphysical proof of things having a *telos*: Humans, universes, or bees. Further, could one not equally posit that the purpose of the Universe was to create dodo birds? If this were the case, the Universe’s final cause has been thwarted; yet, our lives seem none the worse for it.<sup>10</sup> Owing to problems with internal coherence, this form of the SAP, as a means for philosophical checks on scientific inquiry, is rejected.

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<sup>10</sup>From a philosophical perspective, the extinction of fauna is a great disaster environmentally speaking.

## **Theological Response**

A variation on the teleological answer is a theological-wrapping of the teleological argument: “The Universe’s constants must have the values they do because of God’s Plan.” Present or implied in virtually every religion is that its deity deliberately made the Universe, and the Earth, specifically to be the domicile of its followers. Naturally, the constants and the laws of the Universe have been perfectly designed by the Creator for His creation. This line of thinking has no relevance to modern science. Interpreting natural phenomena, including those of cosmological scale, as a means by which to understand the mind of the gods is a form of divination. This is no different than taking the augurs, reading tea leaves, or throwing the yarrows of the *I Ching*. To tolerate the theological argument is tantamount to tolerating the reading of tea leaves.

Fundamentally, the theological response is a wrapping around the teleological response. Provided the existence of a creator whose hand brought both man and the Universe into being, a perception of purpose cannot be evaded. When this thin veneer stripped, the theological response falls victim to all of the criticisms of the teleological response: Assertion of a metaphysical, unknowable *telos* and a lack of clarity surrounding what said *telos* is, etc. In conclusion, the theological response fails to answer the guiding question in a fantastic manner and must be regarded as a vacuous philosophical check on scientific propositions.

## **Argument by Design Response**

A final variation on the Strong Anthropic Principle is the Argument by Design. The Design Argument rests essentially on three key points: Order and harmony exist and are worth appreciating, the classical watch analogy, and probability.

The watch analogy goes as follows. Were one to come across a beautiful Swiss watch, and one had never seen such a device before, one would be “forced” to conclude one of two things:

1. Some agent created this masterwork of chronographic engineering, OR
2. Through an improbable occurrence this masterwork spontaneously came into existence.

In simple logical notation, this is rendered:

$c \vee a$	“Object is created by an agent or Object is the result of an unlikely accident”
$\neg a$	“It is <i>unlikely</i> that this is the result of an accident, so unlikely as to warrant the proposition false”
$c$	<i>modus tollens</i>

Proponents of design arguments cite that one would naturally assume that it was designed by an agent because the probability of a chronographic marvel spontaneously coming into existence would be incredibly small. Design Argument proponents further state that it is obvious that the Universe, like said watch, operates in a similar state of order: Everything is perfectly related in a flawless manner. The proponent of such a view would suggest that such majesty could not exist without the hand of an author. Proponents of this idea have a torch-carrier in scientists like Fred Hoyle. While studying nuclear resonance levels in carbon and oxygen, Hoyle remarked:

“I do not believe that any scientist who examined the evidence would fail to draw the inference that the laws of nuclear physics have been deliberately designed with regard to the consequences they produce inside the stars. If this is so, then my apparently random quirks have become part of a deep-laid scheme. . . [Barrow and Tipler, 1986].”

Providing counter-claims against the argument by design, and repackagings like “Intelligent Design,” is a simple matter.

First, there is no reason that a harmonious and orderly universe, or chronograph, *could not* be the product of a natural process. Argument by design proponents tend to conflate “ $x$  is unlikely” with “ $x$  is impossible,” and in so doing, acquire the logical element ( $\neg a$ , above). In our big Universe we simply do not know how likely or unlikely chronograph or human development is as a part of natural processes. It is logical sleight of hand to equate unlikelihood with falsity.

Secondly, proponents assume that the first assertion is a simple binary disjunction, or that a binary disjunction can be induced whereupon *modus tollens* may be applied. To the argument, we could add a number of disjunctions that would prove sufficiently un-negatable. For example, one could add, “watches

arise as part of a rare but natural process in the Universe” ( $\vee w$ ). This disjunct would alter the initial premiss to  $c \vee a \vee w$ . Design Argument-proponents do not possess the means by which to negate that proposition as well, thus making their *modus tollens-cum-association* impossible — save by means of conflating rarity with negation.

Additionally, further research has shown that motion in a vacuum and many other understandings once deemed “orderly” are, in fact, highly volatile and unpredictable processes.<sup>11</sup> In many cases, historical perceptions of order have been revealed as chaotic, as our ability to discern finer movements and forces grows. It is possible that the Universe is chaotic, not orderly, and in *no* way like a Swiss watch.

The Design Argument has much more logical subterfuge over its underlying teleological core and shows great restraint in not invoking “God.” Nevertheless, it appeals to the notion that the Universe was crafted for man and has the *teleological* goal to nourish him. As such, the argument by design inherits the criticisms pinned to the teleological and theological sub-classes that have already been identified. Accordingly, the Design Argument must be dismissed as well. It has no utility as a philosophical check.

The teleological, theological, and argument by design arguments were easily unraveled by the likes of Bertrand Russell as early as 1927, who noted, who characterized them derisively:

“You all know the argument from design: Everything in the world is made just so that we can manage to live in the world, and if the world was ever so little different, we could not manage to live in it. That is the argument from design [Russell, 1927].”

Russell’s associate, Wittgenstein, presaged the preceding three dismissals in the penultimate proposition of the *Tractatus*:

“6.53. The correct method in philosophy would really be the following: To say nothing except what can be said, i.e. propositions of natural science—i.e. something that has nothing to do with philosophy—and then, whenever someone else wanted to say something metaphysical, to

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<sup>11</sup>Consider that the statement of the *vacuum ex nihilo nihilo fit* may well be proved entirely wrong by the Large Hadron Collider which to Aristotle’s great surprise, may completely rewrite our understandings of generation and corruption. Alternatively, consider Descartes’ “billiard ball” table of physical interaction. Quantum mechanics has dealt a blow to those assumptions of “order.”

demonstrate to him that he had failed to give a meaning to certain signs in his propositions [Wittgenstein, 1921].”

In line with Wittgenstein and Russell, it is clear that the teleological / theological / and quantum mechanics based answers for the strength of the “must” are lacking. For this reason, no utility can be found in them.

In the later part of the 20<sup>th</sup> century, the greater study of quantum mechanics gave, lamentably, the SAP-proponents another chance to try to bolster their case for the strong “must.”

## Quantum Mechanics Based Explanations

In quantum mechanics, the modern-day proponents of the SAP found a route by which to justify why they thought that the Universe’s constants *must* have the values that they do. Quantum mechanics has two interpretations: The Copenhagen, or “standard,” Interpretation proposed by Niels Bohr, and the Many-Worlds Interpretation proposed by Hugh Everett. The Copenhagen Interpretation is associated with PAP, while the Many Worlds Interpretation is associated with PAP2 [Casti, 1989].

### PAP Response

PAP: Observers are necessary to bring the Universe into being [Barrow and Tipler, 1986].

The PAP asserts that Observers are necessary to bring the Universe into being. This version of the SAP relies on the Copenhagen Interpretation. According to the Copenhagen Interpretation, a quantum occurrence is expressed in the form of a wave function. This wave function “collapses” when an “observer” performs an act of measurement and the quantum occurrence is given a value [Casti, 1989].

A simple example of an observer “collapsing the wave function” would be the spin of an electron. According to the Copenhagen Interpretation, at the time of measure, the electron may return two values: spin up or spin down. The value of the electron exists in a quantum state called superposition, where the electron technically exists in a state of both spin-up and spin-down. When the observation is made, the wave function collapses and a value is given: Spin-up or spin-down (represented by +.5 and -.5, respectively) [Casti, 1989].

The way the Copenhagen Interpretation forms the PAP is by assuming that the Universe would exist in a similar state of superposition until the wave function is collapsed by an observer. In such a universe, the “observer brings the Universe into being.” Thus, man is necessary to keep the Universe as perceived out of superposition. Its own Laws of Nature and the values their constants and variables take must be such that they produce man, an observer. That is, the Universe *needs* man in order that it be. There are many problems with this conjecture.

First, it goes directly against the general formulation of the Anthropic Principle that maintained: “because humans exist, the Universe must have already had such properties and been in such a state that humans would be brought into being.”<sup>12</sup> The PAP, with aid from quantum mechanics, asserts that “because humans exist and collapse the Universe’s wave function, the Universe is.” This formulation runs against the core ethos of the Anthropic Principle insofar as it puts the universe ontologically subordinate to man. All previous AP formulations held the universe to be ontologically prior to man. This ontological inversion rests on quantum theory, and by this, it is vulnerable to attack.

Second, what is an observer? In quantum radioactivity experiments, it is usually a photographic plate. Is that qualified enough to be an observer and collapse the world into being? Is a mouse qualified? Is a mentally incapacitated human? Is a blind human? The questions as to what is a sufficient observer do not *necessarily* point to the need for a *human*. We could easily posit a planet or a gaseous nebula with the properties of a photographic plate in the Universe. The Universe, then, is not oriented to *man* but to *observers*, some of which need not even be sentient, let alone human. The PAP’s argument fails to carry.

Further, if all properties and all quantum events exist in a state of quantum superposition until an observer brings them into being, how is the observer formed? If all quantum states are in superposition, are they still able to form observers? If a super-position-*proto-observer* is able to come into being, what collapses it into a non-superpositioned observer who can bring the Universe into being by means of an observation?<sup>13</sup> Assuming an observer can be brought into existence, as soon as the observer comes into being, he will

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<sup>12</sup>See: “Introduction.”

<sup>13</sup>Imagining further circular argumentation is left as an exercise for the reader.

collapse all the wave functions necessary to bring a universal image into existence. The world will look to the observer, assuming he is conscious, like it was perfectly designed to bring him into existence — the world will appear to be congruent with the necessary conditions for his existence. He will discover the WAP and the WAP will illustrate its tautological truth: The world seems to be compatible with my own existence. The PAP, as a formulation of the SAP, asserts that the Universe’s constants and values *must* be such that they produce man. We have seen that the PAP does not support the necessity of the strength of this “must” as a photo-recording nebula would suffice. In a world where man *happened* to appear, he would only note that the Universe did not take values that *prohibited* his existence, the WAP.

*Even if* there were no direct conflict with the AP ethos and *even if* one can manage to tolerate the great gray areas in quantum mechanics and *even if* one chooses to accept the Copenhagen Interpretation, the observer will ultimately see a world compatible with his own existence. The observer will be aware merely of the truth of the WAP. The PAP offers, *per se*, no explanation as to “why the Universe’s constants *must* have the values that they do.” Accordingly, this research must dismiss the PAP from the running of being a philosophical principle with utility given its lack of explanatory power beyond its necessary, implicit assertion of the WAP.

## **PAP2**

PAP2/Many Worlds: An ensemble of other different universes is necessary for the existence of our Universe [Barrow and Tipler, 1986].

The PAP2 finds its root in the Multiple Worlds theory. As above, this version of the AP is rejected out of hand due to its non-congruence with the ethos of the AP. Were that violation to be set aside, it comes to the same end as the PAP.

Following Hugh Everett’s description of quantum mechanics, each quantum act of measurement, each collapse of the wave function, splits the Universe into as many universes as there are options. Considering the example of electron spin measurement, the measurement act creates two new universes: One where the value for the electron is spin-up and another where the value for the electron is spin-down.

Ultimately, the same problems surface for PAP2 as were seen in the PAP. In whichever of the infinitely growing universes an observer emerges, he naturally sees a universe designed and directly compatible with the fact of his existence, *i.e.* the WAP. He validates the truth of the WAP for himself.

Again, PAP2 offers no explanation as to “why the Universe’s constants *must* have the values that they do.” Again, this research must dismiss the PAP as a philosophical principle with checking power.

## Final Anthropic Principle

A final “flavor” of SAP exists, which is so extremely speculative, that this essay does not consider it a core “flavor”: the Final Anthropic Principle [Barrow and Tipler, 1986]. The FAP is the most speculative of all APs and the strongest version of the SAP. The FAP accepts the SAP as true and then asserts the permanence of human life in the Universe. The FAP consists of this statement: “as it is the Universe’s goal (in one way or another) to support our life, it is impossible for the human race to die out, lest the Universe negate its success by killing its goal [Barrow and Tipler, 1986].” The FAP uses the logical machinery of previously discussed forms of the SAP, but strengthens the SAP’s “must” even more by asserting that the human race *cannot* die out. An enumeration of how the FAP can integrate any of the other SAP’s flavors is presented below.

1. In the teleological versions, the Universe would not negate the success of achieving its *telos* by letting its inhabitants die out.
2. In the theological version, God would not eradicate His creation because He has promised not to do so.<sup>14</sup>
3. Design Arguments follow the same logic. Humans are considered part of the harmony and have the role of appreciating the majesty and order in the Universe. As such, the Universe would not eradicate humans. It can also rely on the theological, as ultimately, The Author of the Universe is the same as God.

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<sup>14</sup>This inherits problems with the contradictory messages in, for example, the Bible. In Genesis, Chapter 9 God makes a covenant not to destroy the world by flood, but in 2 Peter, Chapter 3, God promises to devour the world in flames.

4. PAP concludes that human life cannot die out lest the Universe throw itself back into a superpositioned no-man's land.
5. For PAP2, it makes no difference because given that all combinations of all possibilities are represented, life will necessarily emerge in one of the many universes. Persons who believe in PAP2 can always take shelter in the fact that there is a universe where everyone is happy and the human race will live safely and happily in peace forever. The Universe will also find this a pleasant arrangement as it guarantees it an observer.

Not only can life not be destroyed, contends the FAP, after a sufficiently long time, it will accumulate all the bits of information knowable in the Universe and achieve truly a "mind of God" [Barrow and Tipler, 1986]. If man's behavior since the Industrial Revolution is any hint, it is now *incredibly* easy for man to wipe himself out in a matter of moments courtesy of bio-engineered or nuclear weapons. The FAP is both delusional and dangerous. In the end, The Final Anthropic Principle over-invests in the speculation of the SAP. As the SAP was rejected in all its forms, the FAP must be rejected as well.

## **Verdict on the SAP**

Just as the theological / teleological / Design Arguments are rejected due to their lack of substance, so too are the quantum mechanics based SAP formulations rejected. They do not substantiate why the "must" has to be strong. Further, since the nature of the Quantum mechanics-based appeals are directly counter to the general character of the AP, as was characterized in the introduction: "Knowing that I am here, the Universe must have already had properties such that it allowed a life form such as myself to develop" their inclusion under the title "Anthropic Principle" is already a push. Lastly, the science in which the quantum mechanics based explanations are rooted leaves far too many questions and discontinuities to be counted as a dependable means for explaining why the Universe's values (strong) must be set such that man arises. In sum, no explanatory power can be found in the formulations of the SAP.

*Ceteris paribus*, both quantum versions, regardless of interpretation, resolve to the fact that any observers

simply see a universe consistent with their existence—regardless of interpretation.

## Summation of the Explanatory Power of the AP Formulations

In summation, the SAP is exceedingly speculative and lacks in consistency, rigor, and explanatory power in all its formulations. Given that they were rejected outright in the previous section, no explanatory utility exists in these formulations. So too was the WAP rejected outright. Any appearance of utility is chimerical as revealed by close analysis. Having shown the APs divergence from the empirical, scientific tradition and having shown that all forms of the AP are bereft of utility, even as more-loosely constructed “philosophical” principles, a warning about permitting the AP to exist under the appellation “cosmological,” or more generally “scientific,” must be given.

## Dangers to Law-producing Science Implicit in Tolerating the AP

Law-producing science operates in a clear step-by-step process as detailed in the section, “The Mechanics of Law-Producing Science.” This method places certain expectations on the producers of hypotheses that have provided a consistent, successful framework for exploration since the rise of neo-Platonic science in the 1500s. All formulations of the AP operate contrary to this tradition. They operate *ex post facto* and give neither explanatory power, when looking into the past, nor predictive power, when looking into the future.

For philosophers of science of an Idealist character, this reason should prove sufficient to reject all the AP in all its formulations: The AP does not follow the behavior recognized as “doing science,” *vide supra*. Granting a momentary clemency to the AP, the SAP formulations have shown themselves to be over-speculative and/or inconsistent. The WAP appears to be of slight explanatory value, but the value it has is in no way particular to its appellation as *anthropic*. Thus, this work rejects the AP in all of its forms from the scientific, as well as philosophical, vocabulary.

To humor the proponents of the AP is a dangerous proposition. The *ex post facto* structure of argument and implicit chauvinistic belief that, as Protagoras wrote, “man is the measure of all things” nourishes an

attitude of specialness, or entitlement in the Universe, that has been, rightly, in retreat for the last half-millennium. The AP is *not* a principle in the same class as  $E = mc^2$  [Casti, 1989].” To allow it to participate under the name of “anthropic cosmological principle” may seem to give it the appearance of being on the same par as  $E = mc^2$ . Entry into the scientific vocabulary requires the AP to amend itself to the empirical tradition. Until that time, it must be categorically rejected.

Most dangerously, some who wish to assault the machinery of law-producing science play a semantic game.<sup>15</sup> By having the flimsy AP as a principle in the vocabulary of *scientific* endeavor, conversations can be had that establish the AP to be “as good as” assertions like  $E = mc^2$ , which follow the empirical, scientific tradition. Permitting the flimsy AP into that august category *diminishes* the class as a whole and shrinks the magnitude of the achievement that discovered them. No toehold should be granted by philosophers of science lest they awake one day to find the method and machinery of science upended. While philosophers of science, ever open to new explanations, may not wish to so strongly cast out the AP from their lexicon over-hastily, they must recognize that the feelings that animate the flavors of the AP are metaphysical assertions that we must regard as mystical, and must, as Wittgenstein asserted, “pass over in silence [Wittgenstein, 1921].”<sup>16</sup>

As philosophers of science, it is our duty to guard the scientific machinery, consecrated on the blood of Giordano Bruno, the censure of Galileo, the fear that led to posthumous publications by Copernicus, and the condemnation of Darwin, from the insidious weapon the AP represents.

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<sup>15</sup>Some of this number are the the proponents of “Intelligent Design” who play word-games around “*Theory of Relativity*” as a means to cast aspersions on this monument to scientific thought.

<sup>16</sup>Per propositions 6.53 and 7.

## Conclusion

In conclusion, the AP is a departure from empirical, law-forming science. It rejects the methodology of trial experimentalism and resorts to philosophical conjecture. It operates *post facto* and ignores the requirement of law-forming science to make reliable predictions. After careful evaluation, no formulation of the Anthropic Principle recommends itself for preservation in the scientific or philosophical lexicon. While the WAP offers an interesting inversion of the traditional steps involved in scientific inquiry, empirical research offers a more reliable and more fruitful route of inquiry. This route that asks us to observe, hypothesize, and compare to observed reality, both observed and conjectured, has provided us revelations about the Laws of Nature that were unimaginable a century ago. Let us embrace the empirical method and defend it from any principles that may, unintentionally or no, do it harm.

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