

Winter 2-1-2012

The Epistemological Status of Theoretical Simplicity

Yineth Sanchez

Nova Southeastern University

Follow this and additional works at: <https://nsuworks.nova.edu/mako>



Part of the [Social and Behavioral Sciences Commons](#)

Recommended Citation

Sanchez, Yineth (2012) "The Epistemological Status of Theoretical Simplicity," *Mako: NSU Undergraduate Student Journal*: Vol. 4 , Article 3.

Available at: <https://nsuworks.nova.edu/mako/vol4/iss1/3>

This Research Article is brought to you for free and open access by NSUWorks. It has been accepted for inclusion in Mako: NSU Undergraduate Student Journal by an authorized editor of NSUWorks. For more information, please contact nsuworks@nova.edu.

The Epistemological Status of Theoretical Simplicity

YINETH SANCHEZ

David McNaron, Ph.D., Faculty Adviser
Farquhar College of Arts and Sciences
Division of Humanities

Abstract

In this paper, I argue that theoretical simplicity is not an epistemic virtue. Therefore, we need not prefer the simpler explanation of two competing scientific theories. First, I clarify the concept of theoretical simplicity as it figures into discussions in the philosophy of science. Next, I evaluate the strongest arguments in favor of this view as a criterion of theory selection. Then, I present two instances where theoretical simplicity is not preferable as such a criterion. Lastly, I show that while there may be a number of nonepistemic criteria of theory choice, including simplicity, none of them bears upon truth. So, if our aim is truth, the appraisal of scientific theories should depend upon empirical evidence alone.

The Epistemological Status of Theoretical Simplicity

There is a common philosophical presumption that simplicity is a theoretical virtue (Baker 1). This notion that simpler theories are preferable leads to simplicity been employed as a criterion to theory selection. The support for simplicity to function in such capacity is often unexplored and uncontested. Therefore, I find it valuable to reopen the discussion and challenge the original premise that simplicity has epistemic worth. The view under consideration here is that other things being equal, the simpler of two rival hypotheses is best. One might think that the principle, so defined, is equivalent to Ockham's Razor which posits that "entities should not be multiplied beyond necessity" (Kaye 4). A common application of theoretical simplicity is as a parsimonious approach to theory selection. In such case, this principle states that if Theory T postulates fewer claims than Theory T', then it is rational to prefer Theory T over Theory T' (Baker 5). So stated, the principle amounts to an empty truism: who would knowingly multiply entities beyond necessity? Furthermore, why should we prefer the simpler theory? And if so, does "best" mean "more likely to be true"?

In this paper, I will argue that theoretical simplicity is not an epistemic virtue. Therefore, we need not prefer the simpler explanation of two competing scientific theories. I will begin by clarifying the concept of theoretical simplicity that figures into discussions in the philosophy of science. Then, I will evaluate the strongest arguments in favor of theoretical simplicity as a criterion of theory choice. Lastly, I will present two

instances where theoretical simplicity is not preferable as such a criterion. Additionally, it is important to note that the adoption of a particular theory of truth is not necessary to fulfill the purpose of this essay. In this paper, I challenge several arguments in favor of theoretical simplicity and the objections to those arguments still hold irrespective of the view of truth that one may adopt. Thus, I do not find it indispensable to commit this paper to a particular theory of truth in order to make the case against simplicity.

Moreover, let us clarify the concept of theoretical simplicity by distinguishing between two senses of simplicity: syntactic and ontological simplicity. Syntactic simplicity measures the number of claims and the complexity of the principles in a theory, whereas ontological simplicity refers strictly to the number of entities postulated by a theory (Baker 1). Syntactic simplicity particularly addresses the elegance of a theory and ontological simplicity concerns itself with its parsimony. The nature and the precise formulations of these two types of simplicity are in themselves the subject of much debate. These two areas lie beyond the scope of this essay. Thus, it is pivotal to establish that for the purpose of our discussion, we will mainly reference simplicity in the ontological sense as defined by this paper.

Let us now turn to the arguments in favor of theoretical simplicity as a criterion of theory selection. The first argument that we shall consider is the appeal to the economy of nature (Nagel 908). This argument states that the world is simple and that

nature as a whole “prefers” a simple outlook. Therefore, one ought to prefer simpler explanations because they are more likely to capture nature as it is.

Prominent scientists such as Newton, Galileo and Einstein accepted various adaptations of the principle of simplicity. Indeed, Newton included simplicity as one of his three ‘Rules of Reasoning in Philosophy’ at the beginning of Book III of *Principia Mathematica*, where he stated that “Nature is pleased with simplicity, and affects not the pomp of superfluous causes” (Baker 2). Similarly, Galileo in the midst of contrasting the Ptolemaic and Copernican models of the solar system stated that “Nature does not multiply things unnecessarily; that she makes use of the easiest and simplest means for producing her effects; that she does nothing in vain, and the like” (Baker 2).

In spite of this support for simplicity, the economy of nature argument suggests that simpler theories should be automatically preferred, because they are better able to represent nature. However, this argument ignores the predictive power of the theories in question, and it also fails to consider whether or not the simpler theories are less or more likely to be true than their rivals. So, if our aim is truth, then this argument is unsuccessful, because it does not address the future success of a theory.

The second argument in favor of simplicity appeals to scientific practice. In the absence of binding criteria of theory choice, scientists have relied on the doctrine of simplicity. Thomas Kuhn regarded simplicity as a fundamental criterion of theory choice that “brought order to phenomena that in its absence would be individually

isolated and, as a set, confused” (Kuhn 103). This argument suggests that since scientists have employed simplicity in the past, and it has demonstrated success, then they ought to continue to use it as a criterion to theory selection.

Nevertheless, it is important to note that the previous application of simplicity provides no confirming evidence for its adoption. In the past, we have adopted false theories as truthful ones, for multiple reasons, and later, we have come to realize their falsehood. For instance, during the 1500s, the geocentric cosmology enjoyed full support of science, philosophy, and theology. However, it was not until the mid 1600s that Copernicus’ shocking heliocentric view replaced the widely accepted yet false conception of the earth as the center of the universe (Parsons 1). Thus, the appeal to scientific practice fails on the grounds that the previous adoption of a principle does not provide evidence of its correctness or future truthfulness.

The third argument appeals to practicality and aesthetics. It states that if theoretical simplicity possesses practical and aesthetic value, then it follows that it also possesses epistemic value. This argument operates under the presumption that these two properties, practicality and aesthetics, are both commensurate with epistemic worth. Thus, according to this thesis, the presence of either one of these elements would inherently constitute epistemological merit for the doctrine of simplicity.

The hypothesis that simplicity possesses practical and aesthetic worth is not contested in this essay. If the object of science were to produce an elegant and

parsimonious account of the world, then one would find it valuable and attractive to employ the doctrine of simplicity as a reductionist approach. In this sense, choosing the simpler theory would consist of selecting the theory that postulates the fewer number of claims or entities. Therefore, in this case, simplicity may possess both practical and aesthetic worth since it enables scientists to work with the most attractive theory at hand. Arguably, scientists would profit from such endeavor. Nevertheless, this argument commits the fallacy of begging the question since it assumes that the presence of aesthetic and practical value automatically grants simplicity epistemic merit. Furthermore, the mere presence of practical and aesthetic worth in simplicity does not establish an explicit or implicit connection with truth. Indeed, even if the claim that practical and aesthetic worth equate with epistemological merit were defensible, that, in and of itself, does not provide evidence for the epistemic worth of simplicity. It is vital to draw a distinction between practicality and aesthetics on one hand and epistemological value on the other hand, since they can all exist independent of one another.

To further illustrate this point, let us suppose that other things being equal, Theories T and T' are compared. Theory T' is the most elegant and practical theory of the two, since it postulates fewer claims. Thus, theoretical simplicity compels us to adopt the simpler theory, which in this case is Theory T'.

However, the mere fact that Theory T' is more practical and elegant than its rival says nothing about its truthfulness. Consequently, the mere possession of practicality and aesthetics does not contribute to the knowledge of which of the competing theories is more or less likely to be true. Therefore, the view that simplicity possesses pragmatic and aesthetic value is inadequate in validating the epistemological status of theoretical simplicity. It begs the question of simplicity having epistemic standing, and it ignores a theory's likelihood of truthfulness during theory selection.

A fourth argument is offered by Karl R. Popper. He posits that "simple statements, if knowledge is our object, are to be prized more highly than less simple ones because they tell us more; because their empirical content is greater; and because they are better testable" (Popper 456). Thus, simpler explanations should be preferred based on these grounds.

Although greater empirical content and easier testability may be highly valued aspects of simpler theories, they are still unable to predict whether or not a theory is any more likely to be true than its rival. In essence, they do not address the future of a theory and its potential for truthfulness. So, if our aim is truth, then the premises of this argument neglect to contribute to our ultimate aim.

A fifth argument in favor of theoretical simplicity turns on the claim that scientific realism presupposes simplicity (Erwin 56). Scientific realism is an epistemic attitude regarding observable and non-observable things about the world (Chakravartty

1). It advocates simpler accounts and explanations to phenomena. Thus, if our object is knowledge, according to this standpoint, one ought to prefer simpler hypotheses among competing scientific theories. There is present debate and controversy over the nuances and particular variants of this philosophical position which are beyond the scope of this essay. Thus, it is important to state that this essay is not concerned with the particular definition of scientific realism. Irrespective of whether or not there is a clear meaning of that view, the issue raised by the argument under scrutiny here is the notion that if scientific realism is true, then so is theoretical simplicity since one view advocates support for the other. Being able to substantiate this claim is problematic and difficult, yet, if it were to be done, an additional premise stating that scientific realism is true would be needed. So, this argument fails because it commits one to a metaphysical standpoint that has yet to be proven, and it makes the epistemic standing of theoretical simplicity contingent upon the truth of that unconfirmed view.

A sixth argument is the appeal to the simple nature of a theory. This argument compels us to choose the ontologically simpler theory among competing hypotheses strictly because it postulates a fewer number of entities. To better illustrate this point, let us suppose that two rival hypotheses, Theory T and Theory T', are at a stalemate with all things being equal except that Theory T is ontologically simpler than Theory T'. According to the doctrine of theoretical simplicity, one is compelled to adopt Theory T mainly by virtue of its ontologically simpler nature, instead of Theory T'. However, a

theory's simple character, in and of itself, does not make a theory more plausible than its opponent. In essence, the simple nature of a theory does not address the theory's content, likelihood of truthfulness, or predictive power. Thus, this argument fails to contribute to our ultimate aim which is truth.

Moreover, proponents of simplicity argue that history has shown us numerous examples where the simple nature of a theory has impacted its preference. In fact, a renowned example of this claim is the homogeneous theoretical reduction of both Keplerian laws of planetary motion and Galileo's law for freely falling bodies near the earth's surface by Newtonian mechanics and gravitational theory (Nagel 908). Newtonian theory creates one set of laws that combines both Galileo's and Kepler's laws on terrestrial and celestial motion, while preserving fundamental terms present in both theories such as distance, time, acceleration, and the like. Thus, Newtonian theory is best explained as the amalgamation of two widely accepted scientific laws into one comprehensive theory. This example is often appealed to as an instance in which simplicity was used as a criterion of theory selection. In essence, it is argued that the ontologically simpler nature of Newtonian theory, that is postulating fewer claims, was used a criterion for its selection.

Nonetheless, there is no definite manner in which one can use a posteriori knowledge to determine whether or not in its time, Newtonian theory was preferred essentially due to its simpler nature or strictly by virtue of its superior explanatory

power. The weight that simplicity alone could have carried in tipping the balance in favor of the simpler theory cannot be resolved with accuracy given the theological and cultural pressures of the time. In essence, it would be implausible to determine whether or not simplicity alone was ever a factor when deciding the truth of the theory selected. In spite of this, the following claim regarding simplicity can be inferred: if simplicity indeed played a role in tipping the balance in favor of Newtonian theory, so could any other background evidence or feature that has not yet been accounted for. Therefore, this argument fails because the simple nature of a theory ignores other factors such as the theory's future success and its explanatory power.

Let us now discuss two instances where theoretical simplicity is not preferable as a criterion of theory choice. First of all, theoretical simplicity can be employed in two senses, syntactically and ontologically, as previously discussed. Therefore, it is feasible to conceive that opposing senses of this principle will inevitably confront one another. To better illustrate this point, let us consider two theories, Theory T and Theory T'. If Theory T is ontologically simpler, but less syntactically simple than Theory T', while Theory T' is the opposite, syntactically simpler, yet less ontologically simple, then how is it possible to choose the simpler theory among two "simple theories"?

In instances such as this, where one kind of simplicity is opposed to another, there seems to be a deadlock as to which "simple theory" to choose. Thus, this dilemma raises the question as to whether or not it is possible to demarcate a superior sense of

the term “simple.” If achievable, then which of the two senses would have supremacy over the other? Indeed, one might conclude that the confrontation of these two senses of the principle of simplicity calls for a new criterion, other than simplicity, to decide between competing scientific theories. This suggests that if we use simplicity as a criterion of theory choice, we are bound to come to this deadlock and require new criteria. So, this leads us to the question as to why we should use simplicity in the first place.

Moreover, a second instance in which a simpler theory, whether syntactically or ontologically simpler, should not be preferred occurs when the rival theory is more plausible on empirical grounds than the simpler theory. For example, a Freudian hypothesis may be less plausible than another hypothesis for it “commits us to new entities or processes, such as the Id or Freudian repression, for which we have no independent evidence” (Erwin 60), whereas a rival hypothesis may not require such accounts of undetectable theoretical entities. Therefore, in this case, the principle of simplicity should be disregarded and instead, the view that provides more empirical and testable evidence should be preferred.

In short, I have reopened the discussion as to why there is a default acceptance of simplicity as a criterion to theory selection. The justification available for simplicity as such a criterion fails to isolate it as a theoretical advantage capable of standing on its own. This essay serves a cautionary purpose to encourage further exploration of the

current support for simplicity. The arguments in support of this view having epistemic standing are simply insufficient in validating this position. Thus, they are not persuasive and they ought to be further explored.

In essence, I have shown that the simpler theory, properly understood, is not necessarily more likely to be true than its rivals. While there may be a number of nonepistemic criteria of theory choice, including simplicity, none of these bears upon truth. As established, a particular theory of truth is not necessary to appreciate the objections against the support in favor of simplicity. Irrespective of one's conception of truth, simplicity fails to establish its epistemic value. So, if our aim is truth, the appraisal of scientific theories should depend on evidence alone that speaks of a theory's ability to predict truthfulness. Thus, I conclude that theoretical simplicity, although appealing for aesthetic or pragmatic purposes, does not in and of itself possess epistemic value.

Works Cited

Baker, Alan. "Simplicity". *The Stanford Encyclopedia of Philosophy (Summer 2011 Edition)*.

29. Oct. 2004. 20. Feb. 2011. pp. 1-5. <http://plato.stanford.edu/entries/simplicity/>

Chakravartty, Anjan. "Scientific Realism". *The Stanford Encyclopedia of Philosophy*

(*Summer 2011 Edition*). Edward N. Zalta (ed.). 27. Apr. 2011. 19 Apr. 2012. pp. 1.

<http://plato.stanford.edu/archives/sum2011/entries/scientific-realism/>

Erwin, Edward. "A Final Accounting: Philosophical and Empirical Issues in Freudian

Psychology." *Net Library*. Cambridge, Mass. MIT Press, 1996. Web. 24. Feb. 2011.

Kaye, Sharon. "William of Ockham (Occam, c.1280- c.1349)." *The Internet Encyclopedia of*

Philosophy. Jan. 3, 2007. 28. Feb. 2011. pp. 4. <http://www.iep.utm.edu/ockham/>

Kuhn, Thomas. As cited in Curd, Martin, and J.A. Cover. *Philosophy of Science: The Central*

Issues. New York, N.Y.: W.W. Norton & Company, Inc., 1998. Print, pp. 103.

Nagel, Ernest. As cited in Curd, Martin, and J.A. Cover. *Philosophy of Science: The Central*

Issues. New York, N.Y.: W.W. Norton & Company, Inc., 1998. Print, pp. 908.

Parsons, Keith. "*Copernican Questions: A Concise Invitation to the Philosophy of Science*".

New York, N.Y.: The McGraw-Hill Companies, Inc., 2006. Print, pp. 1-5

Popper, Karl. As cited in Curd, Martin, and J.A. Cover. *Philosophy of Science: The Central*

Issues. New York, N.Y.: W.W. Norton & Company, Inc., 1998. Print, pp. 456.

Acknowledgments

I am heartily thankful to my faculty adviser, Professor David McNaron, Ph.D., associate professor in the Humanities Division of the Farquhar College of Arts and Sciences. Unquestionably, without his encouragement, guidance, and support from the initial to the final draft, this project would not have been possible. I am mostly indebted to him for helping me flourish as an individual, a writer, and a philosopher. It was truly an honor to have worked with him.