THE NON-MATHEMATICAL LOGIC OF A SCIENCE OF VALUES

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Abstract

This paper joins the ongoing debate that has taken place in the pages of this *Journal* around the type of mathematics that inheres in the logic of formal axiology. The author argues that the validity of formal axiology as a scientific theory rests on its axiomatic foundation. This foundation is independent of the explanatory value that various forms of mathematics may bring to our better understanding of axiological theory. This essay explores first the analogous nature of the relationship between math and the logic of value and second, it discusses the axiomatic foundation of the logic of formal axiology. The author proposes that three axioms, not just one, are needed in order to establish the science of values known as formal axiology.

Introduction

In the pages of the first three annual issues of the *Journal*, a lively and healthy debate has taken place around the type of mathematics that inheres in the logic of formal axiology. The energy stoking this debate has been fueled by a tendency of interlocutors to conflate science with mathematics. This is, in my view, both unfortunate and unnecessary. The debate misconstrues the ways that Hartman often described the role of mathematics in the logic of formal axiology.

In this essay, I will argue that the validity of formal axiology depends neither on *a bushel and a peck…* nor *a transfinite set.* Rather, the validity of formal axiology as a scientific theory rests on its axiomatic foundation. This foundation is independent of the explanatory value that analogies with various forms of mathematics may bring to our better understanding of the theory. Formal axiology does not need mathematics in order to be a coherent scientific theory of the social sciences.

1. Background of the Debate

This tendency to conflate mathematics with science in our interpretations of Hartman's writing is one of the thorniest of the issues facing axiological scholars today, and is a conceptual stumbling block to advancing the theory and practice of formal axiology. The mathematics question is important enough that in 2008 the Board of Directors set it as one of five strategic goals for the Institute to find or develop a mathematics other than transfinite math, which succeeds at creating a calculus of value—in short, to find one "that works" (Edwards, 2009, 151). Writing in the Editor's page of Vol. 2 of the *Journal*, Edwards frames the issue in the following manner: "The main problem with making axiology a science is with finding a mathematics that is adequate to the task" (2009, 1). He concludes a subsequent article in that volume with: "At present, we are only halfway there in creating a successful science of value. Only the math, the weak part, enables computation, exactness, and the development of a calculus of value" (2009, 165).

Proponents of the mathematical foundation of formal axiology tend to take one of three stances. Hirst (2009, 1) is most vocal in defending Hartman's description of transfinite math as the basis for the structure of value. Forrest (1995, 156) generally agrees with Hartman that transfinite mathematics is, indeed, the basis of formal axiology, but concludes that Hartman failed to apply the logic of transfinite math properly in his description of the cardinality of the extrinsic realm of value. All the while, others including Moore, Richards, and Weller, argue that the logical basis of formal axiology needs to be mathematical, but that transfinite math is the wrong mathematics to apply. Weller (2009) proposes fractal geometry; Moore (1995, 2008) argues that a model based on quantum wave theory may provide a more solid grounding for formal axiology. Richards (2008; 2010) points out convincingly the shortcomings in the math proposed by Forrest, Moore, and Hartman, himself. Richards (2010, 112) advocates the pursuit of some form of finite mathematics. He offers four such formulas—including Moore's—for consideration, while cautioning that none of them give the same value ranking as does Hartman's hierarchy of value. It would seem that we are no closer to a calculus of value than when the math debates began.

My issue with this debate is as follows. Since the validity and value of the HVP depends on its isomorphism with the hierarchy of these value/valuational combinations, if that hierarchy is dependent on math, and if the math behind it is currently unjustifiable, then the HVP rests on shaky ground. It would not be enough that it has been shown empirically by Pomeroy (2005) to correlate strongly with other widely used psychometric tools such as the MMP3 and the Cattrell CAQ. Such cross-validations are helpful, but not sufficient, to validate the claim that formal axiology makes of being a science for the social sciences. If the only justification for the merit of the HVP is its empirical validation, then it is no more scientific than other theories of value such as Rokeach's (Hurst, 2009).

Two matters in this debate deserve greater attention: 1) the analogical relationship between math and the logic of value and 2) the axiomatic foundation of the logic of formal axiology. When these matters are examined, the conclusion can be drawn that formal axiology does not need mathematics in order to be a coherent scientific theory of the social sciences.

2. The Logic of Values as Analogous to Math

One the one hand, I challenge the assumption, often outlined in this *Journal*, that Hartman uses mathematics as the foundation of the logic of value. On the other hand, I find evidence in Hartman's writings that, for him, the relationship between math and the logic of value was stronger than merely a metaphor in the way that Byrum has argued (2008). Instead of either extreme, I think that Hartman is suggesting a middle ground—that the logic of value is *analogous* to the logic of mathematics. I have found in Hartman's writings a number of instances where he described the logic of value as it applies to the social sciences in just this way and where he clearly states that the logic of values is not mathematical in nature.

This interpretation lands me in neither of the two camps which have been most vocal in the pages of the *Journal*. Mathematics is not a foundational element of the logic of value in the way that math is the foundation of natural sciences. Nor is math merely a metaphor for describing the logic of value. Rather, the logic of formal axiology is the foundational element of a value science *just as* mathematics is the foundational element in the natural sciences. Since I am swimming against a strong current here, I will go to unusual lengths to buttress my argument by quoting Hartman's own words as they have been published on several different occasions.

In his autobiography, Hartman writes: "Like mathematics, formal axiology is a kind of logic, though a different kind…" (1994, 54). In *The Knowledge of Good*, he writes: "Just as today mathematics is the language of natural science, axiology will then be the language of value science" (2002, 51). These two passages certainly read as though Hartman conceptualizes the logic of values as being *analogous* to the logic of the natural sciences. The logic of values is not mathematical logic.

In T*he Structure of Value* (1967*)*, the same book which is cited most often by other axiologists to bolster their claims that a mathematical basis of formal axiology is a necessity, Hartman again makes clear that his references to math are analogies, not prerequisites to a science of the social sciences. When distinguishing scientific systems from philosophical ones, Hartman writes that scientific systems have an "overarching system, a superstructure or universal pattern which, in the natural sciences, is mathematics. But mathematics is not the only such system possible" (1967, 30). He continues by remarking that: "formal axiology is to moral philosophy as mathematics is to natural philosophy or as the theory of harmony is to music." He repeats this analogy in his essay on "The Measurement of Value" and continues, "But if [value sciences] are to be sciences then there must be a formal frame of reference which must order these sciences as mathematics orders the natural sciences; and this formal frame of reference is what we call formal axiology….” (1959).

In his essay on “The Nature of Valuation,” Hartman writes:

> Axiology is the pure science which is to the social sciences as mathematics is to the natural sciences. It is formal and universal, built on simple axioms, and contains all possible frames of reference for the social sciences as value sciences. It is the logic of value as mathematics is the logic of fact (Hartman, 1991, 11).

The frequency and the consistency with which Hartman expressed himself in such terms about the mathematics question over so many years gives credence to my assertion that the logic of formal axiology is not based on mathematics. Hartman makes this analogy to demonstrate that the logic of value does for the social sciences what mathematics does for the natural sciences. It brings order and orderly thinking to what, otherwise, remains chaotic. This leads us to ask, “How does it do that?” I posit that it does this by being an axiomatic theory.

3. The Hierarchy of Values Accepted as an Axiom

In both logic and mathematics, an *axiom* is a proposition that is assumed without proof for the sake of studying the consequences that flow from it. An axiom cannot be deduced from anything else, as it is a starting point. Once stated, however, an axiom provides the foundation of a formal deductive system. Clearly, by building formal axiology on the concept of good as concept fulfillment, Hartman developed an axiomatic science. He often refers to formal axiology in this way. In fact, he often, though not always, seemed to indicate that only this one axiom—the one defining good—was needed to establish the scientific foundation of formal axiology (Hartman, 1967, 103; 2002, 97).

I will argue, however, that more than one axiom is needed to establish the axiomatic foundation of this science of value. In fact, I’ll posit that at least three axioms are needed to establish a solid foundation for the theory of formal axiology as we know it today. In addition, one corollary must be recognized to establish an axiomatic foundation for the HVP. I recognize that here again, I am swimming against the mainstream of interpretations of formal axiology, and that my argument is not in accord with how Hartman often explained the axiomatic basis of his theory. We will need to explore how this could be. First, however, I’ll seek to show that, if we accept the presence of three irreducible axioms of formal axiology, then the great math debate which currently consumes so much attention in this *Journal* shrinks in significance.

If we accept that a small number of axioms, at any rate more than one, may be used as the basis for a theory, then we are in good company. Newton posited 3 laws of motion. There are 3 laws of thermodynamics (or 4, depending on who is counting); Euclidean geometry is built upon 5 irreducible axioms.

One area where virtually all members of the Institute agree is that formal axiology is an axiomatic theory. Its axiomatic nature is part of what Hartman said makes formal axiology a science. Let me now put a slightly different emphasis on something that Hartman wrote, and which I have already cited once in this essay. I quote again:

> Axiology is the pure science which is to the social sciences as mathematics is to the natural sciences. It is formal and universal, built on simple *axioms*, [italics mine] and contains all possible frames of reference for the social sciences as value sciences. (Hartman, 1991, 11).

Note that, in the above quotation, Harman used the plural “axioms.” Although at other times, Hartman (1967, 103; 2002,97) seemed to say that all of rest of his theory of formal axiology is built upon a single axiom—the definition of good as concept fulfillment—I will argue that there are at least three axioms needed to comprise this theory. What if we accept three axioms as being the foundations of formal axiology? What would that make of the mathematics question? What would it do for the internal consistency of the theory of formal axiology? I believe it would provide a stronger foundation, one that overcomes the weaknesses in the currently accepted superstructure of transfinite math. Let’s look at what these three should be.

This first axiom is largely undisputed. With this axiom, Hartman formulated a definition of good generally as concept fulfillment or more precisely as fulfillment of the intension of a concept (1967, 101-106). Let’s allow this axiom to stand as defined by Hartman.

The second axiom of formal axiology, in this construct, becomes Hartman’s claim that there are three fundamental types of value—the intrinsic, the extrinsic, and the systemic. Each of these is correlated with a fundamental form of language—the singular, the analytic, and the synthetic. Although Hartman (1967) implies that the three types of concepts derive naturally or logically from his definition of good, Edwards (2010, 43-44) has argued persuasively they are not derivative. Hartman’s three-part description of values is a separate construct. So, let’s allow Hartman’s designation of three types of value to stand as the second axiom of formal axiology.

Note that this axiom does not in any way deal with content; only with form. It does not attempt to answer: what things are good? Attempts to answer that would be applications of this formality, not the formality itself (Edwards, 2010, 19). This second axiom consists entirely of the three formal forms of value, not of any particular instantiation or application of them.

Third, I propose that the hierarchy of value, represented logically through the familiar primary symbolic representation of $I > E > S$, and the binary symbols written as base and either superscripts or subscripts, can and ought to be accepted as a fundamental axiom of formal axiology.

The primary notation of I > E > S can be verbally expressed as follows: Intrinsically good things are richer in value (and thus have more worth) than extrinsically good things, which in turn, are richer in value (and thus have more worth) than systemically good things.

A binary hierarchy can then be built upon this primary hierarchy to add a component which captures valuation of each of the primary values by a valuing subject. Such a binary hierarchy of valuation of values is most often depicted symbolically as follows:

$$I^I \quad E^I \quad S^I \quad I^E \quad I^S \quad E^E \quad S^E \quad E^S \quad S^S \quad S_S \quad E_S \quad S_E \quad E_E \quad I_S \quad I_E \quad S_I \quad E_I \quad I_I$$

The combinatory nature of these bases and scripts is axiological, not exponential. Hartman first expressed combinations of values and valuations this way as a form of symbolic shorthand that is unique to axiology. This shorthand is explained accurately and fully by Hartman as expressions of compositions and transpositions. A composition is represented as a superscript; a transposition is written as a subscript. A composition enriches value; a composition diminishes it. It is clearly evidenced by the ordering of this hierarchy that intrinsic valuation by a valuing subject has greater import than does the value object when it comes to determining the overall richness of the resulting combination. Next in the hierarchy are intrinsic value objects, valued more richly, in turn, by extrinsic valuations and then by systemic valuation. This same pattern then cascades through the E and S dimensions and repeats itself in mirror image in the realm of transpositions.

In a somewhat confusing practice, Hartman sometimes refers to value combinations as combinations of two value objects, such as a *new car* (E^E) rather than being combinations of value and valuation, as in *washing my car* (E^E) or *I love my car* (E^I). I prefer to adopt Forrest's (1994, 30) terminology and refer to a combination of two value objects as a *resultant*, which can then be treated as a value object. Sorting through the ramifications of this distinction and its impact on the contents of the HVP are not considered within the scope of this essay. My view that this valuational hierarchy consists of a combination of value objects and valuations by valuing subjects is in accord with Mefford's (1989) "Meta-Axiological Patterns," or "MAPs".

This hierarchy need not be justified by mathematical calculation, especially not by means of exponentiation. It is perhaps unfortunate that the symbolic representation chosen by Hartman happens to be the same as that of the way we express exponents in math.

For instance, in his autobiography, when Hartman first describes the value calculus of formal axiology, he avoids reference to exponentiation and instead talks merely of value combinations. He first describes compositions and transpositions, and then writes: "Such compositions and transpositions can be systematized and symbolized" (1994, 95). He then illustrates the shorthand symbolization with which we are now familiar, but avoids any description in this passage that would hint that such combinations occur through the application of mathematical exponentiation. Only his chosen shorthand hints at that. It's a misleading hint.

In other words, these binary value combinations may never have been intended by Hartman to be calculated through exponentiation in the way that Forrest (1994, 2008) and others (Weller, 2009; Edwards, 2010; Richards, 2008) claim they were. From my review of the literature of this debate, it would appear that Forrest (1994, 46) is the first axiologist to insist unequivocally that the way in which values and valuations are to be combined is through exponentiation. All recent arguments about how the exponentiation of transfinite math works spring from this. Exponentiation, though, is an interpretation that has been reached by some axiological scholars; this does not make it a fact. Hartman, I argue, was more equivocal about whether his combinatorial calculus necessarily requires exponentiation. I recognize that I am going out on yet another limb here. Given the energy that Hartman (1967, 2006) dedicated to explaining the exponentiation of finite and transfinite numbers, it would be easy to conclude that he saw this as vital part of the theory of formal axiology. I point again to his equally adamant statements, already cited, that speak to the analogous nature of his argument.

In an intriguing but confusing few pages of the *Manual of Interpretation* (2006, 34), Hartman does describe his combinatorial calculus loosely in terms of exponentiation. He acknowledges that when dealing with disvaluation, this exponentiation using infinite numbers does not calculate. In a footnote Hartman adds, "The transfinite quotients have axiological but not mathematical meaning." I interpret him to mean by this that the analogy between the logic of value and the logic of math has reached its limit here and that his discussion of exponentiation is illustrative of, but is not an essential part of, the logic of value.

Mefford introduces a new and more illustrative graphic representation of the binary value/valuation combinations which he calls the "Value Wedge" (2010, 82). He also introduces the phenomenological concept of bracketing to axiology. Bracketing is a meaningful way to distinguish between objects of value and the act of valuing by the valuing subject. Through Mefford's bracketed form of combinatorial calculus, "the *value object* remains itself while *valuation* of the object is dynamic and fluid" (82). Although Mefford makes reference in this same essay to exponentiation, he adds that "The use of exponentiation would be only one model in formal axiology, not the last word on the subject" (82). One can readily grasp the hierarchy of value by viewing and reflecting upon Mefford's value wedge without resorting to exponentiation at all.

This third axiom, then, defines the hierarchy of value and valuations. The hierarchy exists as an axiomatic principle, and for no other reason. It is mathematically derived only in that it is ordered from best to worst, left to right, or in Mefford's representation, as a wedge that opens from left to right. This hierarchy is axiomatically true.

If we accept these three as the axioms of formal axiology, the implications for the theory of are significant. First of all, the mathematics question shrinks to relative unimportance. If an acceptable mathematics can be found which is isomorphic with these axioms, then it will be helpful as an explanatory device. But mathematics, other than the ordering of the combinations of the hierarchy of value, is not needed for formal axiology to be a social science. The HVP, too, in this way, stands on logical grounds whose logic can be tested by empirical applications. Its validity does not depend on accurately calculating the exponentiation of transfinite numbers. For the HVP to remain valid, a corollary would need to be accepted. This corollary would state that a person's value structures can be adequately and accurately described in two parts—a world view and a self view. This would place formal axiology in accord with many of the interpretive schools of social science described by Rogers (1996, 13-17, 36).

Controversy resolved. Or not?

4. Questions in Need of Answers

If the main premises of this essay are valid, this leaves two big questions: 1) *Why did Hartman expend so much energy on the math question?* And 2) *Why do members of the Institute consider the math question to be of such importance?*

I can answer neither of these two questions authoritatively, but would like to propose five possible reasons for Hartman's extensive writings about transfinite set theory and its relationship to the logic of values and for our subsequent intrigue with the matter. In hopes of fostering future dialogue and debate among members of the Institute about this subject, I tentatively propose the following five possibilities.

First of all, there are many intriguing parallels between transfinite math and the logic of values. Illustrating formal axiology in terms of set theory, where it does apply, can be a helpful explanatory device. Such explanations lead the reader to become open-minded towards new ways of understanding. This may be what Hartman intended to do.

Second, Hartman was an accomplished mathematician and probably reveled in exploring all of the possible analogies between the logic of value and the logic of math. He was a pioneer who pushed the boundaries of the logic of value during an era when mathematicians were pushing the boundaries of set theory.

A third factor, and one that I believe may have had a strong influence over Hartman, is that he was arguing in favor of a logic of value at a time when the scholarly community embraced a positivist paradigm of what is meant by "science." Byrum describes this well:

> The paradigm of transfinite math is interesting, to say the least, but not necessary in the ultimate sense of the word for understanding Hartman. Given the popularity of these kinds of intellectual considerations in the late 1950s and 1960s when Hartman was working on *The Structure of Value*, he

> must have felt that finding the parallels with his own work would give his own work a higher credibility. That he so immersed himself in the mathematical configurations is, at least, one other indication of the expansive grasp of his own intellectual curiosity. (Byrum, 2003, 5)

Scholars of positivist persuasion tend to hold that values are too arbitrary, too subjective, and too much based on preferences to be scientifically valid. Perhaps, for this reason, Hartman leaned heavily on math as a way of justifying his theory to this audience. To do so meant "to talk their talk."

I find it of historic interest that, at about the time of Hartman's death, scholars within the social science community began to move away from a narrow positivist paradigm and started to embrace what has since become known as a post-positivist view of social science inquiry. This shift in thinking was triggered, in large part, by the publication of Thomas Kuhn's *The Structure of Scientific Revolutions* in 1962. Whether Hartman was influenced by Kuhn's work is not known. But the contemporaneousness of each of their main publications is very interesting. The first of Hartman's two major published works precedes Kuhn's; the second one follows after. More than half a decade separates the original publication dates of *La Structura de Verdad* (1959) and of *Conocimiento del Bien* (1965). His manuscript for a revised and expanded English language version of the second book, which was published only posthumously in 2002 as *The Knowledge of Good*, remained unfinished at Hartman's death in 1973. It may be that a careful comparison of the arguments presented in the various versions of these two books could reveal a shift in Hartman's own thoughts over the intervening two decades. Although I have not studied them for this purpose, I am intrigued to notice a greatly reduced focus upon mathematics in *The Knowledge of Good* compared with *The Structure of Value*.

A fourth matter that needs to be resolved is what Hartman meant when he so often seemed to insist upon the value of developing a calculus of value. Is transfinite set theory essential to this calculus? I have argued that it is not. It's an analogy; not a perfect model. Is exponentiation the proper way to interpret Hartman's combinatory calculus? I have argued that it is not. I have argued that the hierarchy of binary values and valautional combinations is established axiomatically. It is not derived through exponentiation. Subsequent debates over the exponentiation of transfinite numbers have become a detour from the main road that should take us towards our destination of advancing the theory of formal axiology. Is an accurate mathematical formulation of the logic of values a possibility? Perhaps. Is finding such a mathematical calculus essential to the establishment of the theory of formal axiology as a science? No, it is not.

That being said, there remains plenty of calculating to do with ordinary arithmetic, even if an axiomatic basis for the hierarchy of values is accepted. For instance, Mefford (2010, 83) argues that keener insight can be obtained when calculating scores form part one of the HVP by not combining positive and negative valences into one indicator of balance. Also, additional normative studies of the distribution of scores amongst different populations, in the way that Pomeroy has pioneered (2005) are in order. Expanding the scope of our ability to make use of a combinatory calculus beyond the binary level as assessed by the HVP also deserves attention by axiologists. For those who wish to calculate, there remains much calculating to do.

My fifth and final speculation as to why the math question looms so large in today's discussions about formal axiology has little to do with Hartman. It may say more about us as members of the Institute today, and about our own paradigm of what makes social science a science. Are we, perhaps, interpreting the meaning of a science for the social sciences from a narrower, more American-centric definition of what makes for science than the way that science was defined by Hartman?

Edwards (2009, 163) describes well the broader European tradition of science in which Hartman was schooled. Should we be re-framing ourselves rather than Hartman's work? Are we, perhaps, conflating Hartman's emphasis on a science of values with an unfounded presupposition that science must depend upon math? Are we making more out of one part of Hartman's multi-faceted description of the logic of formal axiology than is called for? Are we reading his work through lenses tinted by our own predispositions? Does continuance of the great math debate advance the theory of formal axiology or obfuscate it? Have we, collectively, taken one possible interpretation of Hartman's semiotic representation of the hierarchy of values—that is, exponentiation—and promoted it in importance far beyond the author's original intent? I conclude that we have.

Sometimes, we must step backwards in order to move forward. In this essay I have argued that, if we return to Hartman's own writings, we can find in them a compelling argument that the logic of formal axiology is not based in transfinite math; nor in fact does it need to be based in any kind of math. While math may provide interesting ways to symbolize the logic of axiology, and while math may provide helpful ways to describe axio-logic so that people can grasp it by way of analogy, this is a far cry from saying that math is fundamental to the logic of formal axiology. The logic of formal axiology is an axiomatic logic. It is a logic that may do for the social sciences what the logic of mathematics has done for the natural sciences. Formal axiology provides a logical foundation for a science of the social sciences. The logic of formal axiology brings order to the chaos of phenomena which currently characterize the social sciences. It is a science; not a math.

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