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Between the Two Images: Reconciling the Scientific and Manifest Images

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ABSTRACT: The paper bridges between a science-based metamathematical model of emerging truth and truth emerging from inquiry within ordinary contexts of argumentation. This requires that the underlying intuitions driving the notion of truth in the scientific image be made clear and analogues identified in a manner that permits their application within the ordinary contexts found in the manifest image.

KEY WORDS: ethical argument, inquiry, legal argument, logic, metamathematics, scientific argument, truth

Wilfred Sellars gave us a powerful insight into human understanding when he distinguished the scientific from the manifest image in *Science, Perception and Reality*. The distinction is roughly between the world as investigated and understood through the constructed concepts and special tools of science and the world as understood by naturally evolving concepts and ordinary sense perception. Both of these perspectives have afforded considerable success in producing useful and presumably true knowledge. And both have been the concern of philosophers since the inception of philosophical thought.

Philosophy has vacillated between the two images with great names connected with either and sometimes both. Plato's views can fruitfully be seen as extrapolated from the best science of his day, geometry, and Aristotle's from biology. The relation of Kant to Newtonian physics is well known and the emphasis on philosophy of science in the 20th century testifies to the power of the scientific image. Yet the manifest image is philosophically compelling for it, after all, is the expression of the phenomenology of being and the basis for all practical success until the technological driven era that began fitfully in classical times, moved forward in the 19th century and then exploded in the 20th with undoubtedly the greatest increase in the quantity and quality of knowledge in the history of humankind.

This distinction is analogous to a similar polarity within logic and especially in its application to argumentation. On the one hand logical concepts have been drawn from science, most particularly, but not exclusively, mathematics; on the other hand ordinary reasoning as captured by inquiry in the manifest image has always been a counterpoint to the formal or mathematical. This is especially true in the last 30 years with the advent of informal logical and argumentation theory, which moved from the abstract characterization of argument as formally construed to an obviously more adequate

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conception of argument as dialogical. With very few exceptions informal logicians and argumentation theorist have eschewed formal models in favor of conceptual structures as ordinarily deployed. To offer a mathematical model at this time, particularly one drawn from the practice of the science seems regressive, especially since such a model harkens back to the era of logical empiricism, a point of view no longer popular even in the philosophy of science. To offer such a model to informal logicians as an account relevant to argumentation seems no less the perverse, but offer such a model I have.

For the past several years and in a number of publications I have offered a metamathematical model of emerging truth (MET) and embedded it in a variety of contexts relevant to argumentation. MET moves away from the natural notion of truth as correspondence, common in philosophical thought from Aristotle to Tarski. Correspondence requires that object of claims be specified independent of the claims themselves. Emerging truth sees truth as a function of such claims and the inquiry in which they are housed. Correspondence is plausible if arithmetic is our paradigm for truth generating inquiry, since the truths of arithmetic are known independent of the logic that accounts for their status as true (in arithmetic, provable). It may also have some purchase when we are dealing with brute facts of common experience. But when we move into the vast areas for which inquiry is required, truth independent of inquiry is impossible to ascertain, since it is the purpose of the inquiry to come know the very truths in question.

The mathematical model itself can be seen as an existence proof; by developing an actual mathematical model of a philosophical concept one may, show that whatever else its failings, the concept is not vacuous. Of course the existence of a mathematical model does not show relevance to any particular area of concern. This is a major lesson to be drawn from the failure of mathematical logic to capture much of what was to be seen essential in argumentation by both informal logicians and argumentation theorists.

In what follows I briefly outline the context that supports the model and then describe the models salient features. Then I will briefly sketch two applications of the model. First to legal argument, which has some affinity with scientific argument in that it is codified and hierarchical, and then to a more distant context, that of ethical argument. In this way I hope to indicate the power of the approach.

THE MOTIVATION FOR THE MET

The original model was designed in response to the following conjecture: If you ask a sane relatively well-informed person what the universe is made of, the answer is most likely to be some hodgepodge of words about atoms, molecules and the like. That is to say, the working ontology of the modern world is the ontology of medium level physical chemistry. The question then was how is ontology internal to a point of view such as physical chemistry warranted (Weinstein, 2002). But ontology is traditionally linked to truth and so if one understood the basis for ontological commitment one might have a clue as to how the notion of truth might be thought about (Weinstein, 2007). This is clear both logically and historically. The ontology of natural kinds gave Aristotle his basic understanding of the categorical proposition and through the development of a logical structure could define a truth predicate in terms of something analogous to the modern notion of satisfaction. In Plato the ontology of forms and the requirement of necessity as a hallmark of philosophical truth moved Plato to the geometrization of ontology as in the

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Timeaus, a powerful metaphor that influenced Renaissance science particularly in Copernicus and Galileo, and resonated with the subsequent philosophical and scientific thought in Leibniz and Newton. In the 20th the link was made the basis for modern logic and much of modern metaphysics through the work of the Wittgenstein in the Tractatus and Russell's logical atomism. The culmination may be seen in the Quineian aphorism, to be is to be the value of a variable, that is, ontology is to be exhibited through the medium of a truth predicate in an adequate logical language.

More pertinently for the context of the paper, the model addressed my intuition of the centrality of Toulmin's model to an adequate theory of argument, especially the notion of warrant. In a recent paper (Weinstein, 2006) I addressed some of the contentious issues surrounding Stephen Toulmin's influential jurisprudential model. The model gives clear sense of the distinction between backing warrants and grounds and, more important, shows why warrants cannot be collapsed into logical implications. Most important, the model permits an intuitive analysis of warrant kinds, which are seen as forming a hierarchy of logical strength. This affords a graded analysis of argumentative support in terms of the strength of the warrants brought forward.. By having a flexible notion of warrant the weight of argumentative support moves beyond reliance upon the evidence to include the robustness of the principled generalizations through which evidence is seen as relevant to the claim. This is essential, for example, to account for the nuance of expert testimony and opens the door to a deeper appreciation of the epistemic power of various disciplinary frames.

The model draws its epistemology from an overt Copernican turn. That is, rather than looking to purportedly a priori criteria as the source of normativity, I look to successful practice (Weinstein, 2006a). I choose, what seems to me, the most successful epistemological practice in the history of human inquiry: physical chemistry as initiated by the development of the periodic table and continuing with increasing practical and theoretical advance through the 20th century, resulting in the most amazing increase of knowledge at the highest level of reliability in human history. Physical chemistry with its supporting array in physics and in its application to material science, both organic and inorganic is, arguably, the foundation of our entire technological competence.

A BRIEF INFORMAL SKETCH OF THE MET

The model presupposes a number of things that are unusual in formal logic but quite natural in actual argumentation (Weinstein, 2007a). The first is a relevance filter. It assumes that any manifestly irrelevant premises are discarded as their irrelevance is ascertained. The second, that a discourse frame set the standards of rigor in argumentation and that degrees of rigor appropriate to an argumentation context are determined as the argumentation proceeds. This would be part of what the Amsterdam theorists call the opening stage, or part of the backing in Toulmin's sense. Third, it is non-monotonic, that is to say inference is reconsidered as new premises are made available. Finally, it is dynamic rather than static. An inference is evaluated within a network of associated inferences and the history of the network. This is a basis for a deep reconsideration of the nature of warrants. Warrants are of varying strength, basic distinctions can be made in dimensions of strength, strong warrants are housed within a body of generalizations (not necessarily universal), strong warrants connect such bodies

of generalization into progressive networks and super strong warrants are strong warrants of exceptional breadth and depth. Although such language is metaphoric, a precise mathematical characterization has been offered in the papers indicated above. For the purpose here the mathematics is necessary, for it shows that the concepts are not vacuous, but not sufficient. For until such a view is shown to be relevant to actual argumentation, rather than then merely satisfying the stylized image that metamathematics imposes on logical discussions, the view is of little interest to informal logicians and argument theorists. This requires that the intuition behind the mathematics be exposed and its relevance to actual argument be demonstrated. One caution, after all is said and done the mathematics, no matter how imposing, must reduce to a clear and noetically powerful philosophical intuition. One should not be surprised if such an intuition is transparent and obvious once noticed, for that is the power of deep logical advance.

The mathematics proper is characterized by two essential logical concepts, that of modeling (various weak entailment relationship with classical implication as a limiting case) and a deeper sense of entailment that relies on the connection between discrete sets of principles and even vocabulary (what in the philosophy of science is called reduction). Reductions are not unlike the analytic entailments of logical empiricism; my first intuition was to equate such entailments with L-true in Beta in the sense of Carnap's classic discussion in the *Meaning and Necessity*. I now see this connection in terms of a hierarchy of warrant kinds, that may often appear to be 'meaning postulates' but although more rigid than weaker warrants, such warrants are resistant to change and form the foundation of inter-theoretic connection that fuel conceptual advance and deeper understanding.

Although the second of the two functions has the most novelty the first one permits a radical shift in perspective to be clearly seen: that is it is the dynamics, not the statics of argument wherein the essential logical concepts lie. The function that maps a theory onto a body of evidence, the basic insight behind philosophical accounts of explanation since Aristotle and canonized by Hempel and his followers, is no more than that condition that the for a significant claim to be about the world there has to be a 'match up.' Of course the devil is in the details, but the deep intuition that science is true just when what it describes is the case has been at the center of modern logic and rightfully so.

The problem, of course, is what is to be the case. One source of our strongest intuitions is the clarity and naturalness with which our sense perceptions, memory etc. conform to the world. If there is any candidate for the best epistemological practice besides for physical chemistry, it has to be common sense perceptual based reasoning, which we employ everyday and for the most part do rather well as measured by success at both the species and individual levels. But of course we make grievous errors. It is the path to correct these errors that the model attempts to indicate. The intuition drawn from physical chemistry is clear, We expect our descriptions and measurements to increase in reliable detail and to afford predictive success at an increasingly nuanced level, that is to say, the models of our assertions must be increasingly adequate to the reality that they attempt to describe. It is the dynamics of this advance that moves truth from truth in a model to truth in a chain of models the members of which are increasing in adequacy to the phenomena as we test and probe in standard ways. Those standard ways are themselves difficult to ascertain, but determine them we do in practice in all of those

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domains in which we are increasingly successful with our inquiries. The notion has been given precise mathematical characterization in the MET, what is relevant here is the intuition. We are rarely right or wrong simpliciter (at least not in areas that requires argument). Rather the picture emerges through argumentation and other methods of inquiry.

Whatever the power of the intuition of correspondence between our models and reality, physical chemistry teaches us a deeper lesson. It is not only more adequate descriptions and predictions that we require. We require that they be robust, that is reliable. Such robustness appears to be based not on any one chain models (sequences of observations and explanations) but by the coordination of many such sequences (model chains) through an overarching theory, and ultimately the unification of such theories in grand overarching theories that reconceptualize the elements of descriptive models in theoretic terms of deep explanatory power and enormous connectivity. The unification of myriad chemical explanations in the Periodic Table was only the first in a century of advances, as hitherto unrelated area of physical sickness were seen to follow analogous principles that could then be reconceptualized in terms of a powerful micro-theory that resulted in many more empirical determinations and a general increase in the adequacy of the theory-driven models. Organic chemistry is one such grand unification, giving us a rich understanding of the very architecture of life in chemical terms. The richly connected theories and practices within physical chemistry is the basis for our understanding of pretty much everything else in the physical universe, from the makeup of stars to the making of microchips. Being right in our empirical models is neither necessary nor sufficient. Incorrect models are frequently useful in practice (Cartwright, 1983). Our models need to be progressive, and they need to be embedded in a hierarchy of connections that give logical force to explanations by their depth and breadth, and such a wealth of coordinated theories needs, itself, to be progressive. The mathematics shows that these desiderata are not mere words or amorphous metaphors. The model gives precise mathematical content to each of these, and permits a definition of truth as emerging from inquiry.

TWO APPLICATIONS OF THE MET

Legal reasoning exists in the stylized context of lawyers' briefs and court decisions. Each of this restrict the argument in a variety of ways, but the most compelling restriction on legal reasoning is a principle of coherence, *stare decisis*, a conservative principle that valorizes precedent. Briefs are constructed based on the facts of the matter and the legal precedents. But neither the facts nor the precedents are absolute, rather through the course of trial procedures factual claims are brought into question and through judges' decisions and the appellate process the relevance of precedence is also open to question. The appellate structure forms a clear hierarchy of logical power. As one moves up the hierarchy judgments and the principles that they instantiate form a logically asymmetric chain: lower court decisions may be overturned by higher court decisions and not vice versa. Higher court decisions do, however, take into account the facts as brought forward in trial as well as the interpretations of the lower court. And so even higher order principles are defeasible in light of information from below. This asymmetric back and forth down a chain, with higher order principles and decisions offering meaning down the

chain and lower order descriptions and decisions giving content up the chain is captured in the MET. That aside, the model tells us that the adequacy of such a structure is a function of increasing articulation, depth and breadth over time. These are readily interpretable in legal reasoning.

Based on the criteria of increasing articulation we would conjecture that a legal argument is logically compelling when it enables more of the details to be seen. That is, the laws cited in a brief illuminate more of the salient facts of the matter and show their relevance. It is more than some amorphous appeal to total evidence, rather arguments are evaluated by showing that through dialogical advance, the arguments brought forward (the laws cited) offer a lens that permits more of the evidence to be admitted for consideration as relevant to the determination under existing laws.

Depth is easily defined in terms of the hierarchy of court decision. A legal argument is logically compelling when it reaches up through appellate decisions and so withstands its overturn on appellate grounds. The appellate procedures redefines the meaning of lower court cases, by seeing them to be in reinterpretable as (or in violation of) a higher order principle. A legal argument is sound when it permits of interpretations that show coherence with higher court rulings.

Breadth is also an apparent property of legal reasoning. Although law is divided into a number of discrete legal realms, torts, criminal law, family law etc., laws apply through a range of cases within these large groupings. Logically powerful laws cover their terrain and are usefully expanded to newly relevant areas. A powerful legal argument, for example, that extended copyright protection to digital media, shows its power by extending the basic legal concept from its original domain (print) to a new and relevantly similar medium (the world wide web). But the most powerful principles, deep procedural principles such as habeas corpus, unify realms of law by showing them to be subject to profound intuitions about the rule of law and the search for justice.

MET gives a mathematical image of such a structure. Whether it will prove useful in analyzing actual legal argumentation remains to be seen. But its precision should permit computer models of legal argument to be constructed and their power across the array of laws and precedents determined. Although this may appear fanciful, lawyers and judges make such determinations as part their expert competence. An expert model based on such reasoning should be no more difficult to construct than expert programs for medical reasoning. Magnani (2001) offers a schematic of such expert systems that might be usefully applied to legal reasoning. In his schematic he indicates movements from data to explanations and vice versa. MET offers a possible structure for adding details to such an abstract account. The construction of a computer model for legal (or medical) reasoning based on MET would be the strongest evidence for its usefulness. But even in the intuitive terms of the discussion so far, it seems clear that concern with increasing articulation, depth and breadth afford an image of legal reasoning that gives coherence to its complexity and moves us far from a simplistic 'covering law' image of how lawyers and judges function. The relationship of a more adequate image of legal argument to ascertaining the adequacy of legal reasoning, by parity with scientific inquiry, rests upon an adequate account of what makes legal reasoning as a system of inquiry more effective, an area in which much work needs to be done. Breadth and depth point to consistency in the basis for judgment a possible surrogate for the appeal to equality before the law, a presumptive criterion for adequacy. Degree of articulation appeals to relevant difference,

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another goal of legal systems, in the face of the over-extension of principles to unlike cases.

Ethical reasoning consists of broadly relevant principles, some of them meta-ethical that have been exposed to human understanding through decades of practical, religious and philosophical inquiry. Meta-ethical principles encapsulated in such fundamental postures as consequentialism and deontology have been articulated by philosophers and have been applied to myriads of human decisions along with their correlative concern with human suffering and universalizability (lack of special pleading). Countless equally robust ethical principles have been codified in religious and legal systems since such systems have been available in written records, and undoubtedly before then in ancient and well-established practices. Killing, theft, injury, family life and the concerns of exchange have all been the subject of ethical scrutiny and the human race in aggregate and within particular cultures has available no shortage of general prohibitions and other sorts of mandates. The problem is their application, and especially the coherent application of such principles in light of the complexity of human action and our limited ability to foresee consequences and other sorts of ramifications. As we have seen earlier legal systems are constructed to deal with such complexity by having hierarchies of evaluation that reach down to cases, and slowly change as new cases confront old precedents. Legal reasoning is constructed to utilize this interplay and has codified, in terms of clear institutionalized procedures and priorities, methods for determining the array of principles to be applied in a case, looking towards a defeasible determination.

In ethics we have access to cases and broad principles, this in itself explains the two poles of ethical discussion, casuistry on the one hand, philosophical ethics on the other. But given the abstraction of principles and the specificity of cases what are clearly needed are medium level generalizations that both reflect principles and that permit the salient details of cases to become apparent. The model gives us a clue as to how to advance. Naturally, the MET gives little help in inventing such mediating principles but it does point to criteria for adequacy.

The first is that mediating principles should sort cases into bundles based on modest generalizations, consistent with higher order principles, and yet be illustrative of salient aspects of the cases. The issue is, of course, salience, we can not look at such medium level principles at a point, but rather have to see how they fair when confronted with the dimensions of ethical decision making. All things being equal they should form a chain of increasingly general principles, while being rooted in the cases. In the law such concepts are built into levels of seriousness in the violation of general legal prohibitions. For example, the sequence first, second, third degree murder, manslaughter and justifiable homicide as a function of the heinous nature of the crime and criminal intent differentiates, in a clear ordering, violations of the principle against taking a human life. Such an ordering permits relevantly similar cases to be grouped and appropriate middle level principles to apply. Substantive moral principles should do no less.

Such sorting of moral cases requires that moral principles, like legal principles, should identify the aspects of a case that are salient for moral judgment. That is to say a logically powerful moral principle lets us see what in a case matters in light of our need to make a moral judgment that is universal across a class of relevantly similar cases. Long-standing disputes such as the abortion debate require, at least, that a substantive

moral principle determining what is human life and when it begins be available. Although there is no agreement as to what that is, the MET shows us why if it needed. That is the second contribution of the MET, a focus on breadth and depth. This enables is to illuminate the texture of the warranting argumentation. In the abortion debate, each position relies on different higher-order principles whether scientific, religious or sociological. Such principles exist within a network of moral concerns. Each network striving for internal coherence through inferential relations between the principles it includes, and attempts to illustrate its adequacy by the role of such principles in clear cases and its consistency with higher-order relevant principles (in the abortion debate the rights of a woman to personal physical integrity in one network, human life at the point of conception in another). In terms of the MET each principle appeals to the depth of the moral reach and the concomitant breadth of its application. The right to physical integrity is a powerful argument because it unifies so many ethical judgments ranging from prohibitions against assault to unequal access to medical care, and similarly for the absolute definition of life at conception. The recalcitrance of the debate can now readily be seen once we realize that each of these networks of values form a unique and heretofore incommensurable backing for the argument. It is only by a grand unification of e.g. religious and humanistic value networks that a definitive resolution is to be hoped for. Failing that unification we can only look for the history of effectiveness of each of the moral constellations and opt in light of their progressive nature which one it is rational to adhere to given their comparative histories at a point. Whether a natural notion of effectiveness, parallel to the obvious effectiveness of physical science can be elaborated once an adequate model of progress can be applied to ethics rests, as on an account of the goals of moral reasoning. As with legal reasoning, consistency of the underlying principles and sensitivity to the particulars have some prima facie force as indicators of adequacy. What may seem astounding is that such intuitions are given precise mathematical content in the MET. What is clear is that the considerations presented here are obvious from the point of view of the MET, and perhaps not as obvious from other logical reconstructions of moral argument.

[link to commentary](#)

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