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Commentary on: Mark Weinstein's "Warranting Evidence in Diverse Evidentiary Settings"

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This commentary consists of three parts. The first attempts to summarize the main theme of Weinstein's paper, insofar as I can understand it; the latter qualification is obvious and almost redundant, except that I must confess I found it very challenging to make sense of his essay. The second part of my commentary advances some negative criticism of his paper, by focusing on issues of conceptual clarity and argumentative cogency. The third part elaborates a positive appreciation of what seems to be Weinstein's main claim; I do so mostly on the basis of things which he does not even mention, but with which I happen to be acquainted.

1. Interpretation

A big part of Weinstein's paper (Section 3, pp. 3-6) offers an account of the history and methodology of physical chemistry (primarily atomic theory) in terms of three epistemological notions, which he labels consilience, breadth, and depth. He defines these three concepts as follows: "***consilience,*** requires that theories are increasingly supported by a body of evidence that is improving in scope and detail. ***Breadth*** requires that a theory explains an increasing number of diverse phenomena, and ***depth*** requires that a theory is reinterpreted in terms of higher-order explanatory frameworks that connect it to other theories of increasing breadth and increasing evidentiary adequacy" (p. 6).

An even bigger part of Weinstein's paper (Sections 4-5, pp. 6-10) presents a similar account of the recent history of cognitive science that includes not only theories of cognition, but also theories of emotions, as well as theories of the neuro-physiology of the brain. In his own words:

> As the models, indicated below, show, the brain coordinates functions across an array of inputs permitting an integrated response that enables perception, memory and purposes to bring together information necessary for coordinated action in the world. I see this as a clear parallel with consilience, the increasing systematic effectiveness across areas [of] concern as the sciences develop and new problems are confronted. Second, the brain integrates the broad array of disparate information, proprioceptive, hormonal, electrical, and chemical, integrating new input with stored input and modifying content in relation to newly acquired stimuli of many kinds. This seems to me parallel to breadth. Most importantly, all of these functions are accounted for on increasingly defined more abstract levels, moving from gross physiological function to the operation at the cellular level, and if we accept materialism, to the molecular level, as we understand the functions of the neurological array [based] on the deepest physiological levels. This has a clear parallel with depth, the reinterpretation of a theory in

terms of a higher order, more abstract and more deeply ontological sense of the ultimate real[i]ties behind the phenomena. (P. 9, brackets mine)

The paper ends (Section 7, "Conclusion," pp. 10-11) with what looks like a plea that informal logic and argumentation theory model themselves on physical chemistry and cognitive science, by taking seriously the epistemological ideals of consilience, breadth, and depth. Here, Weinstein advances several suggestions, the most striking of which is this: that the analysis of "argument must move from structure to the functions the structures exemplify, and in particular, the function of warrants that reflect the underlying networks of commitments in directing and sustaining argument. This requires more than a complication of argument diagramming, but rather a movement into the detail of support: how commitments to warrants and the networks of beliefs that they represent alter the evaluation of evidence, both evidence sought and evidence already available" (pp. 10-11). This suggestion is striking because it also corresponds to the main message which Weinstein seems to want to convey in his paper's title, abstract, and introduction. Indeed, in the preliminary section (no. 2, "Setting the problem," pp. 1-3) Weinstein confesses that this paper is his latest attempt to elaborate and justify a thesis he has advocated for a long time: "My suggestion over many years and many papers is that the analysis and evaluation of arguments requires a focus on warrants. But the adequacy of warrants, whether construed as generalizations or inference tickets, shifts the focus from evidence to the commitments through which evidence is selected, organized and applied. Concern with warrants moves the analysis of argument into a subject-matter dependent stance" (p. 3; cf. Weinstein, 1990a, 1990b, 2003, 2011, 2013).

2. Criticism

One difficulty I have with this pertains to the clarity of the three concepts of consilience, breadth, and depth; it leaves much to be desired, to say the least.

For example, we are told that consilience refers to the increasing *scope* of the supporting evidence, and that breadth refers to the increasing number of *diverse phenomena* explained; but these two things sound the same to me. Similarly, consilience also involves increasing *details* in the supporting evidence, which seems to be what depth is all about. Thus, I don't see that consilience is a distinct concept, above and beyond breadth and depth; as defined by Weinstein, consilience seems to repeat what breadth and depth require. Part of the confusion may stem from the fact that consilience as ordinarily understood is a relationship between two or more theories, whereas Weinstein seems to treat it as a (monadic) property of a theory.

Accordingly, Weinstein's application of these concepts to physical chemistry and to cognitive science is correspondingly confusing, if not confused. For example, at one point in the history of physical chemistry it was discovered that protons and the atomic numbers of elements were to be supplemented with neutrons and atomic weights. To me, it's not at all clear whether the resulting more adequate theory possessed greater breadth, or greater depth, or greater consilience, or all three, or none of the three. With regard to cognitive science, I think I understand that, if and to the extent that emotions can be explained in terms of cognition, then the *breadth* of cognitive science is enhanced; on the other hand, if and to the extent that cognitive states and phenomena can be explained on the basis of neuro-physiological processes, then the breadth of *neuro-physiological theory* is enhanced. However, I don't see that any of this yields an enhancement of the depth or consilience of any one of these theories.

Independently of this difficulty, there is another one, which seems to me even more serious. That is, Weinstein's methodological and epistemological analysis of physical chemistry and of cognitive science says (almost) nothing about the reasoning and arguments advanced or used by physical chemists or cognitive scientists. Thus, I don't see that from such an analysis anything follows about how informal logicians and argumentation theorists ought to conduct and practice their business, namely the interpretation, evaluation, and analysis of arguments. In other words, insofar as Weinstein's effort in this paper (as summarized above) is itself an argument, it is an obvious instance of non-sequitur. On the other hand, perhaps this paper is not advancing an argument; in that case, it would be a non-argument about non-arguments. In either case, the relevance of the paper would be the issue.

3. Appreciation

Despite the destructive criticism just considered, I believe there is something right and important in the main claim asserted by Weinstein in this paper's title, abstract, introduction, and conclusion. At least, this is so if I understand it right. Again, as formulated in the introduction, the claim is that the analysis of argumentation should "focus less on evidence that contradicts claims and … [more on] the network of warrants that support the selecting and evaluating of evidentiary moves" (p. 1).

Here, as a preliminary, let me say that I applaud the way in which Weinstein starts his substantive discussion. He does so by referring to some current articles by columnists in the *New York Times*. One of his examples is a recent column by Paul Krugman (2020) that discusses the politicians running to be nominated by the Democratic Party as this party's candidate in the 2020 election for President of the United States. At one point, Krugman raises the issue of the cause of the Great Recession of 2008, in order to criticize some of the candidates and defend others. His own view is that the cause was "the erosion of effective financial regulation over the previous few decades" (Krugman, 2020, p. 22). He dismisses alternative accounts as "zombie ideas—ideas that should have been killed by evidence, but just keep lurching along." One of these is the "narrative in which liberals somehow caused the crisis by forcing poor innocent bankers to lend money" to people who could not repay it. On this, Weinstein comments that "clearly, both of these claims may be considered reasonably appropriate evidence supporting claims about the cause of the financial crisis, and equally clearly the evidence does not in any way resolve the dispute as to which point of view is a 'zombie'" (p. 2).

In other words, Weinstein is attributing to Krugman a denial of his own thesis about "warranting evidence in diverse evidentiary settings" (p. 1). Now, with all due respect to Krugman (who is an M.I.T. graduate, a Princeton emeritus professor, and the 2008 Nobel Prize laureate in economics), I believe Weinstein's attribution is essentially accurate. In fact, Krugman's columns frequently display such an approach (Krugman 2012, 2014, 2015, 2016). I also agree with Weinstein that such a practice is very damaging and undesirable for anyone engaged in argumentation.

Weinstein also deserves credit for calling attention to a recent *New York Times* column by a mathematician entitled "Mismeasuring the coronavirus," which explains how "up-to-the-minute reports and statistics can unintentionally distort the facts" (Paulos, 2020). Although such a problem will be familiar to an applied logician or philosopher of science, in light of the ongoing pandemic it is extremely useful to discuss the problem in terms of the current situation. And I also agree with Weinstein that this article (unlike Krugman's) seems to illustrate and confirm Weinstein's own main thesis.

Let us now go on to an area which I want to exploit by using its material to illustrate and justify Weinstein's main claim, at least partially, and at least in my own way. The topic is the Copernican Revolution, understood as the transition from a geostatic and geocentric worldview to a heliocentric and geokinetic worldview; this transition started roughly in 1543 with the publication of Nicolaus Copernicus's *On the Revolutions of the Heavenly Spheres* and ended roughly in 1687 with the publication of Isaac Newton's *Mathematical Principles of Natural Philosophy*. What makes this development especially relevant in the present context is the fact that for about a century and one-half there was a controversy consisting of all kinds of arguments for and against the motion of the earth; indeed such pro- and anti-Copernican arguments probably constitute the richest collection of argumentation in the history of thought. In this regard, the contributions and works of Galileo Galilei are especially relevant and instructive because he was very much aware of such a logical aspect of the Copernican controversy and was able to make epoch-making contributions to its resolution (cf. Finocchiaro 1980, 1997, 2010, 2014, 2019).

In his 1543 book, Copernicus had shown that the known facts about the motion of the heavenly bodies could be explained in quantitative detail if one assumes that the earth rotates daily on its own axis and revolves yearly in an orbit around the sun. Such an explanation was not only a novel alternative to the geostatic explanation, but also simpler, more coherent, and less *ad hoc*. However, although better, the Copernican theory was not conclusively proved, because of the explanatory form of its supporting argument, and also because of the existence of many apparently unanswerable counter-arguments. Let's examine some of these.

Some of the objections were epistemological, the most famous being the argument from the deception of the senses. That is, direct sense-experience reveals that the earth stands still; for example, we do not feel any terrestrial motion; and we see heavenly bodies move around the earth. Thus, if the earth were in motion, our senses would be deceiving us—would not be telling us the truth. But this is absurd, since the human senses are the main instruments we have to learn about reality.

Some of the anti-Copernican arguments were religious or theological. The most common of these was the scriptural argument. That is, it is stated or implied in many passages of the Bible that the earth stands still at the center of the universe; for example, in Joshua 10:12-13, God does the miracle of stopping the sun from setting, so that daylight would last longer, in answer to Joshua's prayer that the Israelites were engaged in a battle with the Amorites, and their advantage would be lost if the sun set and night came. Now, the Bible cannot err, and so the earth does not move.

However, another group of arguments were mechanical, in the sense of being based on the motion of bodies near the surface of the earth. One was the vertical fall argument. That is, it can be easily observed that freely falling bodies move vertically; for example, this is what happens to rain when there is no wind; and if one drops a rock from a window, the rock lands at the foot of the building. Now, such vertical fall could not happen on a rotating earth, because the freely falling body would be left behind while the ground and the building would be carried eastward by the earth's rotation, and so the body would land to the west of where it was dropped, after following a slanted path. Therefore, the earth does not rotate.

Another mechanical argument was based on the range of gunshots toward the east and toward the west. Again, observation and experience reveal that eastward gunshots reach a distance equal to that of westward gunshots. This could not happen if the earth were rotating, because on a rotating earth the distance traveled by eastward gunshots would be the difference between their own projectile motion and the eastward motion of the gun carried by the earth, whereas the distance traveled by westward gunshots would be the sum of their own projectile motion and the same

eastward motion of the gun carried by the rotating earth. The conclusion is, again, that the earth cannot rotate.

A third mechanical argument was based on the extruding power of whirling, as at that time they called what today we would call centrifugal force. That is, if the earth were rotating, then bodies on its surface should fly off toward the heavens, because such bodies would find themselves in a whirling system, which for example at the equator would be undergoing a speed of about 1,000 miles per hour, and we know that such whirling generates an extruding power away from the center of rotation. However, such extrusion is not observed, but rather even a feather (when there is no wind) can lie on the ground motionless and undisturbed. It follows that the earth cannot be undergoing rotational motion.

The resolution of the Copernican controversy required not only the invention and construction of new arguments supporting the earth's motion, but also the refutation of the arguments against it. If we look at Galileo's criticism of the mechanical arguments against the earth's motion, we can, I believe, get closer to the topic anticipated above. Here, there will be time and space only for the vertical-fall argument, although similar considerations would apply to the east-west gunshot argument and to the extrusion argument. Galileo's critique of the vertical-fall argument is the following.

It is not true that on a rotating earth freely falling bodies would be left behind during their fall. The reason is that if the earth were rotating, before a given body started falling freely, it would be carried by the earth's rotation; for example, if I am dropping a rock from a window, while the rock is still in my hand, it would be carried along toward the east, together with my hand, my body, and the building. As an approximation, considering a small part of the earth's surface, we can say that on a rotating earth, before the body started to fall down, it would possess an horizontal motion toward the east. Now, this horizontal eastward motion would not be lost but would be retained after the body started falling. The reason for this is that motion, once acquired, is conserved, unless it is subject to disturbance or interferences; this claim may be called the principle of the conservation of motion, which corresponds to the law of the conservation of momentum and the law of inertia of modern physics. Because of conservation of motion, on a rotating earth the falling body, besides falling, would also be moving eastward, so as to land at the foot of the building, with an apparent vertical trajectory. Nor would it be correct say, as the anti-Copernicans would be inclined to say, that on a rotating earth, the falling body's horizontal motion would not be conserved because its vertically downwards motion would interfere with it; here the anti-Copernican would be running counter to the principle of the composition of motion, which stipulates if and how motions in different directions are combined.

In short, in his criticism of the vertical-fall argument against the earth's motion, Galileo was appealing to the principles of conservation and of composition of motion. In so doing he was pointing out that this anti-Copernican argument presupposed such principles as the following: that motion (even uniform motion) requires a force in order to continue, otherwise it spontaneously dissipates; and that bodies can have one and only natural motion (so that on a rotating earth a falling body could not simultaneously move eastward and downward). Now, it turned out that the principles of conservation and of composition became an integral part of modern physics, and that the just-mentioned anti-Copernican principles were part of the Aristotelian physics which had to be rejected. However, in the historical context, besides providing the analysis elaborated above, Galileo could not simply assert the principles of conservation and of composition; he had to argue and provide evidence in their support, and he did do that (cf. Finocchiaro, 2014, pp. 105-112).

Nevertheless, in the Galilean analysis elaborated above, it does seem that, to use Weinstein's terminology and framework, there is a "focus less on evidence that contradicts claims and … [more on] the network of warrants that support the selecting and evaluating of evidentiary moves" (p. 1). That is, the anti-Copernican alleged evidence was vertical fall. Galileo did not focus on whether bodies really fall vertically, or whether they deviate in some manner. Instead, he focused on the network of warrants that made vertical fall so crucial, namely the principles of Aristotelian physics, which the anti-Copernican argument presupposed. And Galileo also focused on the network of warrants which made up his own new science of motion, and which were to replace the old physics. In this sense, I feel I have illustrated and justified Weinstein's main claim.

Finally, a qualification is in order. I don't think that we should exaggerate the correctness or applicability of Weinstein's thesis. In fact, I don't think it would be of much help in the analysis of another group of anti-Copernican arguments. These were the astronomical observational arguments. The argument from the earth-heaven dichotomy claimed that the earth cannot revolve around the sun because, if it did, it would be a heavenly body, and so the physical properties of terrestrial and heavenly bodies would be essentially identical; but they are not. The argument from Venus's phases claimed that the earth could not move around the sun because, if it did, the relative positions of sun, Venus, and the earth would change in such a way that Venus would exhibit phases in the course of a year; but no phases of Venus were observable. The argument from the appearance of Mars claimed that the earth cannot be the third planet orbiting the sun because, if it were, then the distance between it and the fourth planet Mars would change by a factor of about eight as they both revolved around the sun at different rates; thus, as seen from the earth, Mars should exhibit corresponding changes in apparent brightness and size; but these were not observed. And the argument from the apparent position of fixed stars claimed that the earth cannot revolve around the sun because, if it did, then in the course of a year (for example, at six-month intervals) terrestrial observers would be looking at any one fixed star from a very different location, and so its apparent position should exhibit an annual variation; but no such variation was observed, and thus the earth could not be in motion.

Galileo's criticism of these arguments was that, with the telescope, one could observe the phenomena that resulted from the earth's heliocentric revolution: physical similarities between terrestrial and heavenly bodies, phases of Venus, and significant variations in the apparent size of Mars. For these arguments, he did not have to examine their warrants and presuppositions; he simply refuted their respective minor premises, which is what telescopic observation enabled him to do. To be sure, for the argument from the apparent position of fixed stars, even his telescope did not reveal any annual variation; and this situation actually forced him to examine the warrants and presuppositions of this arguments. However, the elaboration of such qualifications is beyond the scope of the present commentary (but cf. Finocchiaro, 2014, pp. 167-209; 2019, pp. 77-92, 137-44).

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