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Scientific Realism and Anti-Realism in Martin Heidegger's Philosophy of Science

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Realism and Anti-Realism in Martin Heidegger's Philosophy of Science

Abstract:
This project will explore the realist/anti-realist debate in the philosophy of science using the writings of Martin Heidegger and current Heidegger scholarship. The realist/anti-realist debate essentially focuses on whether the account science gives of the world amounts to truth or not. Different scholars place Heidegger on either side of the debate, and all have good reasons for doing so. My project, then, will take these positions into account as it attempts to render an original interpretation of Heidegger's position within the realist/anti-realist debate. In particular, this paper will present my interpretation of Martin Heidegger's view of truth as placing him between a strictly realist and anti-realist view of scientific truth before going on to show how adopting Heidegger's unique perspective allows us to avoid some of the problems associated with taking either realism or anti-realism by itself.

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Scientific Realism and Anti-Realism in Martin Heidegger's Philosophy of Science

The philosophy of science attempts to understand the meaning of truth in science. It tackles questions regarding how we should view scientific theory and practice: are theories the absolute truth of reality or are they simply useful models that help us manipulate and make sense of the world? Early twentieth-century German philosopher Martin Heidegger offers a rich and detailed account of truth in general and also seems to present insights into the nature of scientific truth in particular in his monumental work *Being and Time*. In this paper, I intend to set up one of the fundamental debates in philosophy of science regarding the nature of scientific truth: the realist perspective on truth and the anti-realist view of truth. After giving arguments against taking either of these viewpoints individually, I will present my interpretation of Martin Heidegger's view of truth as placing him between a strictly realist or anti-realist view of scientific truth before going on to show how adopting Heidegger's unique perspective allows us to avoid some of the problems associated with taking either realism or anti-realism by itself.

In the philosophy of science, two approaches are taken to answering the question of scientific truth: realism and anti-realism[1]. Realism regards scientific theories as providing an account that corresponds to objective reality, that is, the entities described in a particular model are supposed to exist in the world precisely as (or at least similarly to how) they are modeled by the theory. Another way to understand what objective reality means for the realist is that it is the way the world exists, or would exist, even if we were not here to model it. Moreover, the realist assumes that we have access to objective reality; otherwise our models could not correspond to what is real. Anti-realism, on the other hand, suggests that scientific theories simply model apparent phenomena to help us interact with the world but that the entities described by such theories do not necessarily exist as they are modeled by the theory. In other words, for the anti-realist, the sorts of statements that are true have to do with how the world appears to humans, not with an objective reality to which, according to the anti-realist, humans might not have access. A useful example to help illustrate and analyze the distinction between scientific realism and anti-realism involves considering two models of the atom.

The first model is the familiar picture of the atom, the Bohr model of the atom. The Bohr model depicts an atom as a dense central cluster of protons and neutrons around which electrons rotate in definite orbits at definite distances away from the center. All of the subatomic particles described exist as definite, orb-like, physical entities. Each particle is assigned a charge of positive, neutral

[1] For a more detailed introduction to scientific realism and anti-realism, see Peter Kosso's *Reading the Book of Nature: An Introduction to the Philosophy of Science*.

or negative, and these properties help us determine how the atom interacts with other atoms.

The second atomic model is that proposed by quantum mechanics, and which focuses upon Heisenberg's uncertainty principle. According to quantum mechanics, electrons are not simple, orb-like particles, but complex, difficult to imagine entities that exhibit both particle-like and wave-like behavior. Micro-phenomena such as protons, neutrons and electrons exist as matter waves with positions described in probabilistic terms by the uncertainty principle.

Both of these models, the Bohr model and the quantum model, are taught to high-school and college students, and both of them are useful in making predictions about the world. We might then ask ourselves: which model is true? The answer from a scientific realist's point of view is that whichever model corresponds to objective reality is true—so, if atoms are objectively little orb-like entities with definite positions, then the Bohr model would be correct. From an anti-realist perspective, either or both models might be considered true or untrue. As long as there are reasons for considering either model to be true, then that model is true to a certain extent for the anti-realist, regardless of whether or not it corresponds to some 'objective' reality. Indeed, the anti-realist's reality, being based on phenomena as apparent to humans, cannot be seen as purely objective, and so neither is truth.

However, certain problems plague both realism and anti-realism, making it difficult to use either model as a way of understanding scientific truth. For realism, these problems include issues with the correspondence picture of truth

and a problem called the ‘pessimistic induction’ regarding the plausibility of the scientific endeavor for realists, in which truth may be ultimately unattainable. There are problems with anti-realism as well, such as the ‘no miracles’ argument, which suggests that it would be absurd if science works as well as it does without truth being correspondence between model and reality, in opposition to the anti-realist denial of truth as correspondence. Ultimately, I will respond to these problems in terms of Martin Heidegger’s view of truth, but first we must understand these problems in detail.

The model of truth as correspondence in scientific realism runs into two major problems. The first problem is that human observations cannot possibly lead to objective truth. Part of this problem lies in the idea of getting a determinate and precise picture of reality (which I argue that realism attempts) out of science’s current probabilistic and uncertain model of quantum effects. Realism assumes a determinate picture of reality because it needs reality to exist as such in order for there to be objective truth. By determinate picture of reality I mean that for a realist, reality must exist as a series of definitely and explicitly quantifiable states. In other words, for any given instant in the universe, there is only one right answer to a given question. Only if reality exists in this way is it possible to have an objective reality to which human observations can correspond. Otherwise, if reality does not exist in a determinate fashion, then the entities described by science might be themselves indeterminate. We cannot have objective truth regarding indeterminate entities because if something is truly indeterminate, then its state of existence cannot be explicitly and definitely

quantified and there would be no single right answer to questions regarding that entity's existence. However, quantum mechanics, the model almost unanimously espoused by the current practicing scientific community, posits the existence of entities which are indeterminate. For example, the uncertainty principle in quantum mechanics suggests that the position and momentum of a given subatomic particle is inherently uncertain. This uncertainty is not due to mere imprecise measurement; the entities themselves are described as indeterminate. Thus, there is no objective reality to appeal to in order to find out where these subatomic particles 'really' are. The particles are in no precise location and so there is no single, objective answer to which the truth can correspond. The realist might try to respond to this claim by arguing that these subatomic particles are then objectively uncertain. At that point though, the realist has already lost realism because the realist has admitted that sometimes the single, objective answer to a question might involve several possible answers co-existing at the same time, which does not seem like a definite and singular answer at all.

The other part of the problem with truth as correspondence lies in the fact that humans interfere with and become part of any system that they observe, which renders the information gained through such observation un-objective. Although realists claim that science gives rise to truths that correspond to objective reality, 'objective' effectively means what reality is like as a set of bare facts without any theoretical foregrounding whatsoever. In other words, the facts of the world are always the facts of the world, whether someone is theorizing about them or based on them or not. However, scientific observations by humans

are always made with theoretical foregrounding. For example, when a scientist looks at a sheet of paper with a set of strange curved lines on it and points to one of those lines and says, “that’s an atom,” the scientist views that data through a particular theory which allows that data to be interpreted as an atom. But theory is not the only way in which we become part of and interfere with the systems we observe. The physical act of measurement can often have quite an effect upon the realist’s supposedly objective truth. When scientists measure something, they interfere with it in some way, which means that scientists never measure a phenomenon itself; they measure the phenomena as modified by the measurement. Most of these measurement effects would be trivial, potentially modifying the quantitative measurement by several orders of magnitude lower than the quantity itself. For example, to measure the force of a thrown baseball, a scientist would need to know the baseball’s mass and acceleration. Measuring the acceleration of the ball means knowing how fast the ball is traveling over time. To get such measurements, the scientist might use some sort of radar device. Radar works, in basic terms, by sending out a radio wave of known frequency that bounces off of an object and returns with an altered frequency, from which can be calculated the speed of the object. However, electromagnetic waves such as radio waves also exert a force when they come into contact with objects. This force, having a magnitude, however small, will affect the speed of the ball, which in turn will affect the measurement of the ball’s force. Certainly, there may be no practical difference in the force of the ball due to the radio wave used to measure its speed, but that is not the point—the realist wants science to

describe objective reality, and if we affect the objects we measure in the act of measurement, then those measurements cannot be purely objective.

The second major problem with scientific realism examined here is the pessimistic induction. The pessimistic induction effectively objects to scientific realism on the ground that historically, scientific theories have only ever been proved wrong. Therefore, the current set of scientific theories, held as the truth by the scientific community, will likely be proved wrong in the future. Consider the popular scientific theory of the 1700's that explained the processes of burning and rusting, phlogiston theory. Phlogiston was proposed as a substance in various objects that either leaves (during burning) or is taken into an object under certain conditions (such as the formation of rust upon iron in a moist environment). Eventually, this theory is discarded in favor of modern chemistry, which describes burning and rusting as certain instances of a broad type of chemical reaction called 'reduction-oxidation' or 'redox' reactions. The pessimistic induction asks the question: how can we guarantee that modern chemistry will not be discarded in the future in favor of some other theory? In other words, scientific realism suggests that science's account of the world is correct and corresponds to objective reality, but the pessimistic induction suggests that science never actually knows when it corresponds to objective reality. To be certain, proponents of phlogiston theory doubtlessly felt that they had reached the objective truth of the world in the same way that modern chemists are certain that chemistry models objective reality. Despite such certainty on the part of the scientists, the pessimistic induction calls into question

the idea of science knowing whether or not its account of the world actually corresponds to objective reality.

By now, the case seems heavily stacked against scientific realism but anti-realism is not without problems as well. In particular, the “no miracles argument” makes an anti-realist approach to scientific truth seem problematic. This argument against anti-realism asks us to consider the great success of science in allowing us to manipulate, control and predict the world. In the face of the incredible degree to which these tasks are possible for science, it would seem absurd to say that the world does not exist as these theories describe. For instance, asserting that science’s model of atoms and quantum effects does not correspond to objective reality in the face of say, the detonation of a hydrogen bomb, would require us to believe that something akin to a miracle takes place when the bomb explodes. After all, if atomic theory does not correspond exactly to how things exist, then saying that a group of people put together a contraption that somehow explodes with the force of more than a million pounds of dynamite seems to require miraculous luck. And if the same thing happens twice, this seems even more miraculous unless, of course, one assumes that the entities described by atomic theory exist as described in the world. Scientific realism, which proposes just such correspondence between scientific theory and the facts of the world, makes perfect sense of why science works so well even when producing incredible effects.

In addition to the realist and anti-realist perspectives on the matter of scientific truth regarding the model of the atom, it is also important to

acknowledge that the current community of practicing scientists would almost unanimously agree that the quantum model is ultimately true or at least superior to the Bohr model. Whichever conclusion is reached regarding the debate between realism and anti-realism, it should be able to account for this support of quantum mechanics within the scientific community. I argue that Martin Heidegger's account of truth in *Being and Time* easily accounts for this attitude within the scientific community, as his account describes truth as an endeavor of human communities in which truth is created based upon the shared beliefs and practices of the community. However, I will also argue that for Heidegger, while truth might be made by humans, it is not 'made up' by humans, a reading of Heidegger supported by scholar John Haugeland. I will show also that Heidegger's model of truth places him between a strictly realist or anti-realist viewpoint, and that this unique position allows him to avoid many of the problems associated with either viewpoint taken on its own.

The fundamental analysis of truth in *Being and Time* occurs in chapter 44, "Dasein, Disclosedness and Truth." In this chapter, Heidegger begins with a discussion of what he considers to be the way "truth has been traditionally taken and the way it is supposed to have been first defined," and this discussion quickly establishes for us that Heidegger cannot be strictly a realist (257). Heidegger sees that traditionally, "the essence of truth lies in the 'agreement' of the judgment with its object" (257). In other words, the traditional model of truth for Heidegger is truth as correspondence, or realism. Heidegger goes on to dismiss

truth as correspondence, or "agreement," as a conception that is "very general and empty" (258). Instead of truth as correspondence, Heidegger suggests that:

> To say that an assertion "*is true*" signifies that it uncovers the entity as it is in itself. Such an assertion asserts, points out, 'lets' the entity 'be seen' in its uncoveredness. The *Being-true* (*truth*) of the assertion must be understood as *Being-uncovering*. (261)

It is important to understand that Heidegger's use of 'entity as it is in itself' here is not the same as entities-in-themselves as thought in terms of objective reality. Rather, the entity is thought in terms of "the 'how' of its uncoveredness," that is, how the being of the entity is disclosed to Dasein, the particular kind of being that humans have and are[2] (261). For Heidegger, entities are understood by Dasein in terms of their involvements, given in an "earlier analysis of the worldhood of the world and of entities within-the-world," which shows that "the uncoveredness of entities within-the-world is *grounded* in the world's disclosedness" (263). In order to understand Heidegger's full conception of truth in chapter 44, then, we must understand Heidegger's analysis of the worldhood of the world and entities within-the-world, given in chapter 18 of *Being and Time*.

In chapter 18 of *Being and Time*, "Involvement and Significance; the Worldhood of the World," Heidegger describes how humans come to understand

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[2] Certainly, Heidegger gives a very complex treatment of the existence of Dasein in *Being and Time*. For the purposes of this essay, however, it will be sufficient to think of Dasein simply as a human being without too much of the nuance that Heidegger includes in his discussion, save for the aspect of Dasein which is important for understanding Heidegger's description of truth. Namely, that Dasein, humans beings, cannot be thought simply as 'subjects' separated from the 'objects' in the world. Instead, Dasein can best be thought of as the way in which humans exist as part of (as opposed to separate from) the world, which is in their interactions with the world and entities within-the-world, by which the world and the entities within it are disclosed to Dasein. For a more detailed view of Dasein, see *Being and Time*, Part I.

and disclose the entities within the world in terms of their uses and involvements. This picture of human understanding of the world can be explained throught the explication of the following passage from chapter 18:

> The “wherein” of an act of understanding which assigns or refers itself, is that for which one lets entities be encountered in the kind of Being that belongs to involvements; and this “wherein” is the phenomenon of the world. (119)

So, the ‘worldhood’ of the world is that it is the setting in which acts of understanding occur. Understanding, in turn, comes from humans letting entities be encountered in that world, which has to do with the involvements of those entities. The being of entities is the totality of their involvements; how we project the possibilities of use for those entities is how those entities, and thus the world, is disclosed to us. When we understand this totality of involvements, entities become ‘ready-to-hand’ within the world, that is, they can actually be encountered as entities with understood uses. To better understand how this works in a more concrete sense, it is useful to think of Heidegger’s example of how a hammer is encountered as an entity. We encounter things like hammers in the world only insofar as we understand their uses and involvements with other practices. When we see a hammer, we know that it is used for nailing and removing nails, is often found in toolboxes, is used for woodworking, etc. Without those involvements, the hammer would not be encountered as a hammer; it would be effectively a meaningless lump of matter. Notice, though, that humans are letting this sort of encounter happen, that is, encountering entities in this way

is only possible because of human action in the world. We are the condition of any like an 'involvement' being possible. Otherwise, everything would simply be insignificant lumps of matter. As humans interact with the world and make entities ready-to-hand in the world by understanding the involvements of those entities in human practices, the world is disclosed to them.

So, now with an understanding of what Heidegger means by the disclosure of the world, we can understand how for Heidegger, truth is found in this disclosure, or uncovering, of the world as detailed in chapter 44. Heidegger writes that "'Being-true' ('truth') means Being-uncovering," (262). To make sense of this definition of truth, we must remember that "the uncoveredness of entities within-the-world is *grounded* in the world's disclosedness" (263). In other words, truth is found in how we disclose entities to ourselves in the world, or how we understand them. In Heidegger's language, disclosure occurs "in the projecting of the understanding," in which "entities are disclosed in their possibility" (192). To put it briefly, then, truth is given in how we project the possibilities of the entities around us in the world, which always has to do with how we interact with those entities. Recalling the earlier example of projecting the entity of the hammer, we can understand the truth of the hammer's being as the understanding of the involvements of the hammer as disclosed to us in the world. To rephrase, what is true of the hammer, what the hammer itself *is*, is its involvements in the world, which means its involvements in human practices.

It is important to recognize, though, that this conception of truth means that truth is both a product of and a part of human practice in the world and not

merely some sort of abstract idea. Heidegger writes that “truth (uncoveredness) is something that must always first be wrested from entities” (265). This is similar to the way in which humans ‘let’ entities be encountered in the world, but emphasizes more strongly that truth, the disclosure of entities, occurs through human practices and as such is created by human practices. Without human practices, there would be no disclosure of the world or the entities within it and thus no truth:

> ’There is’ truth only in so far as Dasein is and so long as Dasein is. Entities are uncovered only when Dasein is; and only as long as Dasein is, are they disclosed…Before there was any Dasein, there was no truth; nor will there be any after Dasein is no more. For in such a case truth as disclosedness, uncovering, and uncoveredness, cannot be. (269)

Again, this ties Dasein, human existence as an entity that discloses and uncovers the world to itself, to the production of truth. Truth is not an absolute in objective reality that we find; truth is made by human interaction in the world.

Moreover, truth is not made through a single human’s interaction with the world: truth-making is a community endeavor for Heidegger. The “Self of everyday Dasein is the *they-self*…as they-self, the particular Dasein has been *dispersed* in the ‘they’” (167). In other words, the way Heidegger sees humans as existing on a day-to-day basis in the world is in the mode of acting as an ‘average’ member of a community, the ‘they.’ The they-self, then, is Dasein acting in just this manner, according to a set of beliefs and practices shared by an entire group of persons. So, when an entity is disclosed and understood as

the totality of its involvements, these involvements are always determined by the shared beliefs and practices of a community. Such disclosure can be seen, for example, in the act of teaching and learning. We do not as children simply figure everything out and build the world for ourselves from the ground up; we are taught involvements and uses of entities which through the process become ready-to-hand. We effectively learn the truth of the world as it has been made and continues to be made through the practices of the they-self. Of course, the they-self can be influenced by actions of individuals discovering new ways to disclose entities that increase the totality of such entities' involvements, but the ultimate arbiter of truth seems to be the being of the they-self as it acts in the world. Thus, truth in Heidegger becomes something tied to the practices and beliefs of a community, meaning that communities effectively create truth. Indeed, when Heidegger applies these ideas of truth to the practice of science, the central community for determining the truth in science is, of course, the community of practicing scientists.

Now understanding the general picture of truth in Heidegger, we can move on to the particular way that he describes science in relation to this model of truth in chapter 69 of *Being and Time*. Heidegger claims that what is significant for the rise of mathematical physics, the foundation of modern science, lies in

> *the way in which Nature herself is mathematically projected*. In this projection constantly present-at-hand (matter) is uncovered beforehand, and the horizon is opened so that one may be guided by looking at those

> constitutive items in it which are quantitatively determinable (motion, force, location, and time). (413-14)

We can see in this statement how science effectively sets up its entities, that is, lets them be in such a way as to be able to understand their possibilities and uses. Heidegger's term 'present-at-hand' is used in opposition to ready-to-hand, and basically describes lumps of matter (without the scientific connotations the word normally has) void of involvements. In the 'uncovering beforehand' of such present-at-hand 'matter', science effectively projects matter as the sort of thing that can be understood in quantitative terms. Indeed, Heidegger continues: "Only in the light of a Nature which has been projected in this fashion can anything like a 'fact' be found and set up for an experiment regulated and delimited in terms of this projection" (414). Again, here Heidegger suggests that only if Nature is projected or set up as an entity that can be disclosed in quantitative terms can something like data, facts, be gathered and analyzed. Thus, "the 'grounding' of factual science' was possible only because the researchers understood that in principle there are no 'bare facts'" (414). The preceding statement is significant for two reasons. First, it reinforces the idea that truth for Heidegger is not correspondence: there are no objective, bare facts to which our account of truth can correspond. Again, Heidegger makes it clear here that he is not a realist by suggesting that facts can only be discovered when the world is projected by humans in such a way as to make discovering facts possible. However, the second significance of the last passage is that by using the word 'researchers,' Heidegger implies that it is the community of scientists that is responsible for the

scientific projection of nature. Thus, similar to Heidegger's general account of truth, scientific truth becomes a fabrication of the community that is occasionally added to but mostly just sustained through normal scientific activity. While the basic tenets of the scientific projection of nature are taught and propagated by the community on a day-to-day basis, significant additions to scientific truth are relatively rare. Nonetheless, the body of accepted scientific truths continues to grow, and does so as truths are made and accepted within the scientific community based on its practices.

So, regarding the question of which atomic model, Bohr's or Heisenberg's, is correct according to Heidegger: the answer should be that both models are true, or rather, disclose truth. Both models disclose truth through projecting the possibilities of the way an atom can be encountered in the world. Bohr's model allows us to determine, for example, the ways that atoms can bond with one another. Heisenberg's model helps us figure out where an electron might be found with respect to an atom's nucleus. Each model makes predictions that can be confirmed by actual experiments in the real world, so each model is used by the scientific community to a certain extent. Each model is propagated by the scientific community as well: recall that both are still taught at the high-school and college levels. So, both models appear to be true for Heidegger. Moreover, this makes sense regarding the scientific community's greater insistence on the quantum model over the Bohr model. While the Bohr model may be useful for some ways of projecting the being of an atom and is thus still sometimes treated as true, the quantum model is valued more highly within the practices of the

community and therefore is the theory regarded as ‘the truth’ by that community. Is Heidegger, then, an anti-realist, suggesting that truth is only determined by the community and nothing else? The worry may arise that the community is then simply free to make the truth up in whatever fashion is convenient. This worry arises for Heidegger as well when he writes, “all truth is relative to Dasein’s Being. Does this relativity signify that all truth is ‘subjective’?” (270). The answer to this question from Heidegger scholar John Haugeland’s perspective is that truth is not simply manufactured by the community alone, but that the truth, while created, is also always tied to entities in the world. As this claim is explored, certain realist elements in Heidegger’s philosophy will emerge so we can see that Heidegger is not strictly an anti-realist.

Haugeland suggests that Heidegger is not simply an anti-realist since in Heidegger’s model, though humans make truth, humans do not get to ‘make up’ the truth: scientific truth and the entities described by it are bound to the world as we encounter it in its effects. In “Truth and Finitude,” Haugeland writes that “disclosure itself…is *beholden* for its ‘success’ to those very entities as discovered—entities that are independent of it in the concrete and inescapable sense that they are *out of control*” (76). Here, Haugeland emphasizes that even though in the act of disclosure we project entities in a certain way that allows us to understand them and which therefore creates those entities for us, we do not, in the act of disclosure, make up the concrete effects which serve as the basis of our projection. Effects as they are encountered limit the ways in which we can project the entities we hold as responsible for those effects; we are thus limited in

our projections of entities in the world by the effects that arise from those entities in the world. For example, we do not project the possibilities of our hands as something that can by themselves, say, bend a thick beam of steel because the way we encounter things like hands and steel in the world reveals to us that such a projection is impossible. The effect of a hand exerting a force by itself is not something that can rip through a steel wall, and so our projection is limited. Heidegger says something similar to this in *Being and Time* when attempting to answer his own question of whether truth is subjective or not: "If one Interprets 'subjective' as 'left to the subject's discretion', then it certainly does not. For uncovering…takes asserting out of the province of 'subjective' discretion" (270). Meaningful assertion and truth-making are not simply left up to the will or imagination of an individual making the assertion about an entity in the world. Truth-making is an action of human communities interacting with the world, so that truth is made through agreement within a community which is, in turn, tied to its encounters with the world which it does not control. Making truth in Heidegger does not equate to making the effects we experience in the world, but instead means creating the ways in which the world and our experience in it are understood. In this way, an element of realism enters into Heidegger's otherwise anti-realist account of truth, since humans are both inextricably involved in the creation of truth about the world yet are also not in control of the effects by which the world is encountered and subsequently projected.

So, we can understand Heidegger's model of scientific truth as occupying a unique position between strict realism and anti-realism[3]. Scientific truth, in Heidegger's largely anti-realist sense, is the result of communities' shared beliefs and practices in the way that communities project the possibilities of entities in the world and disclose the world to themselves. However, while this means that there is nothing like a 'bare fact,' since we always project what constitutes a fact beforehand, we do not simply get to make up whatever we want. Our projections and assertions about entities in the world are always limited by our experience of the effects in the world, which adds a certain degree of realism to Heidegger's picture of scientific truth. As indicated earlier, Heidegger's picture of scientific truth is especially attractive because it allows us to avoid problems with and arguments made against purely realist or anti-realist perspectives in the philosophy of science.

Heidegger can respond to the claims against scientific realism, such as the argument against truth as correspondence and the pessimistic induction. The problems with truth as correspondence set up earlier, such as the indeterminate nature of certain entities as projected by science and the interference of observers in observations, can be rather straightforwardly answered by the alternate picture of truth set up by Heidegger. The indeterminate quality of certain entities in quantum physics, for Heidegger, is not a strange failure of an entity to correspond with what should be an objective and

[3] It would be remiss to not mention that Heidegger scholar Trish Glazebrook, in her book *Heidegger's Philosophy of Science*, reaches a similar conclusion: "Heidegger treads a middle ground within the realist/anti-realist debate" (71). However, her argumentation has a somewhat different and broader, more historical focus than the one presented in this paper, making it unnecessary to expound upon her discussion of Heidegger for the purposes of this work.

definite reality, but instead can simply be thought of as the way those entities are projected in their being. The indeterminate state of say, an electron, is how we project the ways for that entity to be. If the projection does not answer to a determinate state of affairs called ‘objective reality,’ there is no problem for Heidegger; that is the way the scientific community has set up the electron. Indeed, the other problem for the correspondence model of truth, observer interference with truth, is not a problem for Heidegger’s model of truth. Rather, observer interference *is* Heidegger’s model of truth. Heidegger fully understands how humans participate in the creation of truth. So, rather than trying to somehow reason how objective truth can be obtained from human practices, Heidegger instead bases his view of truth in those human practices.

Heidegger overcomes the pessimistic induction against scientific truth with the understanding that truth only exists insofar as Dasein, the particular way humans exist in the world, exists. Recall from earlier that “For Heidegger, truth is a decidedly human endeavor. Without humans, there would be no truth; the presence of a human endeavor to create truth is what makes truth possible in the first place. Thus, human communities are also the final arbiters of when a particular projection of nature, such as a scientific theory, no longer discloses truth about the world. The rise and fall of theories accords to their use by the scientific community, and so the pessimistic induction effectively becomes the natural development of truth in human practice. When one theoretical viewpoint gains popularity, it becomes the truth-disclosing projection for the community. When something else more appealing comes along, the old viewpoint may be

abandoned as a less effective means of understanding the world. The pessimistic induction therefore becomes far less pessimistic in Heidegger. Instead of showing how obtaining objective truth is unrealistic, the induction shows just that structure by which Heidegger argues ways of disclosing the world through science come about and eventually get replaced. There is no ultimate truth towards which the practice of science directs itself and seems historically to fail. The scientific community simply seeks to disclose the world in the best way it can for its particular set of practices and beliefs.

Heidegger's system also nicely fends off the 'no miracles' argument against anti-realism because our understanding of entities is always anchored in how we use them, meaning that we master the ways in which the world can be manipulated. Because the truths that we assert about entities are always developed on the basis of practice, we can of course create truths that do not correspond to 'objective reality' but that nonetheless can be used to interact with and manipulate the world. The element of realism added by Haugeland's discussion of Heidegger helps out against the 'no miracles' argument as well. When we project the being of entities in the world, it is on the basis of the effects we observe and interact with in the world. It is these effects we interact with to which our projections of entities are beholden, and in learning to interact with these effects, the entities as they present themselves to us both through their physical effects upon us and in our way of projecting them, we can learn to manipulate them. Regardless of whether or not anything like an atom exists objectively, through our mastery of the effects of what the current community

projects as atoms we have learned to create certain pieces of technology (such as the hydrogen bomb) that utilize our understanding of these effects.

Ultimately, Heidegger's particular view of scientific truth, in straddling the border between realism and anti-realism, allows us to avoid problems with either view of scientific truth taken individually. Heidegger's rich treatment of human truth-making practices paves the way for a deeper understanding of truth and meaning in the world. Using Heidegger we can understand how, contrary to many formulations of what constitutes truth in the past, truth is made and influenced by human practices and beliefs. As we have seen, though, Heidegger certainly does not believe that humans just get to 'make up' the truth either. Rather, truth—especially in the scientific sense—is a complex product of the interaction between the effects of the world upon humans and the human response to and interpretation of those effects that becomes a projection that can be used to understand the world of possibilities in which we find ourselves.

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