World and *Paradigm* in Heidegger and Kuhn*

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Abstract

The aim of this article is to compare Heidegger's philosophy of science with that of Thomas Kuhn. This comparison has two objectives: 1) to use Kuhn's conceptual arsenal to make Heidegger's position clearer; and 2) to show that Heidegger's and Kuhn's positions are not as different as might be expected. Consequently, I may suggest that these philosophies can be compatible. I will show that while there are differences, also there are many continuities. I will address three issues: 1) the differences and similarities between Kuhn's notion of the paradigm and Heidegger's notion of the world; 2) the analogous concepts of «normal science» and «calculating thought»; and 3) the source of intelligibility in both authors. The main difference between the two thinkers, I believe, lies therein.

Keywords

Science, Paradigm, World, Being, Thinking.

Mundo y *paradigma* en Heidegger y Kuhn

Resumen

Mi objetivo en este artículo es comparar la filosofía de la ciencia de Heidegger con la de Thomas Kuhn. Con esta comparación quiero perseguir dos objetivos: 1) usar el arsenal conceptual de Kuhn para hacer más clara la posición de Heidegger; y 2) mostrar que las posiciones de Heidegger y Kuhn no son tan diferentes como cabría esperar. Por lo tanto,

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sugeriré que estas filosofías pueden ser compatibles. Mostraré que si bien hay diferencias, también hay muchas continuidades. Abordaré tres cuestiones: 1) las diferencias y similitudes entre la noción de paradigma de Kuhn y la noción de mundo de Heidegger; 2) los conceptos análogos de «ciencia normal» y «pensamiento calculador»; y 3) la fuente de inteligibilidad en ambos autores. Aquí, creo, es donde radica la principal diferencia entre ambos pensadores.

Palabras clave
Ciencia, paradigma, mundo, ser, pensamiento.

1. Introduction

Both in his lecture *Science and Reflection* and in his course *What is called thinking*, Heidegger made the controversial claim that «science does not think», which, for many, turns him into an enemy of science. Mario Bunge, for instance, affirms:

> [Heidegger] was a crafty man who took advantage of the German academic tradition for which the incomprehensible is profound. And, of course, he adopted irrationalism and attacked science because the more stupid people are, the better one can manipulate them from above[1].

Bunge, a physicist and philosopher of science, accused Heidegger of being incomprehensible, irrational and of attacking science, following the tradition started with Carnap's critique to Heidegger's philosophy[2], in which the German philosopher is not welcomed in analytic circles[3]. Like an uninvited guest to a party, Heidegger is looked at with suspicion. Cyril Welch even declares that Heidegger sees «in science and technology something of the devil's work»[4]. For Welch, his philosophy is nothing but empty words that resemble a false mysticism. The main critique against Heidegger's arguments is their lack of rigor and clarity. This is, in a way, true. Heidegger is certainly not an easy author to read. Nonetheless, that was indeed his intention: to create a new language for philosophy that would make readers to abandon the old metaphysical concepts that dominated philosophy throughout history. Thus, Heidegger's work requires tiresome labor and interpretation.

The aim of this paper is to make a comparison between Heidegger's philosophy of science and Thomas Kuhn's, attempting to bring worlds apart together. With this comparison, I want to pursue two goals: 1) using Kuhn's arsenal of conceptual tools, I want to make

[1] Ignacio Vidal-Folch, «Entrevista a Mario Bunge: Las frases de Heidegger son las propias de un esquizofrénico», *Revista de Pedagogía* 84, Vol. 29 (2008): 188.
[2] See Rudolf Carnap, «The elimination of metaphysics through logical analysis on language», in *Logical positivism*, ed. Alfred Ayer (London: Allen & Unwin, 1959), 60-81.
[3] This prejudice on the philosophy of the German thinker lasted until not long ago among analytical philosophers. But academics such as Hubert Dreyfus, Mark Okrent, Martk Wrathall, Taylor Carman, Thomas Sheehan, Graham Harman, among others, have, in some way, helped to vindicate Heidegger's perception in the analytical world.
[4] Cyril Welch, «Review of The Anatomy of Disillusion: Martin Heidegger's Notion of Truth by W. B. Macomber», *Man and World* 3 (1970): 135-146.

Heidegger's position appear in a clearer fashion; and 2) to show that Heidegger's and Kuhn's positions are not so different as one might expect. My hypothesis is that both philosophies, even with their differences, are compatible and, therefore, this compatibility makes Heidegger not an enemy of science.

I will bring forth some comparisons between *The Structure of Scientific Revolutions* (1962) and *Being and Time* (1927), though I will focus mainly on Heidegger's later philosophy, specifically where he explicitly deals with the problem of science. I will first analyze Kuhn's notion of *paradigm* and show how this notion can complement Heidegger's concept of *world* (*Welt*). Second, I will compare Kuhn's concept of *normal science* and Heidegger's *calculating thinking*. With this comparison I will show how, both for Kuhn and Heidegger, scientists perform their activities within a paradigm/world respectively. Furthermore, this comparison will help me to elucidate Heidegger's claim that «science does not think». Finally, I will analyze what is the source of intelligibility according to each author, i.e. how paradigms/worlds are founded. Here, I believe, is where the main difference between both thinkers lays.

2. The notion of paradigm

One of the key concepts to understand Thomas Kuhn's work is the notion of «paradigm», which expresses several not exclusive different meanings (Margaret Masterman counted over twenty one different senses of «paradigm»)[5]. The definition that best summarizes the notion of paradigm is the following: «These [paradigm] I take to be universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners»[6]. In short, a paradigm is the set of fundamental theoretical assumptions that all members of a scientific community accept. A paradigm, however, does not only consist in theoretical assumptions, since it also involves the shared beliefs and values that unite a scientific community. «[No] scientific group could practice its trade without some set of received beliefs»[7]. The paradigm, thus, is what allows scientists to do their work, to measure, to calculate, to experiment. The paradigm involves a set of problems and models of solutions, and supplies «the conceptual and instrumental tools»[8] with which scientists work. In this sense, a paradigm forms a worldview that guides research, dictating what doing science means. A paradigm is the lens through which scientists observe reality.

Heidegger has a similar idea, albeit at an ontological level, due to which some authors[9] suggest his theory can complement Kuhn's and *vice versa*. On the one hand, Heidegger does

[5] Margaret Masterman, «The Nature of a Paradigm», in Criticism and the Growth of Knowledge, ed. Imre Lakatos, Alan Musgrave (Cambridge: Cambridge University Press, 1970), 63-65.
[6] Thomas Kuhn, *The Structure of the Scientific Revolution* (Chicago: University of Chicago Press, 1970), x.
[7] Thomas Kuhn, *The Structure of the Scientific Revolution*, 4.
[8] Thomas Kuhn, *The Structure of the Scientific Revolution*, 37.
[9] See Joseph Rouse, «Kuhn, Heidegger, and scientific realism», *Man and World* 3, Vol. 14 (1981): 269-290: «the fundamental theses of Kuhn's analysis can be generated from the more general ontological investigations in Heidegger's Sein und Zeit», 270; Breat Dean Robbins, «A reading of Kuhn in light of Heidegger as a response to Hoeller's critique of Giorgi», *Janus Head* 1, Vol. 1 (1998): 2-35: «Kuhn's Structure, as a center of controversy

not want to make «a problem of the *ontical* history and development of science, of the factical occasions of it, [and] of its proximate goals»[10], but rather an ontological analysis that makes this ontical history of science possible. For Heidegger, this «ontic» dimension refers to the historical and contingent, while the ontological refers to the *a priori* and constitutive. That is, Heidegger is interested in what makes the scientific enterprise possible, i.e. the conditions of possibility of the scientific research. On the other hand, Kuhn describes the ontical historical process of this particular human activity. His aim is to «determine by what man and at what point in time each contemporary scientific fact, law, and theory was discovered or invented»[11]. That is, Kuhn is interested in how the scientific enterprise is historically possible. In this way Heidegger provides the ontological-philosophical base for Kuhn's analysis, while Kuhn develops Heidegger's position historically.

To understand Heidegger's position with regards to science one must bear in mind that there is a set of concepts that are closely related in Heidegger's philosophy, for instance: world (*Welt*), truth (*Wahrheit*), clearing (*Lichtung*), meaning (*Sinn*). «Being» (*Sein*) for Heidegger is «meaning» (*Sinn*), which refers to the horizons of intelligibility or meaningfulness. Heidegger defines «being» in *Being and Time* as: «that which determines being as being, that in terms of which [*woraufhin*] beings always been understood»[12]. In order to experience entities (i.e. to contemplate them, but also to deal with them, to use them, etc.), human existence, what Heidegger calls *Dasein,* presupposes a prior understanding of being. This prior understanding does not refer to a conceptual understanding, as if one was first taught as a child what it is to be in order to be able to deal with things. Thus, our actions and our behavior towards entities in everyday life involve an implicit interpretation of them, understanding them a-thematically either as useful –as artifacts–, or as objects of nature, or as objects to be approached theoretically, or, finally, as another *Dasein*.

This not thematized understanding of being precedes the experience of any entity and refers to an *a priori* pre-reflexive interpretation, i.e. a previous horizon, which Heidegger names «meaning» (*Sinn*): «Meaning is that wherein the intelligibility of something maintains itself»[13]; «meaning signifies the upon-which [*Woraufhin*] of the primary project of the understanding of being»[14]. Being is the meaningful framework from which the entity can appear or disclose itself. This «disclosure» is what Heidegger understands as truth, similar to the Greek sense of *ἀλήθεια*, as «unconcealment» (*Unverborgenheit*). Thus, a being *is* when

in contemporary philosophy of science, demonstrates the value of this type of historical inquiry. However, while Kuhn runs the risk of being discounted as an "idealist" and an "irrationalist", Heidegger's thought can provide the foundation upon which to shed light on the crisis of science in our age - which is, in part, aroused by Kuhn's bold project», 2. Furthermore, Trish Glazebrook compares Heidegger's and Kuhn's philosophy in Heidegger's philosophy of science (New York: Fordham University Press, 2000): 15-16, 81-82, 87-88, 101, 208, 244-245): «Thomas Kuhn argues in The Structure of Scientific Revolutions that science works on the basis of paradigms. The latter are much like what Heidegger called "basic concepts" (BT 29/ SZ 9)», 87.

[10] Martin Heidegger, *Being and Time* (New York: SUNY Press, 1996), 326-327.

[11] Thomas Kuhn, *The Structure of the Scientific Revolution*, 2.

[12] Martin Heidegger, *Being and Time*, 4-5.

[13] Martin Heidegger, *Being and Time*, 142.

[14] Martin Heidegger, *Being and Time*, 298.

it shows itself, when it discloses itself in a significant context, which Heidegger calls «world» (*Welt*). The world is what allows beings to appear, it is the opened space of meaning in which beings are revealed.

The difference between meaning (*Sinn*) and world (*Welt*) is ticklish. In *Being and Time* Heidegger seems to identify these two concepts. For instance, he speaks of the «world» «as that for which one lets beings be encountered (…) is the phenomenon of world»[15]. This definition resembles the definition of «meaning» stated above. Moreover, Heidegger refers both to «meaning» and «world» as that which allows the experience of beings. Thus, the definitions of «being» and «world» seem to be closely related. Furthermore, Heidegger identifies truth (as *ἀλήθεια*) with being and meaning as well: «That is why we also say (p. 230 [of *Being and Time*) that how being is, is to be understood chiefly from its "meaning" [*Sinn*], that is, from the truth of being»[16]. Therefore, there is not only an identification between being and meaning, but also between being and truth. «There is' [*Es gibt*] being – not beings – only insofar as truth is»[17]. Heidegger uses different terms to show several aspects involved in the same process: the manifestation of beings. Thus, *being* is that which allows entities to reveal themselves, in an *unconcealed* manner (*ἀλήθεια*), within a space of *meaning*, i.e. a *world*[18].

The world, or the ontological truth[19], is not the condition of possibility as a transcendental horizon in the Kantian way, but rather it is always a *historical* and *finite* horizon. That is why in the thirties and forties Heidegger speaks about a truth that «eventuates» (*sich ereignen*)[20]. He particularly develops these ideas further in *Contributions to Philosophy: (Of the Event).* To speak about the event of truth supposes that the truth is not a stable structure, but rather that it occurs historically in different structures that make possible the experience of beings. Being (*Sein*) is what «eventuates» and must be understood as «intelligibility» (*Sinn*). If Being «eventuates» (*sich ereignen*), then there are historically different frames of intelligibility that make possible several ways of appearing. In this way, if truth is understood as «unconcealment», it cannot possess the features that were traditionally ascribed to it (such as universality, immutability, necessity, eternity etc.). The fundamental structure of the event (*das Ereigns*) is a clearing (*Lichtung*), a space of intelligibility that is opened historically. As for the temporality of the clearing, Heidegger

[15] Martin Heidegger, *Being and Time*, 80-81.
[16] Martin Heidegger, *Pathmarks* (Cambridge: Cambridge University Press, 1998), 257.
[17] Martin Heidegger, *Being and Time*, 211.
[18] For the role of «meaning» in Heidegger's philosophy see Cristina Lafont, *Heidegger, Language, and World-Disclosure* (Cambridge: Cambridge University Press, 2000), 109-78; Thomas Sheehan, *Making Sense of Heidegger: A Paradigm Shift* (London: Rowman et Littlefield, 2015), 3-28.
[19] Heidegger distinguishes between ontic truth and ontological truth. On one hand, the ontic truth consists on the discoveredness of a concrete entity (Entdecktheit) due to the disclosedness of the Dasein (Erschlossenheit). The ontological truth, on the other hand, is the precedent understanding of being and condition of possibility of the discoveredness of the entity. Ontological truth is what makes intelligibility possible. See Martin Heidegger, *Being and Time*, 196-212.
[20] I follow Richard Rojcewicz and Daniela Vallega-Neu's translation in *Martin Heidegger, Contributions to Philosophy* (Of the Event) (Bloomington: Indiana University Press, 2012).

says: «the open place in the middle of beings, the clearing, is never a fixed stage with a permanently raised curtain on which the play of beings enacts itself. (…) The unconcealment of beings - this is never a state that is merely present but rather a happening»[21]. This happening is always factual and brings new possibilities of intelligibility.

I suggest that this precomprehension, or preintelligibility, that Heidegger calls «world» (*Welt*) or «clearing» (*Lichtung*), could also be called «paradigm». For Kuhn paradigms include theories (their laws, definitions, observations) and the instruments that allow scientists to observe and calculate what the theory predicts. Certainly, Heidegger is not thinking in an exclusively scientific paradigm, but rather in broader terms. The first common feature is how the world-paradigm constitutes the way beings appear to us. In *Being and Time* things appear immediately as equipment (*Zeug*), as something one can use. Something is because it has a meaning for a Dasein and this meaning is pragmatic. For example, I can use a car because this being appears to me in a significant context, i.e. the car is useful to move people from one place to another. A cave dweller, however, would not know what to do with a strange object such as a car, because his or her horizon of comprehension is different. Analogously, for Kuhn the data with which scientists work is never pure; neutrality is an illusion. What scientists observe is conditioned by background beliefs and a large amount of theory. For example, in 1572 a new star appeared that meant, for Copernicans, the refutation of the immutability of the stars supported by the Ptolemaic paradigm. The Ptolemaics, however, argued that it was an effect of the Moon, which was closer to Earth[22]. The same phenomenon was interpreted in two different ways: as a new heavenly object and as an atmospheric effect. Another simpler example: a sunset is interpreted by a Ptolemaic as the movement of the Sun, while for a Copernican it is the movement of the Earth, while for an ancient Egyptian it is the death of the Sun (that dies every night and resurrects every morning). As a conclusion one can say that our perceptions of the phenomena in science for Kuhn and in general for Heidegger[23] are always laden by the content of the paradigm (Heidegger uses the metaphor of the «clearing», *Lichtung*) and, thus, are never neutral.

This position means, hence, that for both Kuhn and Heidegger there is no absolute truth. Truth is always relative to the paradigm or historical framework[24]. This Kuhnian idea, i.e.

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[21] Martin Heidegger, *Off the Beaten Track* (Cambridge: Cambridge University Press, 2002), 30-31.

[22] About this historical discussion see James Lattis, *Between Copernicus and Galileo: Christoph Clavius and the Collapse of Ptolemaic Cosmology* (Chicago: The University of Chicago Press, 1994), 145-160. doi: https://doi.org/10.1163/221058785x01065

[23] But also in science: «The "grounding" of "factical science" was possible only because the researchers understood that in principle there are no bare facts», Martin Heidegger, *Being and Time*, 331.

[24] Herman Philipse, speaking about Heidegger but quite close to Kuhn's ideas, says: «Consequently, we do not have the means of evaluating the frameworks themselves in terms of truth and falsity, nor can we evaluate theories or doctrines belonging to different frameworks in epistemic terms. We cannot say anymore, for instance, that modern physics is epistemically superior to the worldview of the Hopi Indians. To be more precise: we will probably say it, because it characterizes our present framework to think that this is true, but we will not be able to justify such a statement in an objective and framework-neutral manner. Surely this position is full-blown historical relativism», Herman Philipse, *Heidegger's Philosophy of Being. A Critical Interpretation* (Princeton: Princeton University Press,1998), 169. «It implies that no theory in science or mathematics and no philosophical doctrine can be called "true" independently of a specific historical framework

that there are no facts independent of the paradigm, questions the traditional concept of truth. The facts with which science works are always relative to a paradigm, and, if the paradigm changes, the facts will do so. Therefore, Platonic truth (i.e. immutable, eternal, universal, absolute) does not exist. As shown above, Heidegger argues in a similar fashion: when he speaks about truth he speaks about a de-Platonized truth, a historical truth. The following extensive but key passage will make this notion clearer:

> However, then there is really no absolute truth! Of course not. It is time that we cure ourselves of the consternation over this and finally take seriously that we are for the time being still human beings and no gods.
> From the fact that there is no absolute truth for us, however, we may not infer that there is in general no truth for us. By truth, we understand the manifestness of beings, which manifestness fits and bind us into the being of beings—in each case, according to the kind of being of the beings that enter here into manifestness. What for us is true in this sense of truth is quite enough for a human life.
> (…) But now, what about the following thought: If there is for us, as it is, no absolute truth, then at least the statement «There is no absolute truth» must be absolutely true. With this, here is, nevertheless, absolute truth, and the statement «There is no absolute truth» is broken through.
> This inference is a small formal piece of art. However, from the statement «There is no absolute truth», it does not follow that the statement itself is absolutely true; it is true only for us. It is important to put into effect the realization that we stand, admittedly, always in the truth of certain regions and stages[25].

An initial conclusion of this idea is that, if there is no truth, there is no «progress», not in science (Kuhn) and not in history (Heidegger). There is nothing «better» or «truer»[26]. According to the traditional view, science progresses, goes forward, towards the truth. In this stance current theories are better, truer, more objective and reliable than the old theories. Kuhn shows, however, that this conception is not historically true in his chief work *The*

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or fundamental stance. Truth becomes relativized to a totalitarian projected framework», Herman Philipse, *Heidegger's Philosophy of Being. A Critical Interpretation*, 170.

[25] Martin Heidegger, *Logic as the Question Concerning the Essence of Language* (New York: SUNY Press, 2009), 68.

[26] Bearing in mind Heidegger's essay about technology, one might object that there can also be better or worse ways of revealing. The problem with technology, however, is not that it is a negative way of manifesting things: «What is dangerous is not technology. There is no demonry of technology», Martin Heidegger, *The Question Concerning Technology* (New York/London: Garland Publishing, 1977), 28.

It is true that technological advances increase certain risks, but the danger is to forget that the horizon of technology is precisely a horizon. In other words, in the current paradigm in which everything closes, in which everything is interpreted from a cause-effect relationship, this paradigm is presented as an absolute and unique horizon that allows us to interpret entities as what is available for us. In other words, the Enfraiming of technology (Gestell), as Loscerbo puts it, is «blind to itself», i.e. is blind to its own way of un-hiding, it does not recognize that it is just another way of manifesting entities and not the only one. See *John Loscerbo, Being and Technology: A Study in the Philosophy of Martin Heidegger* (The Hague: Nijhoff, 1981), 282. «Where this ordering holds sway, it drives out every other possibility of revealing. Where Enframing holds sway, regulating and securing of the standing-reserve mark all revealing. They no longer even let their own fundamental characteristic appear, namely, this revealing as such», Martin Heidegger, *The Question Concerning Technology*, 27.

Structure of Scientific Revolutions. Facts depend on paradigms and they change when the paradigms change. Nonetheless Kuhn is not saying that science is absolutely irrational: there are certain paradigms that are more suitable at certain times because they provide more rational solutions to certain problems than other frameworks. But there are also subjective elements playing an important role. In short Kuhn tries to show a more realistic picture of the scientific enterprise. During the shift of paradigms, scientists do not choose a new paradigm only for rational reasons: maybe the theory is simpler, or fits better with the data. The criteria of truth and falsity depend on the paradigm. Therefore, it is impossible to judge either an epistemic framework or two theories that depend on different paradigms, as true or false. Heidegger will never agree more:

> A historical reflection will acknowledge that is makes utterly no sense to measure the Aristotelian theory of motion straight-forwardly against the results of the research of Galileo and to judge the former as antiquated, the latter as progressive; for in these two cases nature means something entirely different. (…) From the standpoint of historical reflection, the advanced modern science of nature is not a whit more true than the Greek[27].

Paradigms for Kuhn are incommensurable with one each other, which means that paradigms are absolutely different conceptual frameworks, where there is no commonplace or language, and therefore they cannot coexist at the same time in a scientific community. Although I will not deal with this problem here,[28] I would want to remark that Kuhn also speaks about «worlds» referring to paradigms when he speaks about incommensurability: «Notice now that two groups, the members of which have systematically different sensations on receipt of the same stimuli, do in some sense live in different worlds»[29]. For Kuhn, individuals share a «world» when they «belong to the same group and thus share education, language, experience, and culture»[30]. Moreover, what the individual perceives depends on the world in which she lives. This definition of «world» brings to mind Heidegger's analysis of the lectern. In a lecture in Freiburg he pointed out that a lectern is not a neutral object; instead it is interpreted, signified, in a certain way, i.e. as the place where the teacher stands. Rephrasing Heidegger's famous (though certainly unfortunate) example: what would happen

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[27] Martin Heidegger, *Basic Questions of Philosophy. Selected «Problems» of «Logic»* (Bloomington: Indiana University Press, 1994), 48. He claims something similar claims in «The Age of the World Picture»: «[We cannot] say that the Galilean doctrine of freely falling bodies is true and that Aristotle's teaching, that light bodies strive upward, is false; for the Greek understanding of the essence of body and place and of the relation between the two rests upon a different interpretation of entities and hence conditions a correspondingly different kind of seeing and questioning of natural events. No one would presume to maintain that Shakespeare's poetry is more advanced than that of Aeschylus. It is still more impossible to say that the modern understanding of whatever is, is more correct than that of the Greeks», Martin Heidegger, *The Question Concerning Technology*, 117.

[28] See Howard Sankey, «Kuhn's changing concept of incommensurability», *The British Journal for the Philosophy of Science* 4, Vol. 44 (1993): 759-774 and Paul Hoyningen-Huene, «Kuhn's conception of incommensurability», *Studies in History and Philosophy of Science* Part A, 3, Vol. 21 (1990): 481-492. doi: https://doi.org/10.1016/0039-3681(90)90006-t

[29] Thomas Kuhn, *The Structure of the Scientific Revolution*, 193.

[30] Thomas Kuhn, *The Structure of the Scientific Revolution*, 193.

if a cave dweller appeared in the class? «What he would see, gazing at this object, is difficult to say precisely: perhaps something to do with magic, or something behind which one could find good protection against arrows and flying stones»[31]. The example speaks about how the world shapes our experience of things, how our cultural horizon determines how entities are revealed. Both Heidegger and Kuhn think of the paradigm-world as a significant context in which beings show themselves to the eyes, in one case, of the human existence in general, in the other, of the scientists. In this sense, science is always derived; it always comes after the *a priori* opened, or original, world. Science is «the cultivation», «the expanse» of this pre-opened horizon of significance. I think that Kuhn will not disagree with Heidegger on this issue:

> In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds... Practicing in different worlds, the two groups of scientists see different things when they look from the same point in the same direction. Again, that is not to say that they can see anything they please. Both are looking at the world, and what they look at has not changed. But in some areas they see different things, and they see them in different relations to one another. That is why a law that cannot even be demonstrated to one group of scientists may occasionally seem intuitively obvious to another[32].

Kuhn is saying that scientists live in the same but also, at the same time, in different worlds, affirming that scientists refer to the same world but see different things. This «same» world can be interpreted as the pre-opened world of which Heidegger speaks, i.e. the paradigm. Scientists, and all human beings, are already moving in a paradigm of significance before the scientific enterprise begins. Before analyzing the biological structure of a rabbit, one sees it as a sweet animal, who may have some kind of rights, who is part of a huge chain of animal's species, who can also be a pet, and that can be associated with Easter. The gaze of science itself, which objectifies entities, derives from a prior interpretative framework that the scientist assumes in his work. Science is therefore a derived activity (This is developed early in *Being and Time*, §69). Of course, Kuhn did not address this issue, but recognized the dependence of scientific paradigms to another world. Hoyningen-Huene explains that this passage refers to two senses of «world». The first one refers to the scientific paradigm, the world that is «already perceptually and conceptually subdivided in a certain way»[33]. The second one is a world «completely independent of our perceptions and conceptions, a world -as one might say- that is purely object-sided, whereas the world in the first sense is also subject-sided by its origin»[34]. Heidegger would not agree with this «purely object-sided» world if it is understood as naïve realism, but both understand the second sense of a world as something given independently of the human perspective.

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[31] Martin Heidegger, *Towards the Definition of Philosophy* (New York: Continuum, 2008), 57.
[32] Thomas Kuhn, *The Structure of the Scientific Revolution*, 150.
[33] Thomas Kuhn, *The Structure of the Scientific Revolution*, 129.
[34] Hoyningen-Huene, «Kuhn's conception of incommensurability», 485.

3. Calculating thinking and normal science

What did Heidegger mean when he claimed that «science does not think»? Did he mean to say that science is irrational? Did Heidegger really think that the scientific enterprise is such? Would he claim that scientists are not engaged in any kind of intellectual work? Certainly not. This statement refers to how scientists work and live within the paradigm: without questioning it. The actual issue is that

> if a distinction is made between thinking and the sciences, and the two are contrasted, that is immediately considered a disparagement of science. There is the fear even that thinking might open hostilities against the science, and becloud the seriousness and spoil the joy of scientific work[35] .

These fears, however, are not justified. Heidegger realizes that his claim is polemic, but is not his own idea. «Any kind of polemics fails from the outset to assume the attitude of thinking»[36], because one wishes to protect an idea and not the essence of what is being considered, in this case, science. «When we speak of the sciences as we pursue our way, we shall be speaking not against but for them, for clarity concerning their essential nature»[37]. To claim, then, that Heidegger is an enemy of the scientific enterprise is clearly a naïve characterization.

Still, what is Heidegger claiming? The term «thinking», for Heidegger, refers to «philosophical thinking», which has its own special meaning to which I will return below. Let us agree, for the moment, that science does not think because it does not think as philosophy does. For Heidegger, science is «calculating thinking» (*rechnendes Denken*). This statement does not mean simply doing the maths, but rather, in Heidegger words, doing «research». «The essence of what we today call science is research»[38]. Research presupposes a projection of goals, procedure and ongoing activity to accomplish those goals. Nevertheless, to project goals and to know how to proceed to achieve them presupposes a pre-understanding of with what science is dealing, which means that there are some conditions given, or in other words, there is a paradigm given. Research presupposes a total theory, a worldview.

> Its peculiarity consists in the fact that whenever we plan, research, and organize, we always reckon with conditions that are given. We take them into account with the calculated intention of their serving specific purposes. Thus we can count on definite results. This calculation is the mark of all thinking that plans and investigates. Such thinking remains calculation even if it neither works with numbers nor uses an adding machine or computer. Calculative thinking computes. It computes ever new, ever more promising and at the same time more economical possibilities. Calculative thinking races

[35] Martin Heidegger, *What is Called Thinking?* (New York: Harper & Row Publishers, 1968), 13.
[36] Martin Heidegger, *What is Called Thinking?* 13.
[37] Martin Heidegger, *What is Called Thinking?* 14.
[38] Martin Heidegger, *The Question Concerning Technology*, 118.

from one prospect to the next. Calculative thinking never stops, never collects itself. Calculative thinking is not meditative thinking.[39]

Calculating thinking embodies a context of pre-understanding, a world or paradigm that opens the possibilities to science for further exploration and investigation. Heidegger's view of science is quite similar to Kuhn's «normal science». So much so, that Huber Dreyfus will claim: «Heidegger in 1938, thus, anticipates Thomas Kuhn's account of normal science in *The Structure of Scientific Revolutions*»[40]. Basically, normal science is for Kuhn puzzle-solving. Nevertheless, however successful a paradigm seems, it always presents anomalies, fail predictions, or phenomena that do not fit in it. The main goal of a normal scientist is to accommodate or adjust the anomalies to the paradigm. This puzzle-solving idea is quite similar to Heidegger's idea of research, in which the scientist works, solves problems and makes calculations in a pre-understanding paradigm[41].

Scientists do not test the paradigm; they rather believe in it without doubt. This is so that, if a scientist has a problem, she will doubt herself and her own capacity, but not the paradigm, like when we do a math exercise and the teacher gives us the answer: if I do not reach the correct answer, I will doubt my own capacity, not that the teacher was wrong. «No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others»[42]. In this sense, Heidegger can say that scientists do not «think». In an interview with Richard Wisser, Heidegger says:

> And the statement that «science does not think» —which caused a great sensation when I said it in one of my lectures in Freiburg— means: *science* does not move in the *dimension of philosophy*. It is, however, *dependent* upon this dimension without knowing it. For example, physics moves in space, time and motion. Science as science cannot decide what motion is, what space is, and what time is. Science, therefore, does not *think*, in *this* sense it cannot think with its methods.
> For example, I cannot say what physics is with the methods of physics. I can only think of what physics is in the mode of philosophical questioning. The sentence, «science does not think», is *by no means a reproach* but is simply an identification of the inner structure of science; essential to it is the fact that, on the one hand, science is dependent on what philosophy thinks; on the other hand, it forgets philosophy and does not take notice of that which ought to be thought[43].

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[39] Martin Heidegger, *Discourse on thinking* (New York: Harper & Row Publishers, 1966), 46.
[40] Hubert Dreyfus, «How Heidegger defends the possibility of a correspondence theory of truth with respect to the entities of natural science» in *The Practice Turn in Contemporary Theory*, ed. Theodore R. Schatzki (London: Routledge, 2001), 161. doi: https://doi.org/10.1093/oso/9780198796220.003.0006
[41] Heidegger considers the «enframing» (Gestellt) of this scientific-technological paradigm as dangerous, meaning that when the scientific world is considered the main and unique horizon of significance, beings, others and ourselves are disclosed in terms of their use value, as standing reserve, reduced to quantifiable resources. And, at the same time, human being consider himself or herself as the lord of the earth.
[42] Thomas Kuhn, *The Structure of the Scientific Revolution*, 36
[43] Richard Wisser, *Heidegger in Conversation* (New Delhi: Arnold-Heinemann Publishers, 1977), 42.

Another example: Psychiatry works with the human psychic life and its pathologies. It cannot, however, answer what a human being is. It works with a pre-understood notion of the human being and, even if it has much of knowledge about human beings, psychiatry cannot explicit *what* it is to be a human being. This is not a deficiency of science; it is not its goal, since its structure is conceived for another task. This does not mean either that only philosophy can address the issue of what is space, time, physics, or the human being. The fundamental clearing that makes possible any scientific enterprise, however, is only accessible by philosophical (or ontological) thinking, not by an empirical approach, which is possible in a pre-opened clearing[44]. Philosophical thinking, for Heidegger, is reflection (*Besinnung*). There is an untranslatable word game with *Sinn* and *Be*sinn*ung*. «To follow a direction that is the way that something has, of itself, already taken is called, in our language, *sinnan, sinnen* [to sense]. To venture after sense or meaning [*Sinn*] is the essence of reflecting [*Besinnen*]»[45]. In other words, philosophical thinking ventures after how beings are shown to us, how they have a meaning for us. Philosophical thinking reflects on the sources of intelligibility, that is to say, on the paradigm-world. «What matters to preparatory thinking is to light up that space within which Being itself might again be able to take man, with respect to his essence, into a primal relationship. To be preparatory is the essence of such thinking»[46]. Meditative/reflective thinking (*das besinnliche Nachdenken*) is opposed to calculative thinking (*das rechnende Denken*). Therefore, in this sense, science does not think[47].

4. How are worlds / paradigms established?

Heidegger, then, understands science in general as Kuhnian normal science. Nevertheless, the main difference between these authors is the source of intelligibility, or in other words, the origin of the paradigm-world where scientists conduct their scientific enterprise. While for Heidegger science never «discloses» a paradigm-world, but rather moves in one that it inherits, Kuhn always thinks within the limits of philosophy of science. Paradigms are established by «scientific revolutions». «[S]cientific revolutions are here taken to be those non-cumulative developmental episodes in which an older paradigm is replaced

[44] «We today, because of the peculiar ascendancy of the modern sciences, are caught up in the strange misconception that knowledge can be attained from science and that thinking is subject to the jurisdiction of science. Yet whatever unique thing a thinker is able to say can be neither proved nor refuted logically or empirically. Nor is it a matter of faith. We can only envisage it questioningly, thoughtfully. What we envisage thereby always appears as worthy of question», Martin Heidegger, *Nietzsche. 2. The Eternal Recurrence of the Same* (San Francisco: Harper San Francisco, 1991), 227. In this respect Pierre Bourdieu claims that Heidegger's philosophy is a conservative revolution in philosophy given that he tries to make philosophy, once again, the fundamental science. See Pierre Bourdieu, *The Political Ontology of Martin Heidegger* (Cambridge: Polity Press, 2005), 55-69.

[45] Martin Heidegger, *The Question Concerning Technology*, 180.

[46] Martin Heidegger, *The Question Concerning Technology*, 55.

[47] Haugeland compares Kuhn's concept of normal science to the notion of «falling» presented in Being and Time. The idea is quite similar: the Heideggerian concept points to the normal conditions in which what surrounds us makes sense on a daily basis, in the same way that «normal science» determines how scientists proceed in daily life. See John Haugeland, *Dasein Disclosed* (Cambdridge, Mass.: Harvard University Press, 2013), 207.

in whole or in part by an incompatible new one»[48]. In other words, a scientific revolution is the process by which the scientific community changes paradigms; it is a radical shift of the scientific worldview, the replacement of a set of existing ideas and theories for another one set. Revolutions strike when a certain number of anomalies cannot be solved by the existing paradigm. The current paradigm enters in crisis and the faith in it decreases among the scientific community. During this period, other alternatives are proposed and eventually one rises as the new sovereign paradigm because it can solve some early problems and make better predictions. After this new paradigm is established, normal science works as usual, but ruled, clearly, by the new paradigm.

Heidegger briefly addressed the reasons for a scientific crisis in *Being and Time*, affirming that a crisis takes place when there is a transformation of fundamental concepts:

> The real «movement» of the sciences take place in the revision of theses basic concepts, a revision which is more or less radical and lucid with regard to itself. A science's level of development is determined by the extent to which it is *capable* of a crisis in its basic concepts. In these immanent crises of sciences the relation of positive questioning to the matter in question becomes unstable[49].

I believe these ideas seem quite close to Kuhn's perspective. According to Heidegger, scientific research moves in a fundamental interpretative structure that is accomplished by a prescientific horizon. He defines «fundamental concepts» as: «determinations in which the area of knowledge underlying all the thematic objects of a science attain an understanding that precedes and guides all positive investigation»[50]. In other words, fundamental concepts consist of an interpretative horizon that allows for scientific research. The real «movement» in science is not to collect data and store it, but rather the shifting of the fundamental concepts, i.e. the paradigm. A crisis means, for Heidegger, a paradigm shift, the transformation of the basic or fundamental concepts. The sciences themselves, which Heidegger calls ontic sciences, cannot reflect on the «fundamental concepts», since their analytic capacity presupposes the paradigm. It is only ontology, i.e. the discipline that asks itself about the conditions of possibility of these sciences, able to do so.

But, what is the source of a paradigm shift in the sciences? In *Being and Time* Heidegger does not go further with the crisis of the sciences. It is in his later writings that he claims that the foundation of a paradigm/world does not depend on human existence, and thus on scientists. It depends on an event (*Ereignis*). What does Heidegger mean with «event» (*Ereignis*)? Does he mean any ordinary event? Certainly not. Heidegger did not refer to ordinary occurrence, such as sunrise or the inauguration of a shop, but rather to a kind of event that deeply changes our understanding of the world, that changes how beings reveal themselves to us. «The event eventuates [*Das Ereignis ereignet*], which means nothing else

[48] Thomas Kuhn, *The Structure of the Scientific Revolution*, 92.
[49] Martin Heidegger, *Being and Time*, 8.
[50] Martin Heidegger, *Being and Time*, 9.

but that it and only it becomes truth»[51], that is to say that it discloses a world. Curiously, in the winter semester lecture of 1937/38, Heidegger characterized the event as a revolution. Heidegger considers the event a new beginning, which means that an event conveys a new way of seeing things. «Thus the original and genuine relation to the beginning is the revolutionary, which, through the upheaval of the habitual, once again liberates the hidden law of the beginning»[52]. Even though Heidegger does not characterize the event as a revolution in his later work, it is one indeed, given that the usual way of relating to things changes radically. This is what the opening of a world/paradigm means.

But, then, in what sense is *Ereignis* an event? Emad and Maly, for example, insist on that the translation of *Ereignis* as «event» «immediately evokes the metaphysical notions of the unprecedented and the precedent that are totally alien to *Ereignis*»[53]. Richard Polt compares the *Ereignis* with what he calls «reinterpretive events» and gives the following example: if a shy girl participates in a school play and, despite her fear, manages to do it satisfactorily, this «event» changes the way she sees herself and how she experiences the world. It is no longer a threatening world but a place where she feels safe. A «reinterpretive event» is that which changes the way beings reveal to us[54]. Even though *Ereignis* does not happen in a school nor does it happen on an individual level, we can think of the event as a reinterpretive event that transforms how we interpret the world, what surrounds us, and ourselves as a community or as an epoch. The event is what makes possible the link between the being that donates a space of meaning and the *Dasein* who appropriates what has been donated: «The event of appropriation is that realm, vibrating within itself, through which man and Being reach each other in their nature»[55]. Thus, in Heidegger's later philosophy the source of the meaning, the one that founds the paradigm, is this structure called *Ereignis* that donates the horizon in which scientists can perform their research.

Conclusion

I have set out what I think are the main differences and similarities between Heidegger's and Kuhn's philosophy of science, with the goal of giving at least some plausible reasons to consider Heidegger a philosopher of science together with Kuhn. I have shown that Heidegger's position is not so different from the position of a well-known and accepted philosopher of science. Therefore, if my arguments are correct, Heidegger and Kuhn can be considered complementary authors. On the one hand, Heidegger provides an ontological framework that is not confined to the scientific field but encompasses all fields of knowledge. The origin of this ontological framework is not a «revolution», but rather the event of truth.

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[51] Martin Heidegger, *Contributions to Philosophy* (Of the Event), 276.
[52] Martin Heidegger, *Basic Questions of Philosophy. Selected «Problems» of «Logic»*, 35.
[53] Parvis Emad and Kenneth Maly, «Translators' Foreword», in *Contributions to Philosophy* (From Enowing), auth. Martin Heidegger (Bloomington: Indiana University Press, 1999), XX-XXI. About this discussion see also Richard Polt, *The Emergency of Being. On Heidegger's Contributions to Philosophy* (New York: Cornell University Press, 2006), 73-76 and Otto Pöggeler, *The Paths of Heidegger's Life and Thought* (New York: Humanity Books, 1998), 115.
[54] See Richard Polt, *The Emergency of Being*, 78.
[55] Martin Heidegger, *Identity and Difference* (New York: Harper & Row Publishers, 1969), 37.

Kuhn, on the other hand, not only analyzes in detail how normal science or «calculate thinking» works, but shows empirically, unlike Heidegger, how the paradigm-world influences on science enterprise as well.

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