

Husserl and Heidegger on Galileo's mathematization of nature and the crisis of the sciences

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ABSTRACT

The sciences are in a state of crisis. Due to factors like hyperspecialization and an all too naive and uncritical faith in their own method, the sciences have lost sight of their initial goal. The idea that sciences are in a state of crisis can of course famously be found in Edmund Husserl's *Crisis of the European Sciences*. What is less well-known, however, is that Martin Heidegger also discusses and analyzes a crisis of the sciences in his 1928/29 lecture course *Einleitung in die Philosophie*. There are interesting similarities between the nature of the crisis the two thinkers observe, but key differences when it comes to the relation between science and philosophy and the question of whether or not the crisis can be resolved. The aim of this article will be to provide a thorough comparative analysis of Husserl's and Heidegger's accounts of the crisis, the role of Galileo's mathematization of nature in their analyses, and what this means for their ideas concerning the relation between science and philosophy. The goal of this analysis is to provide some conceptual clarity regarding the prospect of naturalizing phenomenology.

1. Introduction

In order to understand what it means to naturalize phenomenology it is vital to understand the notions of 'science' and 'nature'. Interestingly, two of phenomenology's founding fathers – Edmund Husserl and Martin Heidegger – both wrote about a crisis of the sciences that could be traced back to Galileo Galilei's mathematization of nature. This idea of a crisis of the sciences can famously be found in Husserl's *The Crisis of European Sciences and Transcendental Phenomenology* (1970). Heidegger's discussion and analysis of a crisis of the sciences in his 1928/1929 course *Einleitung in die Philosophie* (2001) is less

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well-known. There are interesting similarities between the analyses of the crisis the two thinkers observe, but key differences when it comes to the relation between science and philosophy resulting from their observations.

One of the goals of Husserl's *Crisis* is to identify the original meaning and value of science, by investigating the historical transformation it underwent in modern times. He traces this transformation back to Galileo Galilei's mathematization of nature. The goal of Heidegger's *Einleitung* is to come to an understanding of philosophy by comparing it to science, worldview and history.¹ In order to be able to compare the two, Heidegger suggests we first need a better understanding of science. He attempts to understand the essence of science by starting from a threefold crisis that he observes in contemporary science. Like Husserl, he finds the root of the crisis in Galileo.

Husserl's and Heidegger's analyses of Galileo are of crucial importance to understand their differing attitudes towards the crises of the sciences. Both thinkers agree that in discovering mathematized nature, Galileo is at the same time covering something up. For Husserl, what is covered up by Galileo is a realm of original evidences. For Heidegger, what is covered up is the baselessness of existence. This means that for Husserl, the crisis of the sciences can essentially be resolved if the scientific impetus is directed towards those original evidences, while for Heidegger, the crisis is inherent to the sciences and cannot be resolved.

The fact that both thinkers observe a crisis in the sciences of their times and the fact that their analyses of this crisis and its solution overlap and differ in interesting ways, calls for a comparative analysis on Husserl's and Heidegger's ideas concerning this crisis and its possible solution. Comparisons between Husserl and Heidegger on related issues have been made, but these comparisons never take this idea of the crisis of the sciences as a focal point, instead comparing Husserl's *Crisis* to Heidegger's later philosophy of technology.² Furthermore, the *Einleitung* remains as of yet untranslated, causing comparative studies in the English literature that do contrast Husserl and Heidegger to focus on different works by Heidegger, like his analysis of Galileo in the 1935-

¹ Heidegger never actually gets as far as the third comparison, between science and history. His analysis of Kant's concept of 'world' in the comparison between philosophy and worldview takes up so much time that he doesn't succeed in taking the final step towards history.

² See for example: (Van Mazijk 2019)

36 course *Frage nach dem Ding* (1984)³, which is translated in English. Especially considering the discussion of naturalizing phenomenology, an analysis of one of Heidegger's most comprehensive texts on science and its relation to philosophy is invaluable. As it stands, however, a thorough comparative analysis of Husserl's and Heidegger's stance on the crisis of the sciences based on the *Crisis* and the *Einleitung* is absent in the reception so far.

The aim of this article is to fill that gap and provide a thorough comparative analysis of Husserl's and Heidegger's crisis of the sciences and the relation between science and philosophy. The goal of this analysis is to offer an indirect contribution to the philosophical conversation about the prospect of naturalizing phenomenology, not by directly participating in the debate, but rather by examining the notions of nature and science in two of phenomenology's central thinkers. By closely analyzing their reasons for being critical of Galileo's mathematization of nature, the difference in emphasis in their criticisms, as well as what they consider to be the appropriate relation between science and philosophy, I hope to provide some conceptual clarity regarding the prospect of naturalizing phenomenology.

In this article, I will first sketch the importance of this comparison for the debate concerning the possibility to naturalize phenomenology. Second, I will analyze Husserl's conception of the crisis of science, his analysis of Galileo's mathematization of nature and his proposed solution to the crisis. Third, I will focus on Heidegger's conception of the crisis of science, his analysis of Galileo and the reason he considers the crisis to be inherent to the sciences. Fourth, I will compare the two positions and tie the gained insights back to the issue of naturalizing phenomenology.

2. Naturalizing phenomenology

The notion of 'naturalism' is pervasive and can have different meanings depending on the context. Without going into all these different meanings and contexts at this point, what is clear at the outset – based on the word alone – is that naturalism always implies a relation to nature or 'the natural'. Therefore, any understanding, criticism, or reimagining of the notion of naturalism necessarily brings with it related ideas about the meaning of nature or 'the natural'. So, in

³ See for example: (Cahoone 1986) for a comparison of Husserl's, Heidegger's and Cassirer's reception of Galileo, or: (Dea 2009) for a detailed study and criticism of Heidegger's account of Galileo in *Frage nach dem Ding*.

order to understand the need to naturalize phenomenology, it is crucial to understand the understanding of nature at play in these questions. This becomes especially important when integrating different viewpoints and discussions: Do the authors who aim at naturalizing phenomenology have the same nature in mind as Husserl when he argues against naturalism? Do Husserl and Heidegger have the same idea of nature in mind when they formulate their reasons for opposing naturalism?

As well as preconceptions about nature, any discussion of naturalism also brings with it certain preconceptions about science. For example: to naturalize a specific phenomenon or discipline, is often taken to mean: to align it or its methods with the methods of (natural) science. In order to understand the implications of this in a specific discussion, it is crucial to be aware of the implied notion of science. If we then proceed one step further, it becomes clear that the concepts of 'science' and 'nature' themselves share a similar relation of mutual preconceptions. Specifically, the notion of 'natural sciences' – which is what many authors really mean when they use the more general denomination 'science' – shows the interconnectedness of 'science' and 'nature'. For if natural science is the human enterprise that studies nature, then the two notions are mutually dependent: any understanding of nature calls for a specifically tailor-made type of science as the accurate way of studying it, while at the same time, any preformulated idea of science has at its heart an understanding of the specific kind nature it takes to be its field of study.

The specific kinds of relations between the concept of naturalism on the one hand and the concepts of nature and science on the other can be made more explicit by considering the distinction between ontological naturalism and methodological naturalism (De Caro and Macarthur 2008). The ontological naturalist typically makes claims about that which exists, excluding from existence any entity or set of entities that is non- or supernatural. In its stronger forms, ontological naturalism is a form of reductive physicalism, equating the natural with the physical (Pearson and Protevi 2016). Any form of ontological naturalism, be it weak or strong, has an understanding of nature at its core. The methodological naturalist typically makes claims about how to investigate that which exists, claiming the natural scientific method is the best way to arrive at genuine knowledge. In its stronger forms, methodological naturalism is a form of scientism, holding that only the natural sciences are able to produce meaningful results when it comes to the pursuit of knowledge. Any form of methodological naturalism thus has a conception of science at its core. Since in the context

of naturalism, any notion of 'nature' implies a notion of 'science' and vice versa, to be a naturalist in one sense means that you cannot be agnostic regarding naturalism in the other sense.

The question concerning the possibility to naturalize phenomenology hinges on the exact meaning of the concept of 'naturalism', which in turn hinges on the meaning of the concepts 'science' and 'nature' and the relation between these concepts. The following comparative analysis of Husserl's and Heidegger's analyses of the crisis of the sciences aims to provide a clear depiction of the way two of phenomenology's central figures envision the relation between nature, science and philosophy.

3. Husserl and the crisis

In part one of the *Crisis*, Husserl makes clear that by saying there is a crisis in the sciences, he does not mean to call into question the accomplishment of the existing scientific disciplines, both natural and human. Rather, the crisis Husserl is talking about is connected to "that of the general lament about the crisis of our culture and the role here ascribed to the sciences" (Husserl 1970: 4). He identifies an exclusive focus on the positive sciences in the second half of the nineteenth century and with that "an indifferent turning-away from the questions which are decisive for a genuine humanity." (Husserl 1970: 6). The positive sciences exclude questions concerning human freedom and the meaning of our existence, instead turning to mere facts. This leads to a situation in which the sciences are unable to answer the most burning and fundamental human questions. As Husserl famously puts it: "In our vital need—so we are told—this science has nothing to say to us." (Husserl 1970: 6).

This was not always the case. Husserl describes how in ancient times, people lived according to a philosophical mode of existence: "feely giving oneself, one's whole life, its rule through pure reason or through philosophy." (Husserl 1970: 8). This freedom is first of all theoretical: it frees one from the shackles of prejudice and mythology and allows one to acquire universal knowledge about how the world really is. This theoretical autonomy is followed by what Husserl calls "practical autonomy" (Husserl 1970: 8), meaning that:

[...] man should be changed ethically [but that] the whole human surrounding world, the political and social existence of mankind, must be fashioned anew through free reason, through the insights of a universal philosophy. (Husserl 1970: 8)

From this, the first aspect of what Husserl means by a crisis of the sciences becomes clear. Initially, the ideal of science carried with it practical implications as well. To lead an existence in accordance with reason not only means to live a life in which you practice theory, but a life in which your ethico-political and existential decisions are based on the same rational deliberations. In an age where sciences are merely concerned with facts and no longer with values and meaning, this part that originally belonged to the idea of science gets lost.

Aside from being connected to practical questions, the sciences were originally connected to each other as well. This idea was retained in the modern era, as explained by Husserl referring to Descartes and using the Cartesian image of a tree: “Sciences in the plural, all those sciences ever to be established or already under construction, are but dependent branches of the One Philosophy.” (Husserl 1970: 8). The positivistic sciences that exist nowadays are therefore no more than branches from this so-called ‘One Philosophy’. That is why Husserl refers to the concept of positivistic science as a “*residual concept*” (Husserl 1970: 9). What gets left behind by such a residual concept of science are questions concerning values, ethical actions and the possibility of knowledge, to repeat a couple of Husserl’s examples (Husserl 1970: 9).

Two things follow from this. First, Husserl restates the severing of the connection between ethico-political and existential questions on the one hand and science on the other. Second, the severing of the sciences from one another becomes clear. When the sciences are all branches on this big tree called philosophy, the sciences are all connected to each other. When they no longer see themselves as part of the same tree, however, sciences become separated from each other, and it is no longer clear how the insights of one scientific discipline should matter to the other. This severing is most prevalent when looking at the difference between the human sciences and the natural sciences. While the insights of two sciences might not relate to each other directly, they are still indirectly related because of their basis in the fundamental issues and their directedness towards the same goal.

This severing also leads to a third aspect of the crisis, which Husserl formulates as follows: “a crisis which does not encroach upon the theoretical and practical successes of the special sciences; yet it shakes to the foundations the whole meaning of their truth.” (Husserl 1970: 12). Since the positivistic sciences no longer see themselves as branches on the tree of philosophy, their relation to truth becomes obscured. For the question of what makes something

true and in what sense scientific insights can be considered true is essentially a philosophical question, that science cannot and does not deal with.

Finally, Husserl states that the aforementioned crisis, is a crisis that has an existential impact on all of what he calls 'European humanity':

Thus the crisis of philosophy implies the crisis of all modern sciences as members of the philosophical universe: at first a latent, then a more and more prominent crisis of European humanity itself in respect to the total meaningfulness of its cultural life, its total "*Existenz*." (Husserl 1970: 12)

Husserl connects this existential impact of the crisis to a loss of faith in reason. Reason constitutes the true being of mankind, which does not mean that Husserl sees reason as something every human being naturally has, but more as a task, a struggle, or a goal that we set for ourselves.

In the final paragraph of part one of the *Crisis*, Husserl states that it is necessary to "[...] *reflect back*, in a thorough *historical* and *critical* fashion, in order to provide, *before all decisions*, for a radical self-understanding[.]" (Husserl 1970: 17). The historical reflection Husserl undertakes in part two the *Crisis* has the goal of uncovering the initial impetus of philosophical thinking: what philosophy has been aimed at (Husserl 1970: 17). A crucial part of this critical-historical investigation is to understand how the initial goal of philosophy and science was transformed, leading to the current crisis of the sciences:

The first thing we must do is understand the fundamental transformation of the idea, the task of universal philosophy which took place at the beginning of the modern age when the ancient idea was taken over. (Husserl 1970: 21)

Husserl traces the root of this transformation back to Galileo's mathematization of nature. The ninth paragraph of the crisis is a detailed examination of the meaning of this mathematization of nature, that Husserl undertakes by reconstructing "[...] the train of thought which motivated it" (Husserl, 1970: 23). He starts this reconstruction by stating that "[p]rescientifically, in everyday sense-experience, the world is given in a subjectively relative way." (Husserl 1970: 23). Everyone experiences the world from their own standpoint, causing the world to be given to each of us in differing appearances. Despite the discrepancies between our experiences however, we do not generally believe that "because of this, there are many worlds." (Husserl 1970: 23) We tend to believe there is something objective underlying our subjective experiences, and Husserl describes how for Galileo, it was completely obvious that pure geometry and mathematics accurately describe this objective world underlying our subjective

experiences. What was involved in this obviousness and how did Galileo motivate this idea of mathematical knowledge of nature?

Husserl states that in our everyday life, we experience bodies. These bodies, however, are of course not the ideal bodies of geometry, but actually existing, empirical bodies. So how do we get from these empirical bodies to the ideal bodies of geometry? We can vary the shapes of bodies in our imagination, however, “[f]antasy can transform sensible shapes only into other sensible shapes.” (Husserl 1970: 25). So, by just varying shapes in our imagination, we can never arrive at the pure bodies of geometry. However, these empirical shapes can be perfected, and this process of perfecting was originally connected to practical interests. A straight line can always be straighter, for example when you are designing a square tabletop. However, perfection itself can never be attained: we will never be able to design a tabletop with perfectly straight sides. Husserl writes: “Hence we always have an open horizon of *conceivable* improvement to be further pursued.” (Husserl 1970: 25)

Due to this process of perfection, *limit shapes* arise as that towards which the process of perfection tends. These limit shapes constitute the move from the realm of the practical-empirical to the realm of pure geometry, for by the activity of pure thinking, one can determine these limit shapes and construct new ones. Once determined and constructed, these limit shapes become “acquired tools that can be used habitually and can always be applied to something new.” (Husserl 1970: 26). By using these tools in the “geometrical world of ideal objects” (Husserl 1970: 27), one can achieve what can never be achieved in the empirical world: exactness (Husserl 1970: 27). This means that when it comes to these ideal shapes, it is possible to determine them in their absolute identity.

This was the state of the art in the mature geometry that was already established by the time Galileo took up the discipline. Since it was already established, Galileo did not feel the need “to go into the manner in which the accomplishment of idealization originally arose” (Husserl 1970: 29). Rather, Galileo took up the project of geometry and applied it to physics, based on the idea that geometry establishes “an identical nonrelative truth” (Husserl 1970: 29), overcoming “the relativity of subjective interpretations.” (Husserl 1970: 29). However, in this application to physics, Galileo encountered a problem. For while geometry deals with abstract limit-shapes, concrete empirical shapes are given to us as a plenum, filled in with sense-qualities like “color, sound, smell and the

like.” (Husserl 1970: 30). In order to fully idealize the concretely existing empirical world the sense qualities that go along with the embodied things in the world have to be mathematized.

The first thing Husserl notes about this task, is that as opposed to shapes, these sense qualities cannot be directly mathematized. Indirect mathematization is thus required, and the only reason this is considered a possibility is because “in each case of real bodies, factual shapes require factual plena and vice versa.” (Husserl 1970: 35). So while it is possible to abstractly separate shape and plenum, concretely they are always tied together. Furthermore, Husserl stresses that we nowadays find this indirect mathematization of sensible qualities to be self-evident and unquestionable. He illustrates this with the following example.

What we experienced, in prescientific life, as colors, tones, warmth, and weight belonging to the things themselves and experienced causally as a body's radiation of warmth which makes adjacent bodies warm, and the like, indicates in terms of physics, of course, tone-vibrations, warmth-vibrations, i.e., pure events in the world of shapes. (Husserl 1970: 36)

For us, this way of describing sensory qualities in terms of measurable quantities that correspond to the world of shapes, is indeed self-evident. However, for Galileo, this could not have been self-evident, since his concept of physics is what initiated this self-evidence. Husserl notes that even though the Pythagoreans already observed the “the functional dependency of the pitch of a tone on the length of a string set vibrating” (Husserl 1970: 37), it wasn't until the renaissance that the idea of a universal application of pure mathematics – and with that the co-mathematization of sense qualities – got a real foothold.

Husserl describes Galileo's undertaking here in terms of a double idealization of the world. On the one hand there is the co-idealization of the plenum in each concrete case of the application of pure mathematics to empirically given nature. This gives rise to an idea of universal inductivity of the intuitively given world (Husserl 1970: 38-39). On the other hand there was Galileo's attempt to systematize and secure the idea of a universal, exact causality which “precedes and guides all induction of particular causalities.” (Husserl 1970: 39). This double idealization secured the possibility of the indirect mathematization of sensible qualities in a purely theoretical way, while the question of how the natural sciences should actually proceed here was considered by Galileo to be a

question of scientific praxis, not of systematic consideration.⁴ This makes Galileo's idea of natural science a hypothesis, but in a very peculiar way: "It is the peculiar essence of natural science, it is a priori its way of being, to be unendingly hypothetical and unendingly verified." (Husserl 1970: 42).

The "decisive accomplishment" of natural science thus envisioned, is the formulation of formulae, with which the scientist:

"possesses, in advance, the practically desired prediction of what is to be expected with empirical certainty in the intuitively given world of concretely actual life, in which mathematics is merely a special [form of] praxis." (Husserl 1970: 6)

This explains, firstly, how acquiring these formulae became of particular interest for the natural scientist, and also how some of them "were misled into taking these formulae and their formula-meaning for the true being of nature itself." (Husserl 1970: 44). This idea of 'formula-meaning' is further explained by Husserl in terms of the "arithmetization of geometry" (Husserl 1970: 44), in which the connection between the numbers and the shapes they are meant to signify recedes to the background, finally leading to a "completely universal "formalization"" (Husserl 1970: 45) in which the original meaning (Sinn) of geometry is lost. The result is akin to Leibniz' *mathesis universalis* (Husserl 1970: 45): a universal formal logic that deals with the empty formal meanings of "something-in-general" (Husserl 1970: 45) and categorizes these somethings-in-general in specific manifolds. Geometry is thus reduced to a set of technical rules, while "the *original* thinking that genuinely gives meaning to this technical process and truth to the correct results [...] is excluded" (Husserl 1970: 46). The technical process is completely devoid of the original meaning of geometry, in the sense that it is not related anymore to the actual world, to the actual, concrete shapes from which we started. The discoveries of a natural science that is construed upon this basis can thus be said to pertain to an entirely separate world: "All the discoveries of the old as well as the new physics are discoveries in the formula-world which is coordinated, so to speak, with nature." (Husserl 1970: 48).

In this process, what fundamentally happened, according to Husserl, is that geometry lost sight of the actual world of our experiences:

[T]he surreptitious substitution of the mathematically substructured world of idealities for the only real world, the one that is actually given through

⁴ For a concrete example of how the process of idealization works in scientific practice, see: Garrison, 1986

perception, that is ever experienced and experienceable—our everyday life-world. (Husserl 1970: 48–49)

This is a problem, because this everyday life-world is what provides geometry and the entirety of Galileo's project with its meaning. Husserl therefore calls it a "fateful omission" on Galileo's part that he did not "inquire back into the original meaning-giving achievement." (Husserl 1970: 49). Such an inquiry would look for the ultimate meaning of scientific achievements in the goal it has in our life, in the life-world. For the life-world is the place from which all scientific endeavors start and the only place in which their results can mean something:

Man (including the natural scientist), living in this world, could put all his practical and theoretical questions only to it—could refer in his theories only to it, in its open, endless horizons of things unknown. (Husserl 1970: 50)

This life-world, Husserl stresses, is the world of spacetime, the world in which we practically live, the world in which we bodily exist, and the world in which we find concrete, bodily shapes. What we do not find in this world are geometrical idealities. Even though Husserl realizes that this may sound trivial, he considers it important because it shows that the life-world continues to exist as it does, unaffected by Galileo's geometry. Rather than directly changing or affecting the life-world, what we actually do with this geometrical and natural-scientific mathematization is that "we measure the life-world [...] for a well-fitting *garb of ideas*, that of the so-called objectively scientific truths" (Husserl 1970: 51). This garb of ideas dresses the life-world up as "objectively actual and true" (Husserl 1970: 51) nature and makes us confuse the mere method of geometrical and natural-scientific mathematization for *true being*. Or, as David Carr puts it: "*to be is to be measurable*" (Carr 1970: 334). The focus rested solely on the garb of ideas itself, while the meaning of its constituting ideas, formulae and theories was never a part of the scientific investigation. It is for this reason that Husserl calls Galileo a "a discovering and a concealing genius [*entdeckender und verdeckender Genius*]" (Husserl 1970: 52), who discovers mathematical nature, but in the same act conceals the life-world.⁵

⁵ For a criticism of this idea of the separation between life-world and the world of the sciences, see: (Ihde 2010). Ihde argues that by failing to focus on mediating technologies, Husserl creates the dichotomy he describes. This criticism is countered in (Wiltche 2017). Wiltche argues that Ihde overlooks that "the decisive move in Galileo's reasoning is the leap from experimentally obtained data to an ideal limiting case which is found nowhere in the domain of intuitable things." (Wiltche 2017: 171).

It is exactly this shift of attention to this idea garb of mathematized nature, away from the life-world, that explains the basis of the fourfold crisis of the sciences. For ethico-political and existential questions are relevant in the life-world, not in mathematized nature. The same goes for the questions of the human sciences. This shift of attention also explains the obscured relation to truth, for since science lost track of its original meaning, it is not clear in what meaningful sense scientific findings and results can be thought of as true (or untrue). And finally, science inability to relate to the aforementioned question causes a loss of faith in reason.

For Husserl, there is a clear solution to the crisis of the sciences understood as the severing between the idealized world of natural science and the life-world. This solution rests on the basis of the idea that these two worlds are not fundamentally separate, that “the intentional focus of scientific activity is the everyday world” (Rouse 1987: 225). Or, as Husserl himself puts it:

When science poses and answers questions, these are from the start, and hence from then on, questions resting upon the ground of, and addressed to, the elements of this pre-given world in which science and every other life-praxis is engaged. (Husserl 1970: 51)

So, science always starts from the life-world. Geometry took the actual concrete shapes we encounter in the life-world as its starting point. But even natural scientists today which in their scientific practice might investigate highly idealized worlds, still do this in laboratories, which they share with fellow researchers, etc. In other words: science does not only historically start from the life-world: scientific practice starts from the life-world every day. Husserl writes: “objective theory in its logical sense [...] is rooted, grounded in the life-world, in the original self-evidences belonging to it” (Husserl 1970: 130). What is therefore needed according to Husserl, in order to repair the severing between the life-world and the world of the sciences, is a science of the life-world (Husserl 1970: 123), a way to uncover these original self-evidences of the life-world. Husserl also explains this in terms of two different sort of truths:

[O]n the one side, everyday practical situational truths, relative, to be sure, but, as we have already emphasized, exactly what praxis, in its particular projects, seeks and needs; on the other side there are scientific truths, and their grounding leads back precisely to the situational truths[.] (Husserl 1970: 132)

A science of the life-world can thus be said to serve multiple connected purposes. Since science always starts from the life-world, both historically and practically, a scientific investigation of the life-world repairs the severed connection between the life-world and the world of the sciences. Furthermore, an investigation of the life-world can retrace scientific truths back to the more fundamental situational truths. By uncovering and investigating the situational truths of the life-world and their relation to scientific truths, science's relation to truth becomes unobscured. The goal of this becomes clear.

In relation to this, finally, arises the idea of a universal science encompassing all possible knowledge in its infinity, the bold guiding idea of the modern period. If we have made this clear to ourselves, then obviously an explicit elucidation of the objective validity and of the whole task of science requires that we first inquire back into the pre-given world. (Husserl 1970: 121-122)

For Husserl, a science of the life-world is a first step back in the direction of a universal science. It uncovers what was covered up by Galileo. For Husserl, Galileo's natural science essentially buries the life-world under its mathematized realm of idealities. He values the impetus of modern science, to try to rationally uncover the world. Galileo's fatal flaw is that he didn't reflect back on the meaning of the geometry that was handed down to him by the Greeks. For the original meaning of this geometry lay exactly in its applicability to the life-world. Galileo is thus a 'concealing Genius' in a double sense: he covered up the historical origin of geometry and with that covered up the life-world.

4. Heidegger and the crisis

We now turn to Heidegger's conception of the same crisis. Heidegger treats the subject of the crisis of the sciences in his 1928/1929 lecture course *Einleitung in die Philosophie*. In this course, he attempts to find the meaning of philosophy by distinguishing it from science. However, in order to do this, he first tries to establish the essence of science. In a classic example of hermeneutic reflection, he proposes to find this essence by examining a threefold crisis that he considers to exist in the sciences of his time. This threefold crisis gives him the guiding ideas needed to get closer to the essence of science. The crisis consists in the following three points: a crisis in the relation between science and individual existence, a crisis in the relation between science and historico-cultural existence, a crisis of the internal structure of science (Heidegger 2001: 27).

To illustrate the crisis between science and individual existence, Heidegger points to the dissatisfaction with academic science that came to fruition after World War I, but that had already been slumbering before 1914, when he was still a student (Heidegger 2001: 27-28). He describes the dissatisfaction in the following way:

We sensed a rigidity in the academic scientific community and together with that rigidity a specialization [...] behind which an impotence was hiding, the impotence to convey the essence of science in even a simple manner that spoke directly to existence (Heidegger 2001: 28).⁶

The keywords in this fragment are impotence (*Ohnmacht*), rigidity (*Erstarrung*) and specialization (*Spezialisierung*). The combination of specialization and rigidity makes the sciences impotent to relate to individual existence. Heidegger further explains this by referring to the ideal of *Bildung*. According to the classical idea of *Bildung*, my scientific education at a university should help me, as an individual, to better understand myself, the world around me and my relation to the world around me. An ideal that flourished at the beginning of modernity, when the promise of a unified science and of becoming a *homo universalis* could at least potentially be fulfilled. Due to the intellectual division of labor and the hyperspecialization of the individual sciences, the ideal of a unified science made place for a fragmented landscape. Within this fragmented landscape, it is no longer clear for me, as an individual studying these sciences, what these sciences have to say about my existence, or my relation to the world around me. Thus, specialization causes a specific form of rigidity, meaning that despite its advancements, it is no longer clear how these advancements relate to the lived reality of individual existence. Their hyperspecialization thus make the sciences impotent to relate to individual existence. The crisis that Heidegger refers to here clearly relates to Husserl's points regarding the severing between scientific- and existential questions, and the severing of scientific disciplines from one another.

⁶ My translation, original German: „Wir spürten eine Erstarrung im akademischen Wissenschaftsbetrieb und in eins mit dieser Erstarrung eine Spezialisierung [...] hinter der sich eine Ohnmacht verbarg, die Ohnmacht den primären und ursprünglichen Seinsgehalt der Wissenschaft noch in einfacher und direkt zur Existenz sprechender Weise zu vermitteln.“

What Heidegger takes from this, is that apparently there is a relation between science and Dasein. This means that, according to Heidegger, the essence of science thus needs to be situated and understood in connection to human Dasein (Heidegger 2001: 30).

The second part of the crisis - the crisis between science and historico-cultural existence - is similar to the crisis between science and individual existence. Heidegger again invokes the idea of *Bildung* to illustrate this point. Here, the focus is not on the function of *Bildung* for the individual, but the function of *Bildung* for society. With its specialization, science has not only become important to relate to individual existence, but likewise and for similar reasons, to cultural existence. Due to its specialization, the meaning or relevance of science for our culture and society is no longer clear. This crisis is similar to what Husserl calls the severing of scientific- and ethico-political questions.

This crisis becomes visible in the tendency to popularize scientific insights, which according to Heidegger is a tendency that stems from science itself (Heidegger 2001: 31) and has the goal to decrease the remoteness of science from life (Heidegger 2001: 32). In other words: the tendency to popularization stems from scientists themselves feeling this crisis, seeing that science is in need and therefore somehow needs to be remedied. (Heidegger 2001: 31) This need is that science's practical character, its meaning for culture and society, is no longer clear.

Heidegger sees this tendency to popularization as being led by serious motives, but essentially calls it a fundamental misunderstanding (Heidegger 2001: 32). This misunderstanding comes down to the fact, that in popularizing science, we equate science with its results:

All popularization of science [...] is an offense to its being, because it denies that science cannot be equated with its results, which can then be passed from hand to hand, regardless of the kind of formulation. (Heidegger 2001: 32)⁷

The underlying problem with equating science with its results, is that it overlooks a fundamental aspect of science: that science in itself is already practical (Heidegger 2001: 33). This is not some accidental feature of science, but like its connection to individual existence, belongs to its essence. So here,

⁷ My translation. Original German: Alle Popularisierung der Wissenschaft [...] ist ein Verstoß gegen deren Wesen, weil sie verkennt, daß die Wissenschaft nie gleichgesetzt werden darf mit ihren Resultaten, die dann in irgendeiner Zubereitung von Hand zu Hand weitergegeben werden.

Heidegger has found his second guiding idea. Science needs to be understood not as purely theoretical, but as inherently practical.

The third and final part of the crisis, is a crisis of the internal structure of science. Referring to mathematics, as well as to biology and physics, Heidegger states that it belongs to science to be able to experience a crisis of foundations (Heidegger 2001: 35). What is interesting to him, is that in spite of what one would expect on the basis of the term ‘crisis of foundations’, such a crisis does not cause a scientific field to collapse. Rather, more often than not, such crises cause a field to flourish. How is that possible?

In order to understand this, Heidegger points out the peculiar situation, that no science is able to determine itself: The question of the essence of mathematics is not itself a mathematical question (Heidegger 2001: 38). This in stark contrast to philosophy, of which Heidegger said earlier in the course that it not only can, but has to determine itself (Heidegger 2001: 15). Because science cannot do this, it experiences its own limits in a foundational crisis, it experiences that it precisely cannot determine itself. What Heidegger points to here, is similar to what Husserl calls science’s obscured relation to truth.

What leads Heidegger to the third and final guiding idea: science’s finiteness. Each individual science has specific limits when it comes to its questions, limits that it experiences in a foundational crisis. Like the relation to the individual and its practical nature, these limits, their meaning and the finiteness that they signify should be taken as central to science if we are to correctly understand its essence.

Heidegger continues his investigation of the essence of science from the commonplace idea that science has a relation to truth. Traditionally, since Aristotle, the location of truth is thought to be the sentence. The working definition of science Heidegger therefore proposes to use is: “a justification context of true sentences” (Heidegger 2001: 48).⁸ But in what way, and what does ‘truth’ mean here? Of course, it is well known that Heidegger rejects the idea of truth as correspondence (*adequatio*), as well as rejecting the idea of truth being primarily located in the sentence. He instead proposes to understand truth as unconcealment (*aletheia*)⁹. He takes the same approach here in the investigation

⁸ My translation. Original German: *Begründungszusammenhang wahrer Sätze*.

⁹ For a thorough examination of truth as *aletheia*, see: (Campbell 2001)

of the connection between science and truth. What does this different conception of truth mean for the working definition of science as a foundational unity of true sentences?

In order to answer this question, Heidegger focusses on the difference between scientific and prescientific truth. The difference is that in science, the unconcealment of beings happens explicitly for the sake of this unconcealment itself (Heidegger 2001: 179). In other words: science is theoretical, it is explicitly aimed at truth, at uncovering beings. What Heidegger is looking for, is the specific original act by which our relation to beings changes from a practical, to a merely theoretical one (Heidegger 2001: 179).

He describes this change to a merely contemplative attitude by means of an example. In agriculture we have a practical relation to the land, in which certain features are discovered. When working with a plough, the soil shows itself to have a certain resistance. The plough therefore needs to have a certain hardness in order to be able to penetrate the soil. This relation between resistance and counter-resistance does not itself explicitly become a theme in agriculture, but it does play an important role in this practical context (Heidegger 2001: 181).

Things show themselves in specific ways in our handling of them, giving rise to a familiarity with them. This familiarity is characterized by Heidegger in the following way: "As a rule, things are ordered in that and that way" (Heidegger 2001: 181).¹⁰ Here, 'as a rule' 'In der Regel' in German) literally means 'usually', but by phrasing it this way, Heidegger also refers to the fact that there are rules at work here. When we focus on these rules themselves without looking at the practical context in which they normally play a role, we can see that the rules hold for every material thing and fall under more general laws (Heidegger 2001: 181).

What happens in this change from the practical to the theoretical? Things reveal themselves in a different way. Where before, they revealed themselves as agricultural soil, houses or bridges, now they reveal themselves as material bodies (Heidegger 2001: 184). But not only what they are is revealed in a different way, but *how* they are is also different. Beings no longer show themselves as at hand for practical usage, but merely as material bodies that are present. (Heidegger 2001: 184).

¹⁰ My translation. Original German: "In der regel ist es mit den Dingen so und so bestellt."

Beings are thus redefined and, in this redefinition, reveal themselves as nature. Importantly: we are not dealing with new or different beings, but rather: the being of these beings reveals itself in a different way. This is where Galileo enters the stage. Heidegger treats Galileo as the paradigmatic example of this change in which the being of beings reveals itself in a different way. Galileo's most important insight, according to Heidegger, is that he saw that in order to experimentally examine nature, you first need to have a conception of nature that underlies all your experiments. In other words: you need to fixate nature in a specific way in order to make it experimentally examinable in the first place. Galileo fixates nature in the following way:

[A] context of moving bodies, of beings, the basic character of which lies in their spatial and temporal extendedness, whereby movement is nothing other than the changing of place in time. By means of this basic determination of nature, the plurality of beings is instantly made homogeneous (Heidegger 2001: 187).¹¹

Galileo's defining move, is to make sure that prior to its actual investigation, the being of beings is already understood as nature, as a homogeneous collection of moving, extended objects. It is because of that move, that science becomes mathematical. Only based on a pre-understanding of being that makes beings essentially calculable, can mathematics turn out to be the only right method of investigation.

This understanding of the being of beings as nature precedes any experimental research. Any natural scientific question is preceded by this specific outline of nature. It is striking, however, that even though this preceding outline of nature is the condition of possibility for any type of natural scientific investigation, it never becomes the subject of natural scientific questioning itself (Heidegger 2001: 195).

Heidegger further describes what happens in this process as delimiting a field (Heidegger 2001: 196). In this delimiting of the field of physics, a preceding decision is made regarding what does and what does not count as nature. This alludes to the guiding idea Heidegger took from the third crisis, namely the idea that science is fundamentally finite. Field-delimiting essentially carries

¹¹ My translation. Original German: „[E]in Zusammenhang bewegter Körper, von Seiendem, dessen Grundcharakter in der räumlichen und zeitlichen Ausdehnung liegt, wobei Bewegung nichts anderes ist als Veränderung des Ortes in der Zeit. Durch diese Grundbestimmung der Natur wird die Mannigfaltigkeit des Seienden unmittelbar homogen gemacht[.]“

within it the idea of a limit. In this field-delimiting, beings first show themselves as merely available, as what Heidegger calls *positum* (Heidegger 2001: 197).

Heidegger repeats here, as became clear from his analysis thus far, that science does not first enable a relation to beings. Rather, science establishes itself based on an already existing relation to beings. Beings thus already have to be available in a way, in order for science to be able to grasp them in their mere availability. This grasping is the original act that Heidegger was looking for, the act of field-delimitation that foregoes any actual scientific research.

In the final chapter of the first part of the *Einleitung*, Heidegger connects science with the ideas of transcendence and the ontological difference. In this chapter, he puts our pre-theoretical understanding of being at the basis of this projecting act of field-delimitation (Heidegger 2001: 200). This pre-theoretical understanding of being underlies all our comportments towards the world. And while this pre-theoretical understanding is not itself explicitly ontological, but rather pre-ontological, it is the condition for the possibility for explicitly grasping being and asking ontological questions. Heidegger calls the field-delimiting projection of science an intermediate stage between pre-ontological understanding of being and explicit ontological understanding (Heidegger 2001: 201).

So even if this field-delimiting projection is not an explicit grasping of being itself, there is still an understanding of being at work in it. Prior to all our dealings with beings, we have always already gone beyond them. This going beyond beings in the direction of being is what Heidegger calls 'transcendence' (Heidegger 2001: 206-207).

Transcendence, meant in this way, is part of human existence. The relation between science and transcendence is important, because science needs a transcending move in order to delimit its field of enquiry (Heidegger 2001: 212). However, the transcending move and understanding of being are never itself an explicit part of science. This is also where we arrive at the difference between science and philosophy. In science, the transcending move is always implicit.

The relative brightness of scientific knowledge of beings is surrounded by the darkness of the understanding of being. For even in the ontological projection that happens in the establishment and development and general history of science, being is already understood and delimited in a certain way, but not captured, i.e.,

not specifically comprehended as being (Heidegger 2001: 213).¹²

This is where the three characteristics of science circle back for the third time: it belongs to individual existence insofar as it depends on transcendence, it is activity because the projective transcendent act is an inherent part of it, and it is finite because being itself is never available to it. Philosophy, on the contrary, exists in making this transcending move explicit (Heidegger 2001: 213).

For Heidegger, the relation between philosophy and science, and the possible resolution of the crisis of the sciences, becomes clear in his further elucidation of the notion of ‘transcendence’. Near the end of the second half of the course, in which he deals with the notion of worldview, Heidegger gets back to – and expands on – this notion. Here, he talks about transcendence in terms of his well-known notion of human existence as being-in-the-world. It turns out that the determination of transcendence as understanding of being did not disclose the full picture. A further investigation into the meaning of being-in-the-world will help getting a better grasp at the full meaning of transcendence.

Being-in-the-world means that the being which is in the world is not indifferent with respect to its own being. We exist, Heidegger writes, for the sake of ourselves and because of this we are always confronted with our own possibilities. This gives us the first hint that understanding of being is not a harmless, neutral onlooking (Heidegger 2001: 325). What is at stake in our understanding of being is our being-positing in the world, in which our own being is presented to us as a task. To underline what is at stake in this being-positing, Heidegger further describes this in terms of our being disclosed to both other beings and ourselves. (Heidegger 2001: 326).

At this point, Heidegger stresses that even describing transcendence in terms of being disclosed to other beings, still sounds too indifferent (Heidegger 2001: 328). He tries to adjust this by stating that Dasein is not merely revealed to other beings, but is in the midst of beings, in the sense of being ruled over by these beings. He then expresses this in a peculiar way: “Dasein is *Körper* and

¹² My translation. Original German: “Die relative Helle wissenschaftlicher Erkenntnis des Seienden ist umdrängt vom Dunkel des Seinsverständnisses. Denn auch im ontologischen Entwurf, der geschieht bei der Gründung und Ausbildung und überhaupt in der Geschichte der Wissenschaft, ist zwar Sein verstanden und in gewisser Weise um-gentzt, aber nicht erfaßt, d. h. nicht eigens als Sein begriffen.“

Leib and *life*; it doesn't primarily have nature as an object of consideration, rather it is nature." (Heidegger 2001: 328).¹³ A few lines later he clarifies what exactly he means by nature in this sense: "This is about a fundamentally broader and more fundamental concept of nature: *natura, nasci*, by itself, which Dasein as a free self has no power over" (Heidegger 2001: 329).¹⁴ Nature, meant in this sense, is something that we always already are, and exist in the midst of, but that we have no power over.

What this implies, is that no Dasein chooses its own existence, nor can it say of itself that it exists necessarily. That means, that our existence is in contingent, that we could just as well not have existed at all. Every Dasein relates to this fact of our possible non-existence in one way or another and in that sense we all relate to nothingness (Heidegger 2001: 332). But Dasein's relation to this nothingness goes deeper than the mere insight of Dasein's powerlessness regarding the fact of its own existence. It pervades our relations with objects, others and ourselves, in the sense that we are always scattered among these relations. We must make decisions on where we place our focus, because we cannot do everything. Every decision cuts off specific possibilities.

What this finally alludes to, according to Heidegger, is the baselessness of Dasein (Heidegger 2001: 337).¹⁵ Our existence is baseless, in the sense that it is contingent and without external reason, and there is no laid out path for us. By making certain decisions we are providing ourselves with a basis, but we can only do this because we are baseless. Any of these decisions that we make, constitutes an understanding of being, in which the being of the beings is preliminarily understood in a certain way. However, we can never fundamentally escape the nothingness that lies at the origin of our existence (Heidegger 2001: 340).

Heidegger does not explicitly tie these insights back to the idea of science. But based on what we have discussed so far, it is possible to connect the dots. For Heidegger, science is a way to conceal the baselessness of human existence. By fixating nature in a specific, ordered, homogeneous way, we cover up the fact that to exist as a human being means to be thrown in the midst of

¹³ My translation. Original German: "Das Dasein ist Körper und Leib und Leben; es hat Natur nicht nur und erst als Gegenstand der Betrachtung, sondern es ist Natur."

¹⁴ My translation. Original German: "Es geht hier um einen grundsätzlich weiteren und ursprünglicheren Naturbegriff: *natura, nasci*, von sich her, dessen das Dasein als freies selbst nicht mächtig ist."

¹⁵ Heidegger writes: „Das In-der-Welt-Sein des Daseins, seine Transzendenz, bekundet sich uns als Haltlosigkeit.“

beings over which we have no control; to be at the mercy of the beings we find ourselves surrounded by. Heidegger writes:

This finding oneself is taken as something which Dasein cannot master, which it cannot handle and which remains an essential burden to itself, which it cannot get rid of as long as it exists, which it can only forget, with which it only confirms it more clearly. (Heidegger 2001: 330)¹⁶

Science can accordingly be seen as a way of forgetting this essential burden. Philosophy cannot remedy this by becoming a science, because philosophy as an explicit performance of the transcending movement of human existence, precisely constitutes a recognition of the baselessness of human existence. So even though Heidegger agrees with Husserl that science starts from the world of everyday experience, the problem for Heidegger is not so much that science covers up this everyday world. For Heidegger, the whole scientific impetus of Galileo – which Husserl values to a high degree – is suspect, because it essentially consists in a forgetting, in a covering up of the baselessness of our existence.

5. Science and nature

So here we arrive at the crucial difference between the way Husserl and Heidegger evaluate the crisis of the sciences. For Husserl, the crisis is principally a solvable one. By means of a science of the life-world, the life-world itself is uncovered and the gap between the world of the sciences and the life-world is bridged. This is connected to the fact that for Husserl, a universal science that connects situational truths to scientific truths, finally revealing the entire truth about the world, is something we can attain and should strive for as scientists and philosophers. For Heidegger, the crisis is inherent to the sciences and therefore cannot be solved. Since our existence is baseless and the whole project of science is aimed at covering up this baselessness, science will always be estranged from both our individual, and historico-cultural existence. The internal crisis of the sciences is inherent to science as well, because this crisis essentially refers to sciences being confronted with their own limitations, which are inherent to

¹⁶ My translation. Original German: „Das Sichbefinden ist genommen als solches, dessen das Dasein nicht mächtig ist, das es nicht bewältigt und das als wesenhafte Last seiner selbst bleibt, deren es sich, solange es existiert, nicht entledigen kann, die es nur vergessen kann, um sie damit um so deutlicher zu bestätigen.“

any science due to the act of field-delimitation necessary to establish a field of investigation.

What does this all mean for the possibility of naturalizing phenomenology? There are several conclusions we can reach from what was established. Any notion of naturalism that has a Galilean definition as its corresponding notion of nature is problematic and irreconcilable with philosophy as both Husserl and Heidegger envision it. Heidegger provides an alternative in his more fundamental conception of nature as that which we are, which always precedes us and which we have no power over. However, he at the same time paints a picture of science as an enterprise that is essentially aimed at covering up or forgetting this conception of nature. From this vantage point, even a fruitful collaboration between science and philosophy is hard to envision, since the two disciplines are so essentially different that Heidegger calls the notion of a scientific philosophy "absurd" (Heidegger 2001: 221)¹⁷. Still, Heidegger speaks of a "necessary connection between science and philosophy" (Heidegger 2001: 225)¹⁸, but holds that a "fruitful mutual determination" (Heidegger 2001: 225)¹⁹ between the two disciplines is only possible if the essential differences between them is recognized. Heidegger does not elaborate further on what he understands by this possible mutual determination, but this remark in combination with his overall analysis leads to the question if science and phenomenology cannot work together best when phenomenology is not naturalized at all, but when the differences between the two disciplines and their approaches are cherished instead of pushed aside.

For Husserl, a collaboration between science and phenomenology is very much wanted, albeit not in the form of any kind of scientism or anything like a strong ontological naturalism. Importantly, for Husserl, science and philosophy are similar enterprises, driven by the same scientific impetus of rationally uncovering the world. An alternative notion of nature that fits well with Husserl's proposal of philosophy as a science of the life-world, is that of liberal naturalism, a recent form of naturalism that is at the same time anti-scientistic and anti-supernatural. Instead of accepting "scientific metaphysics" liberal naturalism focuses on "the manifest image" which they characterize as the "nonsupernatural nonscientific realm" and is explicitly identified with Husserl's concept

¹⁷ My translation. German original: "widersinnig".

¹⁸ My translation. German original: "notwendige Zusammenhang der Wissenschaft mit der Philosophie".

¹⁹ My translation. German original: "fruchtbare wechselseitige Bestimmung".

of life-world (De Caro and Macarthur 2022: 1). What this means, is that what this type of naturalism counts as ‘nature’ or ‘natural’ is not a variation of physicalism or any other vaguely defined scientific worldview. Rather, the natural is only negatively defined as the anti-supernatural (De Caro and Macarthur 2022: 2).

What is problematic about this definition, is that its defenders are reluctant to further define what exactly they mean by the supernatural. Rather than defining it, De Caro and Macarthur state that liberal naturalism considers “the question of the supernatural as a vital topic for further research” (De Caro and Macarthur 2022: 2). So rather than explicitly stating what this anti-supernaturalism is meant to rule out, they define its mission in terms of: making sure philosophy doesn’t lose touch with reality, which is then further explained by saying liberal naturalism means to make sure that our knowledge of the world “is suitably tethered to the empirical realm” (De Caro and Macarthur 2022: 2). Interestingly, they define reductionist scientism as a view that has lost touch with reality, while the following passage suggests a close relation between ‘the empirical realm’ and Husserl’s life-world:

Philosophers in the scientific age we are currently living in have been so focused on the sciences, particularly the natural sciences, and how philosophy relates to them, that they have overlooked the world under their own noses. (De Caro and Macarthur 2022: 2)

So, if nature is indeed identified with the phenomenological notion of the life-world – as the passage above seems to suggest without explicitly stating it – then this would bring Husserl’s phenomenology and naturalism very close indeed. However, in order to fully evaluate this connection, more work needs to be done in clearly demarcating the supernatural. It also begs the question whether ‘naturalized phenomenology’ explained in terms of the liberal naturalist’s idea of nature actually ‘naturalizes’ phenomenology in any meaningful way.

6. Conclusion

In conclusion, Husserl and Heidegger both agree that the sciences of their time are in a state of crisis. According to Husserl the crisis consists in a severing of the connection between ethico-political and existential questions on the one hand and science on the other, a severing of the sciences from one another, an obscured relation to truth, and the existential impact of the loss of faith in rea-

son. Husserl traces this crisis back to Galileo's mathematization of nature. According to Husserl's analysis, Galileo was a concealing genius, who took up and expanded on the existing project of geometry in his time, thereby covering up the origin of this discipline in the life-world, essentially burrowing the life-world under a 'garb of ideas'. This crisis can be solved by means of a science of the life-world, which uncovers said life-world and reinstates the relation between the life-world and the scientific domain.

For Heidegger, the crisis of the sciences consists of a crisis of the internal structure of science, a crisis in the relation between science and historico-cultural existence, and a crisis in the relation between science and individual existence. Like Husserl, Heidegger traces this crisis back to Galileo. According to Heidegger, Galileo's defining move was to preliminarily understand all being in terms of nature. This move is a transcending move, whereby the being of beings is always already understood. This transcending is part of human existence: we are thrown in the midst of beings over which we have no control or power. Our existence is baseless, we do not choose our existence and there is no reason for it. Science is a way to cover up this baselessness. Therefore, following Heidegger's line of thought, the crisis is inherent to the sciences.

From both a Husserlian and Heideggerian perspective, the conceivability of a naturalized phenomenology hinges on the exact definitions of 'nature' and 'science' that accompany the notion of 'naturalism'. Any understanding of naturalism as physicalism, scientism or both is clearly at odds with some of the central tenets of both of their philosophies. The notions of 'science' and 'nature' accompanying the notion of 'naturalism' thus need to be critically examined and revised in order to arrive at a naturalized phenomenology that phenomenology's founding fathers would be pleased with.

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