How to Know the World in Opposition to Skeptical Approaches: The Possibility, Inference, and Theoretical Position of Scientific Knowledge Within the Popperian-Lakatosian Framework After the Construction of Reality

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Abstract

This philosophical study focuses on the possibility, inference, and theoretical position of scientific knowledge with a critique of Popperian and Lakatosian ideas in regards to the scientific procedure, after a comprehensive investigation of the fundamental skeptical arguments of philosophy having the potential to undermine the establishment of scientific knowledge along with a threat to human knowledge altogether. Albeit the Agrippan Problem, at first, seems to threaten the possibility of not only scientific knowledge, but human knowledge entirely, it can be solved in concur with the examination of Cartesian skepticism through the constitution of an ontological ground upon which reality is constructed; this allows to set basic beliefs—human knowledge is possible. Subsequently, espousing realist and materialist scheme of reality, in parallel with basic beliefs posed by the scheme, renders the survey of scientific knowledge possible, by virtue of the reliance upon sensory experience. Nevertheless, the attack of inductive skepticism against the scientific methodology by repudiating inductive inferences in science casts a shadow over the possibility and inference of scientific knowledge. Yet, the existence of certain, verified, and irrefutable hypotheses evidently shows the possibility of and by the use induction to some extent, revealing the impossibility of falsifiability and applying deductive reasoning demonstrate the inference of scientific knowledge. Furthermore, within a theoretical framework wherein verified hypotheses —scientific knowledge— are positioned in the hardcore and updatable hypotheses are located in the protective belt, more systematic and comprehensive inferences and more accurate predictions can be made.

Keywords: Knowledge, The Agrippan Problem, Cartesian Skepticism, Inductive Skepticism, The Falsifiability Principle, Scientific Knowledge, Hypothesis, Theory, Hard Core, Protective Belt

If we glance at the history of science, it becomes conspicuous that science has changed our lives drastically over the course of human history. It has been systematically and scrupulously performed for many centuries by people dedicating themselves to deciphering abstruse enigmas of reality and that has led humanity to numerous groundbreaking discoveries.

It is always thought that science is a product or even a branch of philosophy, but peculiarly, there are also some philosophical arguments, specifically, skeptical theses implying that science, in fact, cannot be performed and therefore, scientific knowledge is impossible on the grounds that not only is the knowledge of the world impossible, but we can never know *anything* whatsoever. Moreover, even if, the skeptical argumentation follows, we can know, making a judgment about the certain and general principles of the world to explain how phenomena take place is impossible. Nonetheless, if we assiduously examine those skeptical strategies, it can be argued that scientific knowledge, in the end, is possible and inferable; and its theoretical positioning with the critique of certain frameworks in the philosophy of science concerning the scientific procedure can provide more structured and extensive inferences and more reliable predictions can be made within the context of scientific theories.

Can we really know?

To begin our quest, first and foremost, we should introduce the skeptical arguments that we are going to challenge. There are two fundamental philosophical skeptical problems: *Agrippan* and *Cartesian*, each rooted in a distinctive pattern of argument and the former has an epistemological character, concerning what and how we know, whereas the latter has a metaphysical or ontological attribute, dealing with the nature of being.

The Agrippan Problem, which has a very long history and can be traced back to Pyrrhonist philosopher Sextus Empiricus, questions the possibility of "any" knowledge with a universal attitude through five modes which are argumentative strategies for inducing suspension of judgment in the justification of knowledge. The modes can be epitomized as follows (Williams, 2001):

1. Discrepancy: People can disagree about anything.

2. Relativity: Claims can be relative in any discussion.

3. Infinity: To pursue the justification chain of a claim (Infinite regress).

4. Assumption: To cease the pursuit of justification (Dogmatic assumption).

5. Circularity: To repeat the same assertion (Circular reasoning).

Knowledge, in the philosophical sense, is simply defined as true justified belief and certain understanding, as opposed to mere opinion. This is why justification is of great importance in a claim put forward as knowledge and that is exactly what the Agrippan Problem deals with: Trying to see whether or not a belief can be justified or knowledge is possible at all. If we dissect these modes so as to assess them in detail, it can be, then, realized that the first two modes of the problem are not included in the search of understanding whether knowledge exists since their examination field is not related to this, but they, in lieu, try to give best reasons to claims with the presumption of the existence of knowledge beforehand. The last three modes, in contrast, create the genuine issue in our investigation by unveiling challenges in the sense of having foundational knowledge (This is one of the reasons that the Agrippan Problem is also known as *the Agrippan Trilemma*). Once someone makes a claim, asking its rationale or why he or she puts forward this claim is surely a natural and necessary behavior in a discussion. The real difficulty for *the mode of Infinity* starts at this point. If the person who makes the claim gives his or her reason, asking the reason of the reason becomes ineluctable as a further questioning. If we have an answer to this question, the same happens once more: asking the reason of the reason of the reason. This questioning process, as it can be seen, has the potential to continue forever. As a result, that we cannot have the ultimate justification of an assertion does not allow us to know anything whatsoever. In comparison, *the mode of Assumption* has a completely different feature. It suggests putting an end to the process of infinite regress in order for an ultimate justification to be possible by means of an assumption, but we encounter another problem: Statements offered in the justification chain of a claim must themselves be justified since a justification cannot be based on mere assumptions. This mode, therefore, cannot be held either as an option giving us knowledge. Lastly, *the mode of circularity* offers to justify an assertion by itself. However, reasoning in a circle, indeed, states poor reasoning due to the fact that a statement, simply, cannot support itself. This mode, hence, is also eliminated. After all, one who scrutinizes this problem may come to the conclusion that knowledge is impossible and that this situation, in fact, encompasses human knowledge altogether. When these modes are analyzed one by one, as we have just done, the Agrippan Problem may seem quite reasonable against the possibility of knowledge. Yet, we should continue our inquiry to see if this is conclusive evidence to be a skeptic.

The Agrippan Problem seems to establish the conclusion that knowledge is impossible. Quite the contrary, this conclusion brings about a paradox or contradictory situation that prevents stability in the defense of the argument: We, now, have the knowledge that knowledge is impossible, which, in turn, makes us withdraw the claim

that knowledge is impossible, but again, an investigation on knowledge like this leads us to the conclusion that knowledge is impossible … and so on. Consequently, the idea that knowledge is impossible becomes untenable, and this result, as a matter of fact, shows that *knowledge is necessarily possible*. Nonetheless, it is not possible to abstain from the Agrippan Problem, because the concept of knowledge is intrinsically associated with justification; the Agrippan Problem reckons all the ways of justification. In summary, we, somehow, know that we know, but we do not know how we know; because we do not know how we can justify our beliefs. We are, correspondingly, enforced to base knowledge upon one of the modes in the problem, particularly one of the last three (the trilemma), since the modes in the trilemma are not compatible with each other to be held together. When it comes to how to use the trilemma, finding this requires further research which is inextricably connected to the Agrippan Problem. We must do an ontological investigation on the grounds of the inseparable connection between knowledge and reality: We try to justify our beliefs in a world. This is not simply a language game, and our beliefs correspond to things in reality. Besides, how the reality in which we live is related to how beliefs are tried to be justified in accordance with suitable methods. For that reason, we must shed light on the nature of reality through ontological research.

How this reality is real?

The way we do this research is associated with our next skeptical approach: *Cartesian skepticism*. This type of skepticism was introduced by French mathematician and philosopher René Descartes (1641) whose aim was to construct the absolute reality by using doubt as much efficaciously as he could. The reason that he valued doubt a lot was that he thought the absolute reality needs certain ground and cannot depend upon doubtful phenomena. Cartesian skepticism essentially holds that the knowledge of the external world is impossible. We cannot even know whether or not the external world exists. Human beings may be deceived by an evil demon in a way that they cannot distinguish the real world and the world in which they live. There are also different versions of the same argument, such as the dream argument and, as a modernized version, the brain-in-a-vat argument. We may be, in fact, in a dream and not be aware of this situation or we may be brains in a vat which were removed from our bodies by a mad scientist making us think that we experience the real world through connecting the neurons of our brains to a supercomputer which simulates the reality that we experience (Putnam, 1981). Therefore, we cannot genuinely know anything about the external world. The argument has seemed compelling so far, but it is far from the whole story. Once we ponder upon the argument attentively, it can be comprehended

that Descartes puts forward this problem from the internalist perspective in which one looks at the world only by the consideration of one's own vista. This perspective, however, leads to solipsism—the idea that one can only be sure of one's own existence. That results in a predicament from which we cannot escape, but fortunately, the opposite approach of the internalist perspective, as an alternative, can help us constitute reality: The externalist approach wherein one looks at the world from a broader view in relation to the external world. The focal point of this strategy is that in the case of finding an inseparable and common connection between the internal and external elements, a transition from the certain to the doubtful area can be made with the increment of certainty in the doubtful field. In other words, in lieu of being stuck in the internal world that includes certitude in terms of being sure of one's own presence without any knowledge as to the external world, we can come to know the external world by a transition from the internalist to the externalist perspective. Luckily, we *do* have this sort of connection. It is evident that when some changes occur in the brain, we see a relation between the inner state (thoughts, feelings, perceptions, behaviors, and so on) and the brain that is connected to the external world which is independent of our existence and has a material structure, as we experience by common sense. Conversely, one can affect his or her brain by his or her actions. Yet, consciousness and the sense of the self, moreover, can wither away with the damage or demise of the brain. This situation indicates that consciousness and the self are located in and generated by the brain and that since the external world plays an essential role in our existence we can make a direct transition from the internalist to the externalist approach through reducing "mental states and consciousness" to "material phenomena" -the results of material interactions- without appealing to supernatural, immaterial factors: We live in a material reality that exists independently of our existence—*materialist* and *realist* understanding of reality.

When we construct reality within this materialist and realist scheme and see the place of the self, finding a solution to Cartesian skepticism becomes possible with eschewing solipsism. On the other hand, it is closely wedded to the Agrippan Problem in respect of the possibility of knowledge, regardless of the constitution of different ontological structures. That is to say, even if reality were established within a different scheme, the questions of the possibility of knowledge would remain and become a subject of the epistemic inquiry operated through the Agrippan Problem with regards to how beliefs are justified in a different scheme. If, as we saw in the course of analyzing the Agrippan Problem, knowledge is possible, then we are eventually forced to depend on knowledge upon the Agrippan Trilemma so as to determine how knowledge appears because these three modes are the ultimate ways of finding a

justification for a belief to be knowledge. On the contrary, if knowledge is possible and we are obliged to depend on the trilemma; without using the simple paradox that makes us withdraw the claim that knowledge is impossible through which we come to "know" that knowledge is impossible, how can we possibly reach the conclusion that knowledge is possible (or any knowledge) by using one of the modes of the trilemma which do not provide the possibility of knowledge? At this point, we must realize the fundamental reason behind the Agrippan Problem and along with that, change our attitude toward the mode that paves the way for justification. The Agrippan Problem, specifically the trilemma, is the consequence of not adopting an ontological scheme. When, in other words, there is no ontological ground, as an anchor, upon which reality is constructed, this situation, basically, causes, as a whole, an endless questioning process (the mode of Infinity) by not allowing to establish basic beliefs through regarding those as dogmatic assumptions (the mode of Assumption) that cannot support themselves (the mode of Circularity) and knowledge, consequently, becomes impossible. Yet, when we have an ontological scheme by the acceptance of *the mode of Assumption* in a way that the endless search of justification can be forgone by virtue of non-inferentially credible or self-evident basic beliefs that do not need to be justified, knowledge can be established. In our case, once the realist and materialist scheme is espoused, the belief that things in reality exist independently of our existence and comprehension and that matter is the fundamental content in reality is a self-evident basic belief (or knowledge) on which the rest of human knowledge is built.

When it comes to how we expand our knowledge, this scheme, necessarily, suggests, that the most basic way to learn things in the world is surely our sensory experience on the grounds of the fact that this is the way we interact with reality, but our bare sense organs do not help us all the time in the context of more sophisticated investigations such as scientific research. Since sensory experience is used to collect data from the world, the fundamental tools of science (or the scientific method) are observation and experiment. Within scientific research, in order to establish scientific knowledge that stems from an elaborate procedure, in short, hypotheses (basically proposed views in the purpose of explanation with limited evidence as a beginning point for further examination), firstly, are constituted about phenomena tried to be explained and then, a lot of observations and experiments (if possible, data from different fields of science is used) are performed to see whether or not the results of those are compatible with each other and what is predicted in hypotheses. Causes and effects of investigated subjects and general rules of the universe, in this way, are tried to be demonstrated.

Is science still possible?

Everything, so far, has seemed great in the inquiry of scientific knowledge. Firstly, we started showing that knowledge is possible by examining the Agrippan Problem— which holds the opposite view— and later on, after our realist and materialist construction of reality, we attempted to solve Cartesian skepticism—leading to dark solipsism— in virtue of non-inferentially credible, basic beliefs that present the ultimate solution to the Agrippan Problem. We, then, reached the conclusion that within our ontological framework, the way we know the world is our sensory experience, but our bare sense organs are not adequate for complicated scientific research and that the scientific method, in this case, is used to establish scientific knowledge that is inextricably connected to causality discovered through observations and experiments to explain how things happen. Yet, Scottish philosopher David Hume (1740), at this point, objects to the last aforementioned statement by arguing that induction does not exist, implying that cause and effect relationships cannot be founded. He states as follow:

> "The only connexion or relation of objects, which can lead us beyond the immediate impressions of our memory and senses, is that of cause and effect; and that because it is the only one, on which we can found a just inference from one object to another. The idea of cause and effect is derived from experience, which informs us, that such particular objects, in all past instances, have been constantly conjoined with each other: And as an object similar to one of these is supposed to be immediately present in its impression, we thence presume on the existence of one similar to its usual attendant. […] [P]robability is founded on the presumption of a resemblance betwixt those objects, of which we have had experience, and those, of which we have had none; and therefore it is impossible this presumption can arise from probability" (p. 150).

What he, basically, expresses is that we create cause and effect relationships by using our past experiences. Suppose, for example, that there are two separate billiard balls on a billiard table and that one of which is moving and hitting the other one. What would we expect before this happens? Sure, we say, the ball hit by the other one will move too, but why does it move after this collision? What is the reason behind this prediction? As a response to it, we also say that it moves, because there is a cause and effect relationship: This is a natural result. Hume, however, would claim that we, in fact, do not know whether this will happen, but instead, we assume causality between them by relying upon past situations we observed in which the ball hit by the other moved every single time. By contrast, that we *assume* this causality does not obliterate the probability of that situation and the very problem as to this probability emerges at

this point: It is *probable*, not certain, and correct predictions that come with probability does not count as *knowledge* (true, justified belief and certain understanding, as opposed to opinion). This problem causes *inductive skepticism* (also known as *the problem of induction*) that seems to be against the possibility and inference of scientific knowledge and this is our last type of skepticism after Agrippan and Cartesian. Inductive skepticism comprises two general cases (Henderson, 2020): The first one is what we have just delineated: Causality. The second case is generalizing about the features of objects by dint of some number of observations. The most classic example explaining this kind is the inference that all swans are white, by means of the observation that all the swans that have been seen so far, by an observer making this inference, were white. The problem concerning the matter of this case of induction is basically the same: It is *probable* that the inference that all swans are white is true. We do not have certainty about it, because observation of a swan that has a different color can obviously refute it. If induction (inference of a generalized conclusion from particular instances) is impossible, then how can science be performed in a way of reaching general and absolute conclusions about the world? Can we not have scientific knowledge at all?

On this occasion, Austrian-born British philosopher Karl Popper (1963) takes to the stage and attacks induction by claiming that "Induction, i.e. inference based on many observations, is a myth. It is neither a psychological fact, nor a fact of ordinary life, nor one of scientific procedure" (Popper, p. 53) and champions the view that science can be maintained *without* induction. Popper's main concept around which he constitutes his philosophy, in contrast, is *the Falsifiability Principle*. According to Popper, scientific hypotheses and theories have only the potential to be refuted, in lieu of being confirmed. If a hypothesis is put to severe testing and is not falsified, then it is said to be, in Popper's terminology, *corroborated*. Notwithstanding the positivity of the term "corroboration" and its evident lexical proximity to the word "confirmation", he insists on the idea that corroboration is not a confirmation. Even if a hypothesis or theory were corroborated one million times, we could not say that it is confirmed and this does not give us the reason to think that corroborated hypotheses or theories have better future predictive success, because if it were the case, it would mean induction (Salmon et al., 1999). In a nutshell, the veracity of scientific hypotheses and theories cannot be known. If so, how do we reach conclusions in scientific research? He proposes that "The actual procedure of science is to operate with conjectures: to jump to conclusions" (Popper, 1963, p. 53). At that point, the question that we should ask is: If scientific hypotheses and theories that include propositions about reality cannot be verified, can we then really know anything by means of science? Popper asserts that

we jump to the conclusion with conjectures, but this sort of conclusion is, indeed, not knowledge, but *an unjustified assumption* in the absence of confirmation. We, after all, are left with nothing to say about how nature is with certitude. Therefore, it is clear that within the Popperian framework, scientific knowledge does not seem possible. When it is argued that induction includes probability and that propositions inferred through induction have the potential to be falsified, considering that knowledge contains certainty, this makes sense that induction alone cannot be used as the chief source of the scientific procedure, because all scientific propositions posed by this method, in the end, would depend only on probabilities and that would cause instability and chaotic situation in science in the absence of certainty. Hence, we need further explanations for the scientific methodology and at this stage, a different viewpoint can provide a way for an explanation.

Even though we have concluded that scientific knowledge is not possible within the Popperian framework, it can still be held by reason of its main concept: the Falsifiability Principle. Since verification is impossible, we cannot be certain about the truth of scientific hypotheses and theories, but in regards to the falsity of those, we can emphatically be certain. If, in parallel, we have a hypothesis or theory that does not have the possibility to be rebutted, then the statement that it is absolutely true cannot be made. In opposition, if a hypothesis or theory could not be falsified by any means, how would we react to it? Some people, especially proponents of the Popperian framework, would say that it is impossible, but it is obviously far from the truth. Some examples, briefly, could be the best way to construe this issue. Consider the fact, from biology, that all humans have a common ancestor with chimpanzees (Nick Patterson, Daniel J. Richter, Sante Gnerre, Eric S. Lander & David Reich, 2006). As another similar example, all humans are primates (Kimbel & Martin, 2013). Here is a more straightforward one: The Earth is round. Likewise, the universe is older than six thousand years. These are some examples over which there is no (genuine) doubt about their veracity and these will never change at all. The question is now: How can we be that certain? As we have indicated, we cannot conclude a scientific hypothesis or theory only by finding evidence for it due to the problem of induction and at the same time, we must put it to severe testing to see whether or not it can be refuted. The confirmation of a hypothesis (not theory) lies at the heart of this step. If a scientific hypothesis (that can be tested through observation and experiment) has *no* potential to be falsified at all, then it is regarded as a certain, confirmed hypothesis which becomes scientific knowledge. In the scientific procedure, induction, at first, is used in the constitution of hypotheses to make probable predictions and if hypotheses are confirmed, then deduction (the certain way of reasoning without probability) takes

place to constitute certain conclusions with the use of a confirmed hypothesis. Take our first example to explain this: All humans have a common ancestor with chimpanzees. Suppose that after an examination a scientist finds out that the person he or she examined has a common ancestor with chimpanzees. Then, the scientist continues his or her research by examining more and more people and reaches the same conclusion. Afterward, he or she proposes that all humans have a common ancestor with chimpanzees. What the scientist does here, surely, is to use induction. However, critically, we should ask whether this is a hasty generalization. At this point, some requirements, namely, the *independency* (conducting research independently of different researchers to see whether reaching the same results is possible), *reliability* (being able to see whether research is done by experts), *transparency* (being able to learn how research is done from its beginning to its end to see whether there is a manipulation), and *retestability* (being able to repeat a test to see whether reaching the same results is possible) of scientific research become crucial. There is no a decisive formula of ascertaining when a hypothesis that has evidence can be reckoned as that which cannot be falsified and turn out to be scientific knowledge, but over the course of time, after hypotheses are rigorously tested by scientific communities all around the world (that have, all the time, highly critical manners to hypotheses and theories; especially when there is a new one), those are verified and become scientific knowledge in such a natural process. As such, the knowledge that all humans have a common ancestor with chimpanzees is a product of this sort of process. There are numerous studies demonstrating evidence from various fields like phylogenetics, anatomy, paleontology, and so on (Nathan M. Young, Terence D. Capellini, Neil T. Roach, & Zeresenay Alemseged, 2015), and after a long critical research process, scientists came to the conclusion that this hypothesis cannot be falsified; therefore, it is certain. In doing so, we, in a sense, *infer* scientific knowledge —that is not self-evident — from self-evident, basic beliefs by means of observations and experiments and indeed, this shows that knowledge we infer stems from reality like basic beliefs and we do not invent it, but *discover* it. This is why scientific knowledge is certain, unfalsifiable, and unchangeable.

With regards to how deduction takes place for drawing certain conclusions with the use of inferred knowledge in science, a deductive argument as an example wherein the knowledge that all humans have a common ancestor with chimpanzees is used can simply epitomize the situation:

1) All humans have a common ancestor with chimpanzees.

2) Socrates is a human.

∴ Socrates has a common ancestor with chimpanzees.

Deduction is the reasoning system where if the premises of an argument are true, then the conclusion must be true. In our example, we now know that all humans have a common ancestor with chimpanzees. Instead of examining everybody to see if this is the case, we have a true premise that tells us so. As a result, knowing that Socrates is a human proves that he has a common ancestor with chimpanzees. It can be argued, by way of conclusion, that we are not circumscribed by probabilities and that we can make certain inferences in science. However, being able to reach certitude does not mean that we should relinquish hypotheses that contain probable conclusions. These are of great significance for the inference of scientific knowledge in the scope of theories.

How scientific knowledge and hypotheses are located in theories

So as to grasp the value of hypotheses in theories, first and foremost, we should clearly understand the difference between a hypothesis and theory. A hypothesis is an assumption aiming to explain a particular phenomenon or a reasoned prediction of a possible causal relation, whereas a theory is a set of explanations that includes verified and supportive components. An example, in order to elucidate this distinction, can be given, and to provide integrity for clearer understanding, we can use a related theory to the knowledge that all humans have a common ancestor with chimpanzees: The theory of evolution. This theory, fundamentally, posits that changes in the characteristics of organismal lineages occur over generations, in accordance with inheritable genetic variations that result in biodiversity and speciation —that is, living beings change and evolve (Scheiner & Mindell, 2020). These are some main tenets of the theory. Establishing such tenets (or discovering such principles) requires comprehensive, fastidious, meticulous, and congruent studies that lead to the fact that it is unfalsifiable. On the other hand, there are also probable and falsifiable, but consistent assertions in a theory, known as hypotheses. For instance, a few years ago, it was thought that the oldest humans (homo sapiens) lived in Eastern Africa approximately 200.000 years ago, but more recent studies concerning fossil records have shown that humans lived also in Northern Africa, at least, about 300.000 years ago (Hublin, J., Ben-Ncer, A., Bailey, S., et al., 2017). As it can be discerned, the former hypothesis cannot be confirmed, due to the fact that it is falsifiable (and falsified) and this is also valid for the latter hypothesis because of the same reason. In this sense, we can define these as *updatable hypotheses*. Nonetheless, these sorts of hypotheses are still substantial for us in theories, since albeit we cannot completely rely on them, they help us come close to the truth and strengthen our predictive power through consistency and suggestiveness. Within the context of these hypotheses, we can now, for example,

put forward that homo sapiens may have lived much earlier in subdivided populations across the continent, not only in Eastern Africa in one population (Eleanov M. L. Scerni, et al., 2018). Conversely, there can also be *verifiable hypotheses* that become scientific knowledge like our example that all humans have a common ancestor with chimpanzees. Hence, it can be said that scientific knowledge is a *verified hypothesis*. However, how can we classify or locate these two different types of hypotheses in theoretical structures to have a more comprehensive and systematic apprehension of the explanation of phenomena?

Hungarian philosopher Imre Lakatos (1980), at this point, presents a feasible solution by the introduction of a novel concept: *Research program*. He, clearly, describes what a research program is as follows:

> "[T]he typical descriptive unit of great scientific achievements is not an isolated hypothesis but rather a research programme. […] Newton's theory of gravitation, Einstein's relativity theory, quantum mechanics, Marxism, Freudianism, are all research programmes, each with a characteristic [*hard core*] stubbornly defended, each with its more flexible [*protective belt*] and each with its elaborate problem-solving machinery" (Lakatos, p. 4-5).

The main concepts that we are going to take into account are, specifically, the "*hardcore*" and "*protective belt*". According to Lakatos, the hard core consists of its basic assumptions or axioms that are unfalsifiable cardinal principles, whereas the protective belt surrounds the hardcore and comprises flexible assumptions open to criticism. Besides, the hardcore of a research program cannot be forsaken without abandoning the program entirely. Yet, the problem is that if the hardcore includes unfalsifiable central tenets, then by giving up the research program, that which is done is to abandon verified and certain assumptions —knowledge. If it were done, the hardcore would not consist of unfalsifiable and certain elements. In that case, being certain and reaching any scientific knowledge could not be guaranteed. Therefore, a scientific theory should be diligently established in a way that the hardcore includes only unfalsifiable, certain, and verified assumptions and falsifiable and updatable hypotheses should be located in the protective belt as consistent, suggestive, and supportive components. When, in this way, inconsistent or contradictory evidence is found against an assumption in a theory, the theory can be updated by way of the revision of hypotheses in the protective belt. Thus, the possibility of the inference of scientific knowledge can be guaranteed. Furthermore, we can claim, as a result, that theories can be neither confirmed nor falsified. We cannot confirm, because assumptions in the protective belt can be refuted; and we cannot falsify, since assumptions in the hardcore cannot be confuted. As it is the case in our example, the

finding that the oldest homo sapiens lived, at least, 300.000 years ago, instead of 200.000 years, does not falsify the theory but causes a revision as to hypotheses in the protective belt concerning human evolution. Likewise, as a completely consistent and predicted hypothesis, confirming, by an exhaustive examination, that all humans have a common ancestor with chimpanzees does not verify the theory either. This confirmed hypothesis, rather, turns out to be scientific knowledge through its certain inference after research and becomes a part of the hardcore to perpetually consolidate the theory and allow different inferences within its theoretical framework.

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