Science: the influence of societal perspectives and values on the field

Life

If science is not free from value, it implies that science has been constructed in a way which it is influenced by its context; furthermore, science should not be given the authority of being an absolute truth. However, when one philosophizes about whether science is a construct or not, one is not so concerned as to what the absolute truth is, what is and what isn't, but rather why do we know what we know, can it be trusted and why do we not know what we don't. " Determination of our representations of the world (including our ideas, concepts, beliefs, and theories of the world) by factors other than the world or our sensory experience may undermine our faith that any independent phenomena are represented or tracked, undermining the idea that there is a fact of the matter about which way of representing is correct" (Mallon, 2013).

There seem to be some obvious examples of instances when science has been influenced by societal perspectives of the time. For example, the idea of eugenics- which was soon debunked as a pseudo-science, meaning that it technically no longer falls under this essay's point of inquiry; however, it does serve the purpose of revealing that, at least for some period of time, science is certainly not value free. However, this essay is not so concerned with specific aspects of science that may be directly affected by the values and beliefs of the time; I am more concerned as to whether science as an idea and practice has the ability to be impermeable to social conditions. If this is the case, then science maintains a degree of authority over studies like anthropology and political science.

The three ' sticking points', as highlights be Ian Hacking, reveal many imperfections in the constructionist argument. His main points of contention

can be divided into sections: contingency, nominalism and stability. Contingency purports that it is not inevitable that we should encounter the type of theories that we do. Nominalism expresses how our understanding of the world can prevent some scientific endeavor. Lastly, constructionists argue that the stability of the scientific community is determined by external factors. After discussing these points in the order in which they are presented here, I conclude that there are, indeed, some aspects of science which are not value free.

Contingency

Social Constructionists believe that science was not predetermined to follow the path that it did; it may have developed in a very different way. This is similar to the Duhem-Quine problem as constructionists are inferring that when a hypothesis is falsified, there are multiple paths which could be followed and many reasons why the hypothesis may have failed to be corroborated. Thomas Kuhn agrees that after a revolution or a crisis there are many possible ways to progress. Scientists generally disagree with this and believe that science inevitably leads to the truth.

A great misunderstanding when one encounters this sticking point is to assume that constructionists are suggesting that physical discoveries, like quarks, are socially constructed; this is not the case. It is the idea of quarks which constructionists call into question (Hacking, 1999: 69). Pickering claims that the idea of a quark was not inevitable. Furthermore, he suggests that physics could have taken an equally successful path, which was not dependent of the idea of quarks, that may have emerged had it not been for

the scientific interests post-World War II (Hacking, 1999: 69). Pickering does not suggest that quarks may not exist, but he claims that physics might not have taken a route determined by the idea of quarks. In short, physicists claim that there is an over-arching physical truth, which is inevitably discovered and understood, to greater degrees, the more the study of physics progresses. Pickering contests this idea with the bold conjecture that there are multiple ‘ branches’ of physics which we may follow, and the following of this particular branch is made based on social and cultural constructions of the time. Pickering is not so concerned with the metaphysical definition of ‘ truth’ but rather with understanding three other terms: ‘ resistance’, ‘ accommodation’ and ‘ robust fit’ (Hacking, 1999: 70).

Resistance refers to how nature reacts to scientific conjectures by either corroborating or falsifying a hypothesis. Scientists then adapt to this resistance by reformulating their hypothesis, modifying the apparatus and correcting beliefs etc.- this is referred to as accommodation. Once this process of resistance and accommodation reaches, for lack of a better word, an equilibrium, we can say that a ‘ robust fit’ has been formed by the end product of all these elements. Pickering’s understanding of this process leading to a robust fit is similar to the Duhem-Quine problem given to contest Karl Popper’s claim that science is rational. This problem states that no hypothesis is tested in isolation:

“ Suppose that an experimental observation is inconsistent with a speculative conjecture expressed within the context of a theoretical model. That does not automatically refute the conjecture. For the observation is

inconsistent only with the conjecture as it is used in the model, when taken together with auxiliary hypotheses about how the apparatus works.”

This problem is a strong refutation and therefore adequately contests the claim that science is not constructed, in some way, and therefore not entirely value-free. Although Pickering illustrates that contingency is indicative of no predetermination, it does not mean underdetermination . He claims, instead, that even if a hypothesis’s falsification is predetermined, the manner in which it is falsified and how scientists accommodate this resistance is not predetermined. This avoidance of underdetermination makes the constructionists’ point more feesible- as it is not proposed by Pickering that scientists collectively chose which path to take, but their values and context affected the manner in which they adapted.

An interesting, but not very strong, objection to the point of contingency is that of ‘ alien science’. Sheldon Glashow claims if we were to encounter an alien, its fundamental physics would be the same as what we have understood in terms of physical laws. This claim could unhinge the constructionists’ argument, as it implies that any society in the universe would produce essentially the same idea of physical science, no matter their values. Fortunately for the constructionist, this claim has a major flaw. We would be unable to know for sure that what they have written is the same as our physical laws. “ We think we have translated the language of these beings only if we have translated their physics into something like ours. Hence translation begs the question of equivalence” (Hacking, 1999: 75). The initial claim is also tautological because we would only agree that aliens

express physics if we were able to translate their statements into what we recognize as physics. Steven Weinberg attempts to rebut this by saying that there are certain laws which must be deducible from any sound physics. This need not be the case, as certain inventions that rely on specific theories may have been created without the explicit discovery of the laws to which the invention conforms.

Physics, indeed, could have developed in a manner which was not determined by quarks but be equally as successful. Furthermore, this alternative branch of physics may not have been corresponding with the physics we know today. Physicists reject this second claim as there is no evidence of an alternative path which may have been followed. They say that there are some things which are absolutely noncontingent. But, the contigentist refutes this by saying that the laws offered as the examples of those physicists' claim are not necessary inevitable.

Given this discussion of contingency, I think it is fair to say that there is a reason to believe that science is not value free as it is constructed, in some way, by its context as we respond to certain failures of experiments in different ways. However, this does not mean that physical laws are untrue, it simply means the reason why we know things and don't know other things is determined by values. A significant question left open by this point is whether physics has multiple paths leading to different truths (according to constructionists), or whether we inevitably progress towards the truth no matter which path upon physics progresses (according to most physicists).

Nominalism

A nominalist claims that the manner in which we assemble things in a group is totally arbitrary and therefore constructed. The most obvious example of this is constellations. There are no classifications that objectively exist- we simply construct them. While Socrates is often quoted as speaking of carving nature at the joints, nominalists claim that nature has no joints by which to be carved (Hacking, 1999: 83). When we construct a category, we are influenced by our values. Therefore, according to the nominalist, science is not value free.

A point which explains this well is Goodman and the new riddle of induction. Goodman points out that even if we ignore the problem of induction which Popper tries to refute, we will still confront an epistemic issue: If every emerald we have ever seen is green, we can pose the theory that all emeralds are green. Now, if we are the theorize that all emeralds are ‘ grue’- meaning that they will be green up until 2020 but blue thereafter, we encounter a problem. The same set of data and sound inductive inferences lead to two contradictory theories. According to the first inference, the first emerald we see in 2020 will be green, but according to the other theory, the emerald will be blue. Even if we agree that the future will represent the past, we still have to establish which classification to use in order to conduct our science. Goodman claims that the only fundamental difference between green and grue is that we can comprehend green because it is a concept which exists in our language. The difference is contingent on our understanding rather than any truth about the physical world. This

successfully reveals that science is dependent on our constructed understanding of the world and hence is not free from value.

Another point regarding nominalism is termed Putnam and Conceptual Schemes. This problem makes the claim that the world is built out of an undeterminable number of parts. For example, if the world is only made up of three elements, we could also say that the world is made up than more than three elements by adding one element to another element and arranging them in different ways. This relies on classical mereology. I would dispute this point by saying that even if a part is constructed by two initial elements, it can still be divided into those initial elements, meaning that only three essential elements exist in order to make up every other element. However, just because an element can be divided into its parts, does not entail that the constructed element does not exist. Therefore, I agree with Putnam and his nominalism.

Nominalism appears to be a robust point of the constructionist's argument. This enforces the claim that science is not value free, but is reliant on socially contextual factors.

Stability

This point asks why scientists tend to agree with one another on most occasions. The scientist claims that this is because of evidence and other good reasons. In opposition to this, the social constructionists claim that this widespread agreement is due to external factors such as the social networks which provide connectivity to resources. Therefore, for a well-established

theory to be overturned, scientists have to work extensively against the power of these authorities and institutions.

These explanations need not necessarily contest one another. In fact, a well-functioning scientific community should mean that theories are tested extensively and supported by sound evidence. The evidence corroborating a theory is increased by subjecting the hypothesis to as much testing as possible, which requires a rigorous scientific community. This seems likely to me as it seems like a necessary condition of a scientific community would be to desire to establish well-tested experiments in order to come closer to a ‘ scientific truth’. I believe this to be so, unless one were to engage with the idea that the scientific community has ulterior motives, which is not a point worth engaging with in a philosophical essay.

Indeed, the reason we are aware of some scientific truths and not others is likely to be because of the priorities of the time. More time, effort, and money is invested into a specific area of science should that area be of short-term benefit to the surrounding community. So indeed, a strong scientific community can signify ‘ better’ science, but it can also entail specific scientific priority. Furthermore, the parts of the globe that have a strong scientific community with access to experimental resources are wealthier countries. This is not to say that the science these countries produce is questionable, but the areas of science on which they focus will surely benefit them directly rather than less resource-abundant countries. This implication means that the reason we understand some realms and not

others is socially constructed and therefore not immune to the influence of societal values, but the actual science itself may still be sound.

Conclusion

The argument as to whether science is a socially constructed and therefore prejudiced by values is far less contentious than it sounds. The sticking points of contingency, nominalism and stability do not claim that what we believe to be true according to science is entirely constructed and therefore false. What these points do claim is that the way we understand the world and the reason we know some things and not others is " controlled by social or cultural factors rather than natural factors, and if there is any core motivation of such research, it is the aim of showing that such objects are or were under our control: they could be, or might have been, otherwise"(Mallon, 2013). This is a relevant discussion to be having amidst the discourse of decolonizing education. Many believe that it is only the humanities faculty that is able to partake in this change; however, these points of constructivism show that there may be space for a certain kind of decolonization, or at least a deep unravelling of the sciences. The point on stability particularly lends itself to a decolonization of science. Not necessarily scientific method itself, but rather a reexamining of the reasons why some fields are investigated and others are not. The point on contingency stipulates that there are many different routes which physics might have taken and the route that it does take is determined by social factors. Nominalism unpacks the way in which we understand the world and how this can prevent us from theorizing in a certain way. And finally, the stability of science is called into question. It can be said that although

scientific method may not be entirely determined by values, there are aspects of the discipline which are influenced by us as human beings rather than the natural world itself.