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Insurmountable Dilemma of Unconceived Alternatives

Duhem's problem of unconceived alternatives is a major issue that has the potential of undermining the possibility for knowing scientific truth, and Longino's explanations of what is needed for true objectivity potentially provides a promising answer. Although transformative criticism, as Longino defined it, in a scientific theory can broaden the set of hypotheses and possibly make it more likely that one hypothesis can be justified over others, it is not a guarantee. Due to this, Longino's transformative criticism requirement does not solve this problem of unconceived alternatives, and it is highly unlikely any theory will ever be able to.

I will outline my argument, include a proof for its validity, and then defend each of the premises.

1. If transformative criticism does not guarantee a way to justify we have the correct hypothesis in our set of hypotheses, it does not solve the problem of unconceived alternatives.
2. Transformative criticism does not guarantee a way to justify we have the correct hypothesis in our set of hypotheses.

C. Therefore, transformative criticism does not solve the problem of unconceived alternatives.

Let *P* be the claim *"*transformative criticism does not guarantee a way to justify we have the correct hypothesis in our set of hypotheses" and *Q* be the claim "transformative criticism does not solve the problem of unconceived alternatives." The logical proof is as follows:

1. ((P -> Q) ∧ P) (assumption)
2. (P -> Q) (1, $\wedge\, elim$)
3. P (1, $\wedge\, elim$)
4. Q (2, 3, $\rightarrow elim$)

In this essay I will justify line 1 of the logical proof, which is equivalent to the first two premises of the argument.

I will start with defending premise 1, which involves describing what it would take for a theory to solve the problem of unconceived alternatives. Duhem's problem of unconceived alternatives claims that even if our scientific tests allow us to have evidence in support of a hypotheses over its alternatives, there is no way to adequately justify we are deciding from a complete set of hypotheses. That is, we do not have a means of properly justifying that the truthful answer or explanation exists in one of our hypotheses since it is impossible to prove "no other hypothesis is imaginable".[1] Even if we have evidence to support one of our theories, according to Duhem, the problem lies in proving that there is not another hypothesis that no scientist thought of that is even better explained by evidence. For another theory to solve Duhem's problem of unconceived alternatives, it must provide a method or a reason to ensure that scientists have conceived of every possible scientific explanation, or that one hypothesis can be justified with such confidence that it can be trusted over any unconceived theory. This is a daunting task, because even if we have enough evidence that we can make future predictions or

[1] Pierre Duhem, The Aim and Structure of Physical Theory, 190

have some confidence in a theory, the science may be able to be explained with an unconceived idea, so it is near impossible to justify a hypothesis over any unconceived alternatives. If Longino's transformative criticism fails to guarantee that we can justify the scientific truth is one of the considered hypotheses, it does not solve the problem of unconceived alternatives. It will not be sufficient for it to simply be likely for the scientific truth to exist in the set of considered hypotheses, because Duhem's problem remains a problem if there is no guarantee of justifying this.

Premise 2 states that Longino's requirement of transformative criticism, which is mentioned as part of her broader requirements for scientific objectivity, does not guarantee that we can justify having the correct hypothesis. Longino focuses on how to prevent biases in scientific theory in both its discovery and justification. Transformative criticisms of scientific theory, according to Longino, needs to include avenues for people to criticize, shared standards of relevance and adequacy for the criticisms, a communitarian approach, and inclusion in the shared equality of qualified practitioners.[2] This helps ensure that a diverse, expert group is able and willing to make useful criticisms of a scientific theory that ideally make them closer to finding the truth. If subjective biases, both conscious and subconscious are eliminated from background assumptions, these background assumptions that lead to the creation of scientific theories are more likely to reflect objective scientific truth. While transformative criticisms can eliminate biased hypotheses and give an objective way for creating and justifying objective hypotheses, there is no way to guarantee we have enough evidence to justify one hypothesis over another. Although transformative criticisms are necessary to make scientific pursuits as fair and close to

[2] Helen Longino, Science as Social Knowledge: Values and Objectivity in Scientific Inquiry

accurate as possible, requiring them does not provide a solution to Duhem's problem, simply due to the nature of the problem.

Consider the current question of the expansion of the universe and Hubble tension. Scientists have found contradictory statistics when trying to solve for Hubble's constant, and different methods that were believed to be able to reach the same result have recently been found to contradict each other. These experiments were done publicly with room for criticism and peer review and were created from a communitarian team approach, all things required by transformative criticisms. While women and racial minorities are still underrepresented in the sciences, the scientific theories within astronomy have nothing to do with human demographics, so it is unlikely that there are biases influencing the actual theories (in contrast to Morton's craniometry, which was directly impacted by racial biases). Despite the current high degree of objectivity in astronomy, the Hubble tension is evidence that there is some concept in either the methods of testing or in the makeup of our universe of which scientists are unaware. Currently, the theory of dark energy and Hubble expansion of the universe dominates, but the contrasting evidence may hint to the fact that there is another unknown aspect. As a result, Duhem's problem of unconceived alternatives can allow us to question the truth of Hubble's constant, due to the mere fact that we do not have enough other hypotheses or scientific knowledge to justify our trust in it. Transformative criticisms can make our theories more creative by including more people and more likely to reflect scientific truth, but as there is no way to prove a theory over unconceived alternatives, transformative criticisms do not solve Duhem's problem.

A powerful counterargument would be that transformative criticisms do give scientists enough confidence in one hypothesis over another, because the hypotheses are all coming from unbiased, objective science. This could come from the idea that a hypothesis is justified if it

allows us to control our environment and provide accurate predictability, and it would argue that transformative criticism allows us to believe a theory that does this. For example, the problem of unconceived alternatives is clear in Samuel Morton's racist theories of craniometry, where he divided the human population into races and argued for varying levels of "intellectual endowments".[3] If transformative criticisms were present in his scientific inquiry, there would have been modification of background assumptions from an inclusive group of peers, which would have prevented his racial biases from dictating his conclusions. According to Longino, transformative criticisms would have required adherence to standards of criticisms and a communitarian approach to question his assumptions, both of which were clearly missing. Regarding Morton's theories, transformative criticism had the ability of solving this example of problem of unconceived alternatives, because it could have introduced a null hypothesis as an alternative theory: that there is no relation between brain size and intellectual capacity, especially with the racial differences he suggested.

In response to this, I acknowledge that transformative criticism was missing from Morton's theory and could have solved the problem in this situation, but that is due to the specific nature of Morton's claim. Morton's craniometry was a racially biased theory lacking substantial objective evidence, so any transformative criticism would have helped. It was also due to the binary nature of the hypotheses: brain size affects intellectual capacity, or it does not, where this is not the case for all instances. In scientific theories that are not dominated by social biases and with a more complex set of hypotheses, it is more likely that transformative criticism will not be able to solve Duhem's problem. It took centuries after Newton's ideas of gravitation for Einstein to think of the groundbreaking theory of general relativity, and there is no evidence that another

[3] Samuel G. Morton, Crania Americana, 5

theory we trust will not be unearthed by such an unconceived alternative. Before Einstein described what gravity really means in terms of spacetime curvature, Newton's theory provided us with the ability to accurately make predictions and control our environment, which is what scientists like Hempel would consider sufficient for scientific truth. By this logic, things we can use to make accurate predictions and control our environment can contain slight scientific misconceptions, which transformative criticisms may not prevent. Many others could have peer reviewed, questioned Newton, and effectively caused him to change his background assumptions, but it still took Einstein's brain to conceive of general relativity, which has nothing to do with transformative criticism.

I will conclude by noting that even if Longino's transformative criticism requirement does not solve Duhem's problem of unconceived alternatives, it is still vital that it be used in the sciences. There is likely nothing that can guarantee a way to justify we have considered all possible hypotheses, but our only chance at getting closer to scientific truths is if we eliminate biases in assumptions and scientific methods. If all science used Longino's ideas, justification for theories would be based on pure empirical evidence, and it would give us more reason to trust them. As Longino herself said, "scientific knowledge is, therefore, social knowledge". [4]

[4] Helen Longino, Science as Social Knowledge: Values and Objectivity in Scientific Inquiry, 180

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