

## Philsoc Student Essay Prize, Michaelmas term, 2020 – 1st Prize

### Does Lakatos' methodology of scientific research programmes offer the best of Popper's and Kuhn's philosophies of science without their weaknesses or does it combine the weaknesses of both?

By Graham Cansdale

I will first briefly set out Popper's and Kuhn's philosophies of science, identifying their main strengths and weaknesses in terms of how they deal with (a) what I will call "human factors" (sociological, psychological, historical, personal factors) and (b) rationality. I will then compare them with Lakatos' methodology of scientific research programmes, concluding that Lakatos's attempt to reconcile Kuhn's emphasis on history with Popper's insistence on rationality is not entirely successful.

Popper's philosophy of science is based on falsification. The basic idea is that while no amount of evidence and observations can prove a theory (because the very next observation could turn out to be a counter-example), as a matter of deductive logic a single piece of counter-evidence *falsifies* a theory. For a theory to qualify as science – as opposed to non-science – it must make a broad range of highly specific predictions, which must be novel and "risky" in the sense that they must be highly vulnerable to being falsified. The *context of discovery* is not epistemically relevant. i.e., it does not matter how the conjectures are arrived at: a hunch, dream or lucky guess will do. What is relevant is the *context of justification*: scientists must specify in advance what would count as counter-evidence, their conjectures must then be tested against the evidence and, if found to be false, promptly discarded.

The strengths of Popper's falsificationism are that by separating the context of discovery from the context of justification and by operating solely with deductive logic, it keeps science rigorously rational at the justification stage, while still allowing for more subjective human factors, such as creative insight and speculation, at the theory-generation stage<sup>1</sup>.

The weaknesses of Popper's falsificationism are that it requires scientists to immediately discard a whole theory in the face of a single piece of recalcitrant evidence. Descriptively this "*quick kill by refutation*"<sup>2i</sup> is not an accurate depiction of what scientists actually do (they typically hang on in there, tweaking and fine-tuning), and prescriptively it is poor advice since it constitutes throwing out the baby with the bath water. Popper's rationality is too restrictive and naive; there is more to rationality than deductive logic.

For thoroughgoing relativist Kuhn, science does not aim for objective truth, but is a problem-solving practice seeking greater explanatory power. Normal science proceeds conservatively, with the scientific community working within a single, socially-constructed holistic "paradigm". But occasionally, as recalcitrant anomalies accumulate, the paradigm reaches crisis point and is abruptly abandoned wholesale in a scientific revolution in favour of a competing paradigm. Science therefore proceeds not cumulatively, but cyclically. What makes a paradigm prevail is its acceptance by the scientific community on essentially idiosyncratic (personal, subjective, psychological, rhetorical...) grounds. There is no principled rational way of choosing between rival paradigms. The nearest scientists can (and do in fact) get to rational choice is by applying a core set of relatively constant shared epistemic values (regarding accuracy, consistency, simplicity, fruitfulness and scope) that constitute a kind of consensus-based bedrock defining good science.

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<sup>1</sup> unlike the mechanical data-collection approach of naive inductivism.

<sup>2</sup> Lakatos, p. 25.

The strengths of Kuhn's view are that it usefully highlights the key role of social, psychological and historical factors (which Popper restricted to the context of discovery) and offers a re-think of what rationality could/should mean in science. Its main weakness is that it appears to be excessively relativistic, reducing science to "mob psychology"<sup>3</sup>, and insufficiently rational in that the core epistemic values are ultimately too subjective to unequivocally determine choices in key cases.

Broadly speaking, to combine the best of Popper and Kuhn, Lakatos needs an account that duly caters for both human factors and rationality. In order to avoid the respective weaknesses, this means:

(a) an account of human factors that gives them a greater role than Popper allows, but does not give them a Kuhnian *carte blanche*, and

(b) an account of rationality that is less restrictive than Popper's "*quick kill*", deductive logic, but more objective and robust than Kuhn's ultimately arbitrary epistemic values.

Does Lakatos succeed in doing this?

For Lakatos the basic unit of scientific activity is the "research programme", essentially a revamp of Kuhn's paradigms. The difference is that there are typically several research programmes at a given time in a given field, operating in parallel and competing with each other. A research programme comprises a hard core of fixed principles that must be adhered to (just as Kuhnian scientists stick dogmatically to their paradigm during periods of normal science) and a protective belt of additional assumptions that apply the hard core to specific phenomena. The protective belt not only can, but *must* be adapted in order to protect the hard core from falsification and to yield broader, bolder and more precise predictions. A research programme is *theoretically* progressive if it increases its predictive power in that way and *empirically* progressive if (some of) its novel predictions actually get confirmed or rather are not refuted by falsification<sup>4</sup>. A research programme is "degenerating" if it merely tinkers with its protective belt in an *ad hoc* way that fails to make any novel predictions and/or makes novel predictions none of which are confirmed (i.e., all of which are falsified). The rational thing for scientists to do is to continue to pursue progressive programmes but to abandon degenerating ones.

In terms of human factors, Lakatos's account looks like an improvement on both Popper and Kuhn, since it is a descriptively and historically more accurate account of what scientists actually do and how science actually proceeds. As Lakatos himself points out, *pace* Popper, scientists do not (and should not) abandon theories at the first recalcitrant hurdle and, *pace* Kuhn, scientific progress does not take the form of sudden rationality-free revolutions: "*Scientists have thick skins*"<sup>5</sup> and will try all sorts of manoeuvres before abandoning a beloved theory. History shows that "[...] *on close inspection both Popperian crucial experiments and Kuhnian revolutions turn out to be myths: what normally happens is that progressive research programmes replace degenerating ones*"<sup>6</sup>.

Lakatos appears to have usefully diagnosed those flaws in Popper and Kuhn, but does his own account stand up in its own right in terms of rescuing rationality? Lakatos seeks to portray the history of science as progressing in a rationally coherent way. But the rational pattern he posits is actually "*imposed with the benefit of reconstructive hindsight and is then said to have been guiding the work*

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<sup>3</sup> Ladyman, p. 116.

<sup>4</sup> Since Lakatos inherits Popper's falsificationism, he is also subject to the same general problems that affect Popper (and almost all theories of scientific method), such as the underdetermination of theory by data and the Duhem problem (beyond the scope of this assignment).

<sup>5</sup> Lakatos, p. 23.

<sup>6</sup> Lakatos, pp. 25-26.

from the beginning”<sup>7</sup>. The problem is that Lakatos fails to specify in advance how a scientist can *at the time* reliably identify whether their research programme is a progressive one to be pursued or a degenerating one to be abandoned. This is something that can only be appreciated in the fullness of time with the benefit of hindsight. In contrast to Popper’s view, whereby scientific status is an all-or-nothing matter of logical implication, for Lakatos the scientificness of a research programme is to a large extent a matter of history and a matter of degree, with research programmes waxing and waning and sometimes taking “decades before they get off the ground and become empirically progressive”<sup>8</sup>. As stated above, while this has the virtue of being a more accurate, realistic and flexible view than either Popper’s or Kuhn’s, it means that when choosing between theories *in real time* a Lakatosian scientist can only make a subjective judgment call, in which case they are on the same subjective irrational footing as a Kuhnian scientist involved in a paradigm shift. Lakatos therefore fails to solve the very irrationality problem he set out to rectify.<sup>9</sup> It is, of course, possible that the rules governing scientific methodology simply cannot be specified in advance and that rational reconstructions after the event are as good as it gets, in which case Lakatos is not at fault.

Be this as it may, for present purposes I conclude that Lakatos caters better for human factors than Popper without giving them a Kuhnian *carte blanche*, but fails to provide an account of rationality that improves on Popper’s restrictive one, because he fails to provide an account of scientific rationality at all, thereby also failing to rectify Kuhn’s irrationality. While Lakatos usefully highlights some problems with Kuhn and Popper, his attempt to reconcile Kuhn’s emphasis on history with Popper’s insistence on rationality is ultimately not entirely successful.

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<sup>7</sup> Nickles, p. 210.

<sup>8</sup> Lakatos, p. 25.

<sup>9</sup> Larry Laudan attempts to build on Lakatos and salvage the rationality of science from the Kuhnian free-for-all in terms of “research traditions”, arguing it is rational to pursue – without necessarily fully believing in (“accepting”) it – the research tradition that currently has the best problem-solving record.



