in *Encyclopedia of Philosophy and the Social Sciences*, Byron Kaldis, editor. SAGE Reference, 2012.

Pessimistic Induction – 1,000 words

Sherrilyn Roush, University of California Berkeley

A pessimistic induction is an argument that makes use of empirical claims about the history of science – especially accounts of past theories that are false by our lights – to argue that we have little reason to believe our own theories are even approximately true, or refer to real objects, in the parts of their claims that go beyond matters observable to the human senses. These are claims such as that electrons have spin, since electrons are too small to observe directly with the human eye. The view that we do have reason to believe these things is called *scientific realism*.

What is usually counted as the first argument of this type, given by L. Laudan, is not strictly an induction. That is, it does not enumerate examples of past failures of science in order to make a positive inference that we have reason to believe our theories are also false. Rather, since the particular realist views Laudan argued against had put forth strong general claims, such as that the predictive success of our mature theories was a reason to think they are approximately true, examples of past scientific theories with properties that did not fit those claims could be used to falsify them. Laudan argued that counterexamples to the connection between success and truth are very common in the history of science. We no longer believe the humoral theory of medicine or the physics hypothesis of the existence of an ether permeating space, but these were assumptions that were successful in prediction. Objections can be made to the relevance of some examples, though. The humoral theory of medicine enjoyed a reign of many hundreds of years from ancient to medieval times, but its success in diagnosing and curing disease does not seem comparable to that of our germ theory, for example. The only response to the plague that it had available were things like herbs and bloodletting. As for the ether, although physicists believed there was such a thing it has been argued that the assumption played no crucial role in their calculations leading to successful predictions. On the other side, it has been argued that the scientists did not know that the ether assumption was unnecessary to the success their physical theory as a whole enjoyed. We similarly may be unaware that some parts of our successful theories are inessential to their success. Thus even if success were an indicator of truth, we may not know which truths our theories' success indicates.

Pessimistic arguments that have taken the form of a simple induction – roughly, most successful past theories were false, so our successful theories probably are too – have fallen on hard times with the realization that these judgments depend on base rates. For the probability that a theory is true given that it is successful depends not only on the probability that a theory will be successful given that it is true, but also the probability that a theory chosen randomly, without regard for its success, will be true, and that a theory chosen randomly without regard for its truth will be successful. Making inferences without all of these probabilities is fallacious, and making an accurate judgment of what they are seems impossible.

The potent challenge that the history of scientific failures presents to us is better formulated by J. Worrall, who focuses on the observation that for a given currently accepted theory there is usually a theory that was accepted in the past and that contradicts our theory. The past scientists had evidence just as we do, so what reason can we give to think that we will not suffer the same fate of having our theories replaced with future theories that contradict them? A pessimistic argument of a similar form is given by P.K. Stanford, and points to the fact that there were alternatives to our predecessors' theories, alternatives that were not conceived by them. We know this because we have since conceived of some of them, and they are written into our accepted theories. What is the reason to think that we are not also subject to conceiv*able* but as yet unconceived alternative theories that will replace ours someday?

One kind of successful response to challenges of this form would be to explain how our justification for believing our theories is different in some principled way from the justification our predecessors had for theirs. S. Roush has argued that the principled difference is our continual creation of new methods of investigation and evaluation. In a way that is highly relevant to reliability, we are not simply doing the same thing as our predecessors were and doing more of it. She argues that this makes the failures of our predecessors to get true theories largely irrelevant to judging the expected truth or falsity of our own.

Another strategy, that of Worrall, is to accept that there is no reason to think our theories will not be replaced, but point out that there is reason to think that significant aspects of our theories will be retained in the replacement. The reason is that significant aspects of successful past (fundamental) theories have been retained in ours. Despite the inconsistency of the older theories with ours, the retention of parts of the older in the newer theories means we can continue to regard the earlier theories as approximately true. Similarly, we have reason to expect that though our theories will be replaced we will be able to continue to regard them as approximately true. Worrall argues that in fundamental physics mathematical structure has been retained over several centuries, a thesis that undergirds a view called *structural realism*.

Further Readings

in *Encyclopedia of Philosophy and the Social Sciences*, Byron Kaldis, editor. SAGE Reference, 2012.

Laudan, L., (1981). 'A Confutation of Convergent Realism. *Philosophy of Science, 48*, 19–48.

Roush, S., (2010). Optimism about the Pessimistic Induction. In P.D. Magnus and J. Busch (Eds.) *New Waves in Philosophy of Science* (pp. 29-58). Palgrave-MacMillan.

Stanford, P.K., (2006). *Exceeding Our Grasp: Science, History, and the Problem of Unconceived Alternatives*. Oxford: Oxford University Press.

Worrall, J., (2009). Miracles, Pessimism, and Scientific Realism. *PhilPapers*, http://philpapers.org/rec/WORMPA.

Sherrilyn Roush

University of California, Berkeley

Cross References

Abduction and Inference to the Best Explanation

Induction and Confirmation

Realism and Anti-Realism in the Social Sciences