What is critical rationalism?

Critical rationalism is a school of thought whose major exponent is Karl Popper. Joseph Agassi, Hans Albert, William W. Bartley, Ian Jarvie, Noretta Koertge, Alan Musgrave, David Miller, and John Watkins are other philosophers who have contributed to it. Here I follow mainly Popper's version of critical rationalism. In a nutshell, it can be characterized as “an attitude of readiness to listen to critical arguments and to learn from experience; it is fundamentally an attitude of admitting that ‘I may be wrong and you may be right, and by an effort, we may get nearer to the truth’” (Popper 1971: 225).

Critical rationalism differs radically from the traditional rationalism of Plato, Descartes, and the like, in a number of ways. First, traditional rationalism puts reason above experience in knowledge acquisition. Second, it claims that reason can justify our beliefs, claims, and theories. Third, it asserts that it is possible to obtain certain, indubitable, foundational knowledge by reason. Critical rationalism rejects all of these. Neither reason nor experience has any priority in acquiring knowledge. Nor does critical rationalism try to do justice to reason and experience by taking them as equally primordial. Critical rationalism is, above all, a matter of willingness to correct one's mistakes by appealing to both. “Reason” in this context refers not to a faculty possessed by all people but to clear, critical thinking which is essentially social and grows in interaction with others.

Critical rationalism is modeled on the Socratic method of critical inquiry. The sole function of critical argumentation and experience is to check whether our beliefs, claims, or theories are true or false. If we are lucky, we can show them to be false and eliminate them. But neither reason nor experience can ever justify a belief, a claim, or a theory to be true or even probably true. Critical rationalism is thoroughly anti-justificationist. In that respect, it is an extremely radical approach which diverges from the entire tradition of epistemology, whether rationalist or empiricist. Traditionally, a belief is said to be held rationally if it is justified by reason or experience. Justification appears as a necessary condition also of (propositional) knowledge. More explicitly, according to the traditional account of knowledge, a person, S, knows that p (where p is a proposition) if and only if (i) S believes that p, (ii) S has justification (evidence, good reasons) for p, and (iii) p is true. But that account is threatened by an infinite regress. For one can always demand further justification for the evidence or the reasons...
one has. If one does not want to be a dogmatist or a skeptic, one must stop this regress somewhere. It is at this point that traditional epistemologists appeal to foundational beliefs which are epistemologically basic. Whereas rationalists such as Descartes resort to clear and distinct ideas or intuitions, empiricists like Locke turn to sense experience or observation. Both camps take refuge in some form of foundationalism.

Critical rationalism denies that there can ever be justification (experiential or otherwise) for our beliefs. It gives an account of “knowledge” that is antithetical to the one widely accepted by rationalists and empiricists alike. Moreover, for the critical rationalist there are no truths about the world that can be known beyond any doubt, either through reason or experience. Certainty is unattainable, and the search for it is futile. Even the simplest empirical claim might be wrong, no matter how strongly it is believed. Critical rationalism is fallibilist as well as being anti-justificationist and anti-foundationalist. Nevertheless, rationality and objectivity are possible. Rationality has nothing to do with justification, but has everything to do with openness to criticism. Similarly, objectivity is a matter not just of impartiality or open-mindedness of the believer, but of collaborative efforts of relentless criticism of our views that are intersubjectively criticizable.

Critical rationalism and science

According to its advocates, critical rationalism is best exemplified by (empirical) science. To see this, let us turn to Popper's analysis of the nature of science. Popper claims that science can be distinguished from non-science. The problem of distinguishing between science and non-science is called “the demarcation problem,” and is not to be confused with the problem of empirical meaningfulness. This latter problem of distinguishing meaningful statements from meaningless ones was the concern of logical positivists who suggested the criterion of verifiability by possible experience as a solution to it. Popper rejects both the criterion, on the grounds that it renders the laws of science meaningless, and the problem itself as merely verbal and thus insignificant.

Popper's solution to the demarcation problem has two components, one logical, the other methodological. First, at the formal logical level, scientific statements must satisfy the criterion of falsifiability (or, equivalently, of refutability, testability); that is, they “must be capable of conflicting with possible, or conceivable, observations” (Popper 1968a: 39). This point can be made more clearly in terms of Popper's falsificationism, according to which the deductive method of testing constitutes the scientific method. A scientific theory is tested by deducing from it observational consequences. Those consequences can be compared with basic statements that express the results of observations. More specifically, basic statements are singular, existential statements asserting the occurrence of an observable event localized in space and time. If the potential falsifiers of a theory, $T$, are defined as the class of basic statements with which it is inconsistent, then the following definition can be given (see Popper 1968b: 86):

A theory is falsifiable (testable, refutable) if and only if the class of its potential falsifiers is non-empty.
Falsifiability is necessary but not sufficient for solving the demarcation problem. To see why, suppose a theory, $T$, has an observational consequence which conflicts with some accepted basic statement. Then it is always open to a supporter of $T$ to add auxiliary assumptions to protect $T$ against possible falsification. Therefore, the formal logical condition must be supplemented by a (meta-)methodological rule that says that “the other rules of scientific procedure must be designed in such a way that they do not protect any statement in science from falsification” (Popper ibid.: 54). Thus, the scientific status of a theory depends not just on its being falsifiable, but also on our attitude toward it; we must not be uncritical and attempt to save the theory from refutation using immunizing stratagems such as appealing to ad hoc auxiliary hypotheses. If some theory, $T$, has a false observational consequence, then adding auxiliary hypothesis $A$ is permissible only if the degree of testability of $T$ and $A$ taken together is increased. “Avoid making ad hoc auxiliary assumptions,” “Formulate bold theories,” and “Test them as severely as possible” are some of the methodological rules that must be adopted as a result of the critical attitude essential to scientific activity. Let us look at them more closely.

A bold theory is one that has high empirical content; it can be tested more easily than a cautious one. This is because a bold theory prohibits more, so it has a larger class of potential falsifiers. Testing severely means deducing the most improbable observational consequences of a theory relative to background knowledge and checking them against observation. More precisely, consider a new theory $T$ to be tested. Call $B$ the background theory and let $E$ be some test evidence which is a logical consequence of $T$ and $B$. Then the following definition can be given (Popper 1968a: 390):

The severity of the test relative to the background theory $B$, $S(E,B)$, is $1/P(E|B)$, where $P(E|B)$ means the probability of $E$ given $B$.

Hence, the smaller the probability of $E$ given $B$ (i.e., the more surprising the test evidence is against the background knowledge we have), the severer a test it constitutes. Finally, consider the rule that says that ad hoc auxiliary assumptions must be avoided. This is because ad hoc assumptions are not independently testable; they result in an overall reduction in empirical content and hence in the degree of falsifiability. Ad hocness then is the opposite of boldness.

Note that all these methodological rules are related to testing or testability. This is no surprise since testing is arguably the most effective organon of criticism in science. Theories can be criticized by testing them against observations or experiments. The bolder a theory, the more testable it is; it “sticks its neck out,” so to speak. The more severely tested a theory, the easier it is to see its falsity if it is false, so that it can be discarded and replaced by something better. But even if a theory passes all the severe tests it has been subjected to, it does not mean that it has been thereby shown to be verified (i.e., true) or confirmed. Popper says that such successful theories have been corroborated. Corroboration is not another term for confirmation since it does not involve any notion of inductive support for a theory. Theories remain as unsupported hypotheses or conjectures forever. Popper’s falsificationism is therefore antithetical to all forms of confirmationism.
Popper's anti-confirmationist approach to science results from his anti-inductivism. Broadly speaking, inductivism takes induction both as a method of discovering generalizations (or laws) on the basis of neutral observations and as a method of justifying the former on the basis of the latter. Popper objects to both. Without a viewpoint, prior expectation, interest, problem, or something like a theory, observations are pointless. What science needs is relevant facts, and relevance is always relative to a problem, interest, or perspective, often a theoretical one. Furthermore, every observation (basic) statement (as simple as “This liquid is water”) is theory-laden in the sense that terms occurring in it (like “liquid” and “water”) are universals and have a dispositional character: they refer to physical objects which exhibit a law-like behavior. Hence, there can be no theory-neutral description of observational facts. As Anthony O’Hear puts it, “asserting a singular statement about the world commits one just as much as asserting a universal statement to an open-ended predictive set of implications because of the dispositional character of the descriptive term” (1980: 70). That is why observation statements or, equivalently, basic statements are also fallible: no amount of observation can ever justify or establish their truth. They remain as conjectural as universal statements or theories. As for induction as a method of justification, Popper endorses David Hume’s negative arguments to the effect that no inductive inference from observed facts to generalizations or to any unobserved facts can ever be justified. Nevertheless, science does grow by eliminating false theories, if we are lucky enough to refute them, and by replacing them by others that have higher empirical content. The aim of science is truth (or more precisely, explanatory truth) in the realist sense (i.e., correspondence between theories and mind-independent facts), but we can never be sure that we have hit on it even when our theories have been highly corroborated. In later years Popper came to believe that truthlikeness, or verisimilitude, is a more realistic aim for science than truth simpliciter. Providing a successful definition of verisimilitude is important because it enables the critical rationalist to argue that science not only grows but actually progresses by producing theories that have increasing verisimilitude. Given two theories, even if both are false, it may be possible to determine that one is closer to truth than the other. Verisimilitude, therefore, is a comparative notion which Popper has attempted to define as follows (see Popper 1968a: 233):

Let F and G be two theories with comparable content. Then G has greater verisimilitude than F if and only if (a) the truth-content but not the falsity-content of G exceeds that of F and (b) the falsity-content of F, but not its truth-content, exceeds that of G.

Unfortunately, not only Popper’s attempt but all similar attempts to define verisimilitude thus far have failed. Even if they were successful, the relationship between verisimilitude and corroborations would remain conjectural because corroborations is not a measure of verisimilitude. To put it differently, saying that the better-corroborated theory is also the one that is closer to truth would be no more than a guess even if a successful definition of verisimilitude were available.
Finally, it should be noted that both the methodological rules and the basic statements have the status of proposals or conventions. The former are accepted as a result of a decision to increase the falsifiability of theories; the latter are motivated (but not dictated) by observations and are required for testing. Both can be criticized and revised if necessary; they can also be used to refute theories that contain falsifiable generalizations or laws. Because of this, Popper does not consider his philosophy a form of conventionalism.

Some criticisms of critical rationalism

Popper's falsificationism, anti-inductivism and anti-justificationism have created a voluminous, mostly critical literature. Some of the more pertinent criticisms are presented below.

As we have seen, the rule against ad hoc moves is part-and-parcel of that methodology. But as Popper himself later admitted, science does benefit from such moves, even if only occasionally. Pauli's hypothesis that introduced the existence of neutrinos is a good example (see Popper 1974: 986). What are we to make of such cases? Popper's response is to point out that Pauli's hypothesis eventually did become an independently testable hypothesis. But that response is unsatisfactory because it ignores the fact that even ad hoc hypotheses can be fruitful, can pave the way for scientific progress. This issue is a symptom of a more general problem with falsificationism. Falsificationism does not have the conceptual resources to deal adequately with the complexity of scientific activity, especially of the history of science. This is a point brought home variously by historically minded philosophers of science like Thomas Kuhn, Imre Lakatos, and Paul Feyerabend. If we value scientific progress above all else, then we should allow even ad hoc hypotheses, as Feyerabend has urged. If we wish to make sense of the actual practice of science, then we need a more nuanced framework, such as Kuhn's or Lakatos's, that is sensitive to the historical development of science. As their works show, so far as the actual practice of science is concerned, falsification of theories is a historical process, and no scientific theory is abandoned, even when it gets falsified, unless there is a better alternative. If scientists had followed the falsificationist methodology strictly, then even the most promising theories would have been rejected too prematurely since every theory is born into an ocean of anomalies, as Kuhn put it.

Consider now “the pragmatic problem of induction,” which involves an agent who is contemplating which course of action to take in order to achieve a certain goal: which theory should she choose as a basis for her action? Popper's answer is that she should choose the best tested (and, we might add, the most corroborated) one (Popper 1972: 21–22). But why would it be rational to act on a theory that has survived the best empirical criticism? After all, to say that a theory has been corroborated implies no more than that it has to date withstood testing, that we have so far failed to refute it. As Popper himself admits, corroboration is a mere summary of the theory's past performance and says absolutely nothing about its performance in the future. Popper's response is that the choice is rational in the sense that the theory chosen appears to be the best in the light of our critical discussion even though it is not rational in the sense that it is based upon good reasons to ground the expectation that it will be
successful since there can be no such reasons as Hume showed us long ago (Popper ibid.: 22). However, as Miller has pointed out, despite the fact that empirical criticism does play a role in the agent’s decision process, it cannot provide her with any reason to adopt the best theory since it does not say anything about the future. What Popper should have said, and does eventually indeed say upon Miller’s suggestion, is that the agent should act on that proposal which has survived the most thorough criticism, which could of course make use of the best theory available (Popper 1974: 1025; Miller 1994: 41 and 2006: 113). Even then, argues Miller, it would be wrong to conclude that such a proposal is likely to be more successful than others. No critical evaluation can provide any reason for its success in the future, and the failure to see this would allow induction in by the back door. The correct advice would be: “Refrain from any practical proposal that does not survive critical scrutiny as well as others do,” not “Prefer the practical proposal that best survives critical scrutiny” (Miller 2006: 124; emphasis original). The same reasoning applies to theory choice as well. Given two theories such that $T_1$ is refuted but $T_2$ is not, the correct advice “is not that $T_2$ should be preferred to $T_1$ but that $T_1$ should not be preferred to $T_2$” (Miller ibid.: 127). While this does remove from critical rationalism all traces of inductivism, including a “whiff of it,” which Popper sometimes allows however reluctantly (compare Popper 1974: 1192–1193, fn. 165b), it is too cautious. Granted, the critical rationalist has no reason to think that $T_2$ is true or likely to be true; but she seems to have every reason to believe that it cannot be worse than $T_1$ (which is, after all, refuted) and therefore to prefer it over $T_1$, at least in the sense of entertaining it for further testing.

The categorical denial of “good reasons” – of any form of justification – for our beliefs and theories verges on skepticism. Knowledge can no longer be defined in terms of justified true belief. (We ignore the famous Gettier problem in this context as it does not affect our discussion.) In fact, belief in the subjective sense (as a mental state) too drops out of the concept of knowledge. What remains is only conjectural knowledge in the objective sense, that consists of linguistically formulated theories, problems, and arguments without any knowing subjects (see Popper 1972: 108–9 and 1974: 1027–8). But, clearly, it does not make sense to predicate truth of a problem or an argument; only propositions can be true or false. Critical rationalists owe us a proper account of propositional knowledge.

Some critical rationalists, however, think that it is just too costly to give up justification altogether. For example, Musgrave (1999, pp. 331–2) suggests, on Popper’s behalf, replacing the justification condition with the following: $S$ can justify his believing that $p$. In this way, he distinguishes between $S$’s justifying that $p$ and $S$’s justifying his belief that $p$ and argues that the definition of knowledge should include the latter, not the former. He then introduces the hitherto unnoticed justificationist principle, according to which $S$’s believing that $p$ is justified (reasonable) if and only if $S$ can justify (or give good reasons for) $p$. The amended condition and the newly added principle then yield the traditional account given in the first section. According to Musgrave, Popper’s anti-justificationism is tantamount to his rejection of the justificationist principle. Musgrave’s suggestion is an ingenious move, but it is not welcomed by many critical rationalists on the grounds that by allowing in justification, as well as belief in the
subjective sense, it diverges too much from the spirit of critical (as opposed to justificationist) rationalism.

**Critical rationalism and its limits**

Scientific theories, metaphysical doctrines, and philosophical arguments can all be criticized rationally in various ways. Does the theory have wide explanatory scope? Does it withstand tests? Is it consistent and simple? Does it solve the problems it set for itself? Even though metaphysical doctrines are not testable, they too can be criticized to see if they have heuristic power, if they are fruitful and free of contradictions. Arguments, too, can be subjected to criticism on the grounds of validity, as logic teaches us. Is everything criticizable or are there some limits to the things to which critical rationalism can be applied? Popper has recognized two kinds of limits.

The first kind arises from the application of critical rationalism to social phenomena. According to Popper, while natural events are explained by subsuming them under laws, human actions are explained by what he calls “situational analysis,” that is, by appealing to the problem situation of the agent, his or her perception of it, and the rationality principle according to which agents always act appropriately to the situation in which they find themselves. Now, Popper advises us not to criticize this principle under any circumstances. If our explanation of an action fails, he says, nothing can be gained by criticizing the rationality principle, as opposed to criticizing the description of the agent’s problem and problem situation. In a similar vein, Popper advocates piecemeal social engineering for social reform, arguing for conservative conjecturing and cautious testing instead of bold conjecturing and severe testing. This is because the aim of social engineering is not just to acquire knowledge but to lessen human suffering. Since human actions always have unintended consequences, some of which can be undesired, we might end up doing more harm than good. Thus, despite his rhetoric of the unity of method, Popper restrains his falsificationism in the case of the social sciences.

Once the limits of falsificationism are recognized for the social sciences, however, it is easy to see that the same considerations apply to the physical and biological sciences as well. Where there are serious risks of harming people or damaging the environment, we should again refrain from bold conjecturing and severe testing. This is a further limit to the applicability of critical rationalism, often not recognized by its advocates.

Finally, critical rationalism seems to limit itself. Can there be any non-circular, rational argument for adopting critical rationalism in the first place? Popper thinks not. A person will not be moved by critical argumentation unless he or she is already willing to listen to it. Thus, concludes Popper, critical rationalism can be adopted only through an irrational leap of faith in reason (Popper 1971: 231). In this way an element of fideism is smuggled into critical rationalism. Can this unwelcome consequence be avoided? Bartley argued that his pancritical (or comprehensively critical) rationalism avoids it. This is the position that “[any] position may be held rationally without needing any justification at all — provided that it can be and is held open to criticism and survives severe examination” (Bartley 1984: 119). The idea is that
because the essence of rationality lies in criticism and not in justification, pancritical rationalism, which is a position and a practice of critical argument, can be applied to itself rationally, without an irrational commitment to its own principles. Pancritical rationalism can be criticized by its own standard and, depending on the outcome of criticism, can be adopted or rejected rationally. Pancritical rationalism does not limit itself in the way that critical rationalism does, hence its comprehensiveness. In this way, fideism is avoided.

Both John Watkins (1993) and John Post (1993) argued that Bartley’s pancritical rationalism leads to something like a paradox. To see this, consider the following statement, A, which presumably represents pancritical rationalism or an essential component of it:

A: Every rational statement is criticizable.

Furthermore, pancritical rationalism conjectures that

B: A is itself criticizable.

Now, we can argue for the following pair of statements (here, I simplify Post’s argument for reasons of scope):

1 Ever criticism of B is a criticism of A; (this is because, since pancritical rationalism is comprehensive, in so far as A is itself rational, B follows from A).
2 No criticism of A is a criticism of B. (The argument in a nutshell is this: a criticism of A would entail that A is criticizable. But that is precisely what B says. Hence, a criticism of A ends up confirming B.)

From this pair, it follows that there is no criticism of B. Thus, B is not criticizable after all. But since B is not criticizable, not all rational statements are criticizable, assuming B to be rational. Hence, A is false as well.

Now, what does this argument show? Does it refute pancritical rationalism? Is criticizability a necessary or a sufficient condition of rationality? What exactly does criticism involve? Bartley’s work and responses to it have generated a considerable literature attempting to answer such questions. Bartley himself argued that Watkins’s and Post’s arguments do not affect his pancritical rationalism because his position is not adequately characterized by the statement that all rational statements can be criticized. Miller too defended pancritical rationalism by pointing out that deriving an uncriticizable statement from it is no refutation of it, much less a concession to irrationalism. For pancritical rationalists are not committed to the claim that all consequences of their position must be criticizable; what matters is that they merely conjecturally hold the position that opens all positions, including itself, to criticism, and that is all pancritical rationalism requires.
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See also Confirmation; Epistemology of science after Quine; The historical turn in the philosophy of science; Logical empiricism; Metaphysics; Scientific method; Truthlikeness.

References


Further reading

Popper’s major works are listed above. To these may be added his Realism and the Aim of Science, which is volume 1 of The Postscript to The Logic of Scientific Discovery, (ed.) W. W. Bartley (London: Hutchinson, 1983). The Philosophy of Karl Popper (ed. P. A. Schilpp) contains both critical essays by many of the leading philosophers of science of the 20th century and Popper’s replies to them. Miller (1994) and (2006) are arguably the best and most consistent defenses of critical rationalism. John Wettersten’s The Roots of Critical Rationalism (Amsterdam: Rodopi, 1992) uncovers the historical background to critical rationalism. O’Hear (1980) provides an overall critical exposition of Popper’s philosophy. Adolf Grünbaum’s “Is Falsifiability the Touchstone of Scientific Rationality? Karl Popper versus Inductivism,” in R. S. Cohen, P. K. Feyerabend, and M. W. Wartofsky (eds) Essays in Memory of Imre Lakatos (Dordrecht: Reidel, 1976) is an incisive criticism of Popper’s view that the rationality of science can be characterized in terms of falsifiability, to the exclusion of inductive supportability. For the application of Popper’s falsificationism to the social sciences see Noretta Koertge’s “Popper’s Metaphysical Research Program for the Human Sciences,” Inquiry 18 (1975): 437–62. Radnitzky and Bartley’s Evolutionary Epistemology, Rationality, and the Sociology of Science contains, among other things, a number of important articles on the limits of rationality and critical rationalism, including Watkins’s and Post’s criticisms of Bartley’s pancritical rationalism and his reply to them.