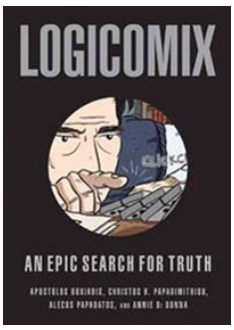
What is science? What is demonstration? Some primary texts

Bertrand Russell (1872–1970) (and Alfred North Whitehead, Gottlob Frege, David Hilbert, Kurt Gödel)

Logicomix:

Aristotle (384–322 BCE), *The Nicomachean Ethics*: I.3 (tr. W. D. Ross) *An Epic Search for Truth*



Our discussion will be adequate if it has as much clearness as the subject-matter admits of, for precision is not to be sought for alike in all discussions, any more than in all the products of the crafts. Now fine and just actions, which political science investigates, admit of much variety and fluctuation of opinion, so that they may be thought to exist only by convention, and not by nature. And goods also give rise to a similar fluctuation because they bring harm to many people; for before now men have been undone by reason of their wealth, and others by reason of their courage. We must be content, then, in speaking of such subjects and with such premisses to indicate the truth roughly and in outline, and in speaking about things which are only for the most part true and with premisses of the same kind to reach conclusions that are no better. In the same spirit, therefore, should each type of statement be received; for it is the mark of an educated man to look for precision in each class of things just so far as the nature of the subject admits; it is evidently equally foolish to accept probable reasoning from a mathematician and to demand from a rhetorician scientific proofs.

Now each man judges well the things he knows, and of these he is a good judge. And so the man who has been educated in a subject is a good judge of that subject, and the man who has received an all-round education is a good judge in general. Hence a young man is not a proper hearer of lectures on political science; for he is inexperienced in the actions that occur in life, but its discussions start from these and are about these; and, further, since he tends to follow his passions, his study will be vain and unprofitable, because the end aimed at is not knowledge but action. And it makes no difference whether he is young in years or youthful in character; the defect does not depend on time, but on his living, and pursuing each successive object, as passion directs. For to such persons, as to the incontinent, knowledge brings no profit; but to those who desire and act in accordance with a rational principle knowledge about such matters will be of great benefit.

These remarks about the student, the sort of treatment to be expected, and the purpose of the inquiry, may be taken as our preface.

David Hume, *A Treatise of Human Nature* (1739–40): I.3.6

There is no object, which implies the existence of any other if we consider these objects in themselves, and never look beyond the ideas which we form of them. . . . It is therefore by EXPERIENCE only, that we can infer the existence of one object from that of another.

The nature of experience is this. We remember to have had frequent instances of the existence of one species of objects; and also remember, that the individuals of another species of objects have always

attended them, and have existed in a regular order of contiguity and succession with regard to them. Thus we remember, to have seen that species of object we call flame, and to have felt that species of sensation we call heat. We likewise call to mind their constant conjunction in all past instances. Without any farther ceremony, we call the one cause and the other effect, and infer the existence of the one from that of the other. . . . This relation is their CONSTANT CONJUNCTION.

From the mere repetition of any past impression, even to infinity, there never will arise any new original idea, such as that of a necessary connexion; and the number of impressions has in this case no more effect than if we confined ourselves to one only. . . . Since it appears, that the transition from an impression present to the memory or senses to the idea of an object, which we call cause or effect, is founded on past experience, and on our remembrance of their constant conjunction, the next question is, Whether experience produces the idea by means of the understanding or imagination; whether we are determined by reason to make the transition, or by a certain association and relation of perceptions. If reason determined us, it would proceed upon that principle, that instances, of which we have had no experience, must resemble those, of which we have had experience, and that the course of nature continues always uniformly the same.

About **Karl Popper (1902–1994)**, written by Stephen Thornton:

Popper's final position is that he acknowledges that it is impossible to discriminate science from non-science on the basis of the falsifiability of the scientific statements alone; he recognises that scientific theories are predictive, and consequently prohibitive, only when taken in conjunction with auxiliary hypotheses, and he also recognises that readjustment or modification of the latter is an integral part of scientific practice. Hence his final concern is to outline conditions which indicate when such modification is genuinely scientific, and when it is merely ad hoc. This is itself clearly a major alteration in his position, and arguably represents a substantial retraction on his part: Marxism can no longer be dismissed as "unscientific" simply because its advocates preserved the theory from falsification by modifying it—for in general terms, such a procedure, it transpires, is perfectly respectable scientific practice. It is now condemned as unscientific by Popper because the only rationale for the modifications which were made to the original theory was to ensure that it evaded falsification, and so such modifications were ad hoc, rather than scientific.