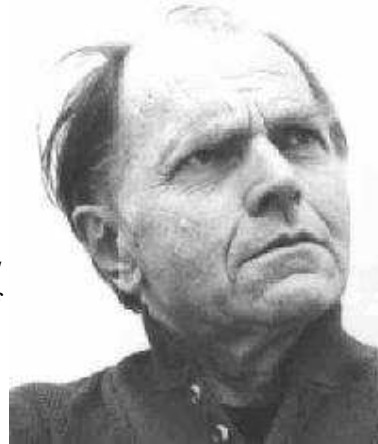


Against Method

Outline of an anarchistic theory of knowledge

Paul Feyerabend (1975)

Source: Analytical Index (being a sketch of the main argument) and the concluding chapter from *Against Method* (1975) publ. Humanities Press. Just the Analytical Table of Contents and Concluding Chapter reproduced here.



- Science is an essentially anarchistic enterprise: theoretical anarchism is more humanitarian and more likely to encourage progress than its law-and-order alternatives.
- This is shown both by an examination of historical episodes and by an abstract analysis of the relation between idea and action. The only principle that does not inhibit progress is: *anything goes*.
- For example, we may use hypotheses that contradict well-confirmed theories and/or well-established experimental results. We may advance science by proceeding counter-inductively.
- The consistency condition which demands that new hypotheses agree with accepted *theories* is unreasonable because it preserves the older theory, and not the better theory. Hypotheses contradicting well-confirmed theories give us evidence that cannot be obtained in any other way. Proliferation of theories is beneficial for science, while uniformity impairs its critical power. Uniformity also endangers the free development of the individual.
- There is no idea, however ancient and absurd, that is not capable of improving our knowledge. The whole history of thought is absorbed into science and is used for improving every single theory. Nor is political interference rejected. It may be needed to overcome the chauvinism of science that resists alternatives to the status quo.
- No theory ever agrees with all the *facts* in its domain, yet it is not always the theory that is to blame. Facts are constituted by older ideologies, and a clash between facts and theories may be proof of progress. It is also a first step in our attempts to find the principles implicit in familiar observational notions.
- As an example of such an attempt I examine the *tower argument* which the Aristotelians used to refute the motion of the earth. The argument involves *natural interpretations* - ideas so closely connected with observations that it needs a special effort to realise their existence and to determine their content. Galileo identifies the natural interpretations which are inconsistent with Copernicus and replaces them by others.
- The new natural interpretations constitute a new and highly abstract observation language. They are introduced *and concealed* so that one fails to notice the change that has taken place (method of anamnesis). They contain the idea of the *relativity of all motion* and the *law of circular inertia*.
- Initial difficulties caused by the change are defused by *ad hoc hypotheses*, which thus turn out occasionally to have a positive function; they give new theories a breathing space, and they indicate the direction of future research.
- In addition to natural interpretations, Galileo also changes *sensations* that seem to endanger Copernicus. He admits that there are such sensations, he praises Copernicus for having disregarded them, he claims to have removed them with the help of the *telescope*. However,

he offers no *theoretical* reasons why the telescope should be expected to give a true picture of the sky.

- Nor does the initial *experience* with the telescope provide such reasons. The first telescopic observations of the sky are indistinct, indeterminate, contradictory and in conflict with what everyone can see with his unaided eyes. And, the only theory that could have helped to separate telescopic illusions from veridical phenomena was refuted by simple tests.
- On the other hand, there are some telescopic phenomena which are plainly Copernican. Galileo introduces these phenomena as independent evidence for Copernicus while the situation is rather that one refuted view - Copernicanism - has a certain similarity with phenomena emerging from another refuted view - the idea that telescopic phenomena are faithful images of the sky. Galileo prevails because of his style and his clever techniques of persuasion, because he writes in Italian rather than in Latin, and because he appeals to people who are temperamentally opposed to the old ideas and the standards of learning connected with them.
- Such 'irrational' methods of support are needed because of the 'uneven development' (Marx, Lenin) of different parts of science. Copernicanism and other essential ingredients of modern science survived only because reason was frequently overruled in their past.
- Galileo's method works in other fields as well. For example, it can be used to eliminate the existing arguments against materialism, and to put an end to the *philosophical* mind/body problem (the corresponding *scientific* problems remain untouched, however).
- The results obtained so far suggest abolishing the distinction between a context of discovery and a context of justification and disregarding the related distinction between observational terms and theoretical terms. Neither distinction plays a role in scientific practice. Attempts to enforce them would have disastrous consequences.
- Finally, the discussion in Chapters 6-13 shows that Popper's version of Mill's pluralism is not in agreement with scientific practice and would destroy science as we know it. Given science, reason cannot be universal and unreason cannot be excluded. This feature of science calls for an anarchistic epistemology. The realisation that science is not sacrosanct, and that the debate between science and myth has ceased without having been won by either side, further strengthens the case for anarchism.
- Even the ingenious attempt of Lakatos to construct a methodology that (a) does not issue orders and yet (b) puts restrictions upon our knowledge-increasing activities, does not escape this conclusion. For Lakatos' philosophy appears liberal only because it is an *anarchism in disguise*. And his standards which are abstracted from modern science cannot be regarded as neutral arbiters in the issue between modern science and Aristotelian science, myth, magic, religion, etc.
- Moreover, these standards, which involve a comparison of content classes, are not always *applicable*. The content classes of certain theories are incomparable in the sense that none of the usual logical relations (inclusion, exclusion, overlap) can be said to hold between them. This occurs when we compare myths with science. It also occurs in the most advanced, most general and therefore most mythological parts of science itself.
- Thus science is much closer to myth than a scientific philosophy is prepared to admit. It is one of the many forms of thought that have been developed by man, and not necessarily the best. It is conspicuous, noisy, and impudent, but it is inherently superior only for those who have already decided in favour of a certain ideology, or who have accepted it without having ever examined its advantages and its limits. And as the accepting and rejecting of ideologies should be left to the individual it follows that the separation of state and *church* must be supplemented by the separation of state and *science*, that most recent, most aggressive, and most dogmatic religious institution. Such a separation may be our only chance to achieve a humanity we are capable of, but have never fully realised.

The idea that science can, and should, be run according to fixed and universal rules, is both unrealistic and pernicious. It is *unrealistic*, for it takes too simple a view of the talents of man and of the circumstances which encourage, or cause, their development. And it is *pernicious*, for the attempt to enforce the rules is bound to increase our professional qualifications at the expense of our humanity. In addition, the idea is *detrimental to science*, for it neglects the complex physical and historical conditions which influence scientific change. It makes our science less adaptable and more dogmatic: every methodological rule is associated with cosmological assumptions, so that using the rule we take it for granted that the assumptions are correct. Naive falsificationism takes it for granted that the laws of nature are manifest and not hidden beneath disturbances of considerable magnitude. Empiricism takes it for granted that sense experience is a better mirror of the world than pure thought. Praise of argument takes it for granted that the artifices of Reason give better results than the unchecked play of our emotions. Such assumptions may be perfectly plausible *and even true*. Still, one should occasionally put them to a test. Putting them to a test means that we stop using the methodology associated with them, start doing science in a different way and see what happens. Case studies such as those reported in the preceding chapters show that such tests occur all the time, and that they speak *against* the universal validity of any rule. All methodologies have their limitations and the only 'rule' that survives is 'anything goes'.

The change of perspective brought about by these discoveries leads once more to the long-forgotten problem of the excellence of science. It leads to it for the first time in *modern* history, for modern science *overpowered* its opponents, it did not *convince* them. Science took over by *force*, not by argument (this is especially true of the former colonies where science and the religion of brotherly love were introduced as a matter of course, and without consulting, or arguing with, the inhabitants). Today we realise that rationalism, being bound to science, cannot give us any assistance in the issue between science and myth and we also know, from inquiries of an entirely different kind, that myths are vastly better than rationalists have dared to admit.' Thus we are now *forced* to raise the question of the excellence of science. An examination then reveals that science and myth overlap in many ways, that the differences we think we perceive are often local phenomena which may turn into similarities elsewhere and that fundamental discrepancies are results of different *aims* rather than of different methods trying to reach one and the same 'rational' end (such as, for example, 'progress', or increase of content, or 'growth').

To show the surprising similarities of myth and science, I shall briefly discuss an interesting paper by Robin Horton, entitled 'African Traditional Thought and Western Science.' Horton examines African mythology and discovers the following features: the quest for theory is a quest for unity underlying apparent complexity. The theory places things in a causal context that is wider than the causal context provided by common sense: both science and myth cap common sense with a theoretical superstructure. There are theories of different degrees of abstraction and they are used in accordance with the different requirements of explanation that arise. Theory construction consists in breaking up objects of common sense and in reuniting the elements in a different way. Theoretical models start from analogy but they gradually move away from the pattern on which the analogy was based. And so on.

These features, which emerge from case studies no less careful and detailed than those of Lakatos, refute the assumption that science and myth obey different principles of formation (Cassirer), that myth proceeds without reflection (Dardel), or speculation (Frankfort, occasionally). Nor can we accept the idea, found in Malinowski but also in classical scholars such as Harrison and Cornford, that myth has an essentially pragmatic function or is based on ritual. Myth is much closer to science than one would expect from a philosophical discussion. It is closer to science than even Horton himself is prepared to admit.

To see this, consider some of the *differences* Horton emphasises. According to Horton, the central ideas of a myth are regarded as sacred. There is anxiety about threats to them. One 'almost never finds a confession of ignorance and events 'which seriously defy the established lines of classification in the culture where they occur' evoke a 'taboo reaction' .4 Basic beliefs are protected by this reaction as well as by the device of 'secondary elaborations' which, in our

terms, are series of *ad hoc* hypotheses. Science, on the other hand, is characterised by an essential scepticism; 'when failures start to come thick and fast, defence of the theory switches inexorably to attack on it.' This is possible because of the 'openness' of the scientific enterprise, because of the pluralism of ideas it contains and also because whatever defies or fails to fit into the established category system is not something horrifying, to be isolated or expelled. On the contrary, it is an intriguing 'phenomenon' - a starting-point and a challenge for the invention of new classifications and new theories. We can see that Horton has read his Popper well. A field study of science itself shows a very different picture.

Such a study reveals that, while some scientists may proceed as described, the great majority follow a different path. Scepticism is at a minimum; it is directed against the view of the opposition and against minor ramifications of one's own basic ideas, never against the basic ideas themselves. Attacking the basic ideas evokes taboo reactions which are no weaker than are the taboo reactions in so-called "primitive societies." Basic beliefs are protected by this reaction as well as by secondary elaborations, as we have seen, and whatever fails to fit into the established category system or is said to be incompatible with this system is either viewed as something quite horrifying or, more frequently, it is *simply declared to be non-existent*. Nor is science prepared to make 'a theoretical pluralism the foundation of research. Newton reigned for more than 150 years, Einstein briefly introduced a more liberal point of view only to be succeeded by the Copenhagen Interpretation. The similarities between science and myth are indeed astonishing.

But the fields are even more closely related. The massive dogmatism I have described is not just *a fact*, it has also a most important function. *Science would be impossible without it.* "Primitive" thinkers showed greater insight into the nature of knowledge than their 'enlightened' philosophical rivals. It is, therefore, necessary to re-examine our attitude towards myth, religion, magic, witchcraft and towards all those ideas which rationalists would like to see forever removed from the surface of the earth (without having so much as looked at them - a typical taboo reaction).

There is another reason why such a re-examination is urgently required. The rise of modern science coincides with the suppression of non-Western tribes by Western invaders. The tribes are not only physically suppressed, they also lose their intellectual independence and are forced to adopt the bloodthirsty religion of brotherly love - Christianity. The most intelligent members get an extra bonus: they are introduced into the mysteries of Western Rationalism and its peak - Western Science. Occasionally this leads to an almost unbearable tension with tradition (Haiti). In most cases the tradition disappears without the trace of an argument, one simply becomes a slave both in body and in mind. Today this development is gradually reversed - with great reluctance, to be sure, but it is reversed. Freedom is regained, old traditions are rediscovered, both among the minorities in Western countries and among large populations in non-Western continents. *But science still reigns supreme*. It reigns supreme because its practitioners are *unable to understand, and unwilling to condone*, different ideologies, because they have *the power* to enforce their wishes, and because they *use* this power 'just as their ancestors used *their* power to force Christianity on the peoples they encountered during their conquests. Thus, while an American can now choose the religion he likes, he is still not permitted to demand that his children learn magic rather than science at school. There is a separation between state and church, there is no separation between state and science.

And yet science has no greater authority than any other form of life. Its aims are certainly not more important than are the aims that guide the lives in a religious community or in a tribe that is united by a myth. At any rate, they have no business restricting the lives, the thoughts, the education of the members of a free society where everyone should have a chance to make up his own mind and to live in accordance with the social beliefs he finds most acceptable. The separation between state and church must therefore be complemented by the separation between state and science.

We need not fear that such a separation will lead to a breakdown of technology. There will always be people who prefer being scientists to being the masters of their fate and who gladly submit to the meanest kind of (intellectual and institutional) slavery provided they are paid well and provided also there are some people around who examine their work and sing their praise. Greece developed and progressed because it could rely on the services of unwilling slaves. We shall develop and progress with the help of the numerous willing slaves in universities and laboratories who provide us with pills, gas, electricity, atom bombs, frozen dinners and, occasionally, with a few interesting fairy-tales. We shall treat these slaves well, we shall even listen to them, for they have occasionally some interesting stories to tell, but we shall *not* permit them to impose their ideology on our children in the guise of 'progressive' theories of education. We shall not permit them to teach the fancies of science as if they were the only factual statements in existence. This separation of science and state may be our only chance to overcome the hectic barbarism of our scientific-technical age and to achieve a humanity we are capable of, but have never fully realised. Let us, therefore, in conclusion review the arguments that can be adduced for such a procedure.

The image of 20th-century science in the minds of scientists and laymen is determined by technological miracles such as colour television, the moon shots, the infra-red oven, as well as by a somewhat vague but still quite influential rumour, or fairy-tale, concerning the manner in which these miracles are produced.

According to the fairy-tale the success of science is the result of a subtle, but carefully balanced combination of inventiveness and control. Scientists have *ideas*. And they have special *methods* for improving ideas. The theories of science have passed the test of method. They give a better account of the world than ideas which have not passed the test.

The fairy-tale explains why modern society treats science in a special way and why it grants it privileges not enjoyed by other institutions.

Ideally, the modern state is ideologically neutral. Religion, myth, prejudices do have an influence, but only in a roundabout way, through the medium of politically influential *parties*. Ideological principles *may* enter the governmental structure, but only via a majority vote, and after a lengthy discussion of possible consequences. In our schools the main religions are taught as *historical phenomena*. They are taught as parts of the truth only if the parents insist on a more direct mode of instruction. It is up to them to decide about the religious education of their children. The financial support of ideologies does not exceed the financial support granted to parties and to private groups. State and ideology, state and church, state and myth, are carefully separated.

State and science, however, work closely together. Immense sums are spent on the improvement of scientific ideas. Bastard subjects such as the philosophy of science which have not a single discovery to their credit profit from the boom of the sciences. Even human relations are dealt with in a scientific manner, as is shown by education programmes, proposals for prison reform, army training, and so on. Almost all scientific subjects are compulsory subjects in our schools. While the parents of a six-year-old child can decide to have him instructed in the rudiments of Protestantism, or in the rudiments of the Jewish faith, or to omit religious instruction altogether, they do not have a similar freedom in the case of the sciences. Physics, astronomy, history *must* be learned. They cannot be replaced by magic, astrology, or by a study of legends.

Nor is one content with a merely *historical* presentation of physical (astronomical, historical, etc.) facts and principles. One does not say: *some people believe* that the earth moves round the sun while others regard the earth as a hollow sphere that contains the sun, the planets, the fixed stars. One says: the earth *moves* round the sun - everything else is sheer idiocy.

Finally, the manner in which we accept or reject scientific ideas is radically different from democratic decision procedures. We accept scientific laws and scientific facts, we teach them in our schools, we make them the basis of important political decisions, but without ever having subjected them to a vote. *Scientists* do not subject them to a vote - or at least this is what they say - *and laymen* certainly do not subject them to a vote. Concrete proposals are occasionally

discussed, and a vote is suggested. But the procedure is not extended to general theories and scientific facts. Modern society is 'Copernican' not because Copernicanism has been put on a ballot, subjected to a democratic debate and then voted in with a simple majority; it is 'Copernican' because the *scientists* are Copernicans and because one accepts their cosmology as uncritically as one once accepted the cosmology of bishops and cardinals.

Even bold and revolutionary thinkers bow to the judgement of science. Kropotkin wants to break up all existing institutions - but he does not touch science. Ibsen goes very far in unmasking the conditions of contemporary humanity - but he still retains science as a measure of the truth. Evans-Pritchard, Lévi-Strauss and others have recognised that 'Western Thought', far from being a lonely peak of human development, is troubled by problems not found in other ideologies - but they exclude science from their relativisation of all forms of thought. Even for them science is a *neutral structure containing positive knowledge* that is independent of culture, ideology, prejudice.

The reason for this special treatment of science is, of course, our little fairy-tale: if science has found a method that turns ideologically contaminated ideas into true and useful theories, then it is indeed not mere ideology, but an objective measure of all ideologies. It is then not subjected to the demand for a separation between state and ideology.

But the fairy-tale is false, as we have seen. There is no special method that guarantees success or makes it probable. Scientists do not solve problems because they possess a magic wand - methodology, or a theory of rationality - but because they have studied a problem for a long time, because they know the situation fairly well, because they are not too dumb (though that is rather doubtful nowadays when almost anyone can become a scientist), and because the excesses of one scientific school are almost always balanced by the excesses of some other school. (Besides, scientists only rarely solve their problems, they make lots of mistakes, and many of their solutions are quite useless.) Basically there is hardly any difference between the process that leads to the announcement of a new scientific law and the process preceding passage of a new law in society: one informs either all citizens or those immediately concerned, one collects 'facts' and prejudices, one discusses the matter, and one finally votes. But while a democracy makes some effort to *explain* the process so that everyone can understand it, scientists either *conceal* it, or *bend* it, to make it fit their sectarian interests.

No scientist will admit that voting plays a role in his subject. Facts, logic, and methodology alone decide - this is what the fairy-tale tells us. But how do facts decide? What is their function in the advancement of knowledge? We cannot *derive* our theories from them. We cannot give a *negative* criterion by saying, for example, that good theories are theories which can be refuted, but which are not yet contradicted by any fact. A principle of falsification that removes theories because they do not fit the facts would have to remove the whole of science (or it would have to admit that large parts of science are irrefutable). The hint that a good theory *explains more* than its rivals is not very realistic either. True: new theories often predict new things - but almost always at the expense of things already known. Turning to logic we realise that even the simplest demands *are not* satisfied in scientific practice, and *could not be* satisfied, because of the complexity of the material. The ideas which scientists use to present the known and to advance into the unknown are only rarely in agreement with the strict injunctions of logic or pure mathematics and the attempt to make them conform would rob science of the elasticity without which progress cannot be achieved. We see: facts alone are not strong enough for making us accept, or reject, scientific theories, the range they leave to thought is *too wide*; logic and methodology eliminate too much, they are *too narrow*. In between these two extremes lies the ever-changing domain of human ideas and wishes. And a more detailed analysis of successful moves in the game of science ('successful' from the point of view of the scientists themselves) shows indeed that there is a wide range of freedom that *demand*s a multiplicity of ideas and *permits* the application of democratic procedures (ballot-discussion-vote) but that is actually closed by power politics and propaganda. *This is where the fairy-tale of a special method assumes its decisive function.* It conceals the freedom of decision which creative scientists and the general public have even inside the most rigid and the most advanced parts of

science by a recitation of 'objective' criteria and it thus protects the big-shots (Nobel Prize winners; heads of laboratories, of organisations such as the AMA, of special schools; 'educators'; etc.) from the masses (laymen; experts in non-scientific fields; experts in other fields of science): only those citizens count who were subjected to the pressures of scientific institutions (they have undergone a long process of education), who succumbed to these pressures (they have passed their examinations), and who are now firmly convinced of the truth of the fairy-tale. This is how scientists have deceived themselves and everyone else about their business, but without any real disadvantage: they have more money, more authority, more sex appeal than they deserve, and the most stupid procedures and the most laughable results in their domain are surrounded with an aura of excellence. It is time to cut them down in size, and to give them a more modest position in society.

This advice, which only few of our well-conditioned contemporaries are prepared to accept, seems to clash with certain simple and widely-known facts.

Is it not a fact that a learned physician is better equipped to diagnose and to cure an illness than a layman or the medicine-man of a primitive society? Is it not a fact that epidemics and dangerous individual diseases have disappeared only with the beginning of modern medicine? Must we not admit that technology has made tremendous advances since the rise of modern science? And are not the moon-shots a most impressive and undeniable proof of its excellence? These are some of the questions which are thrown at the impudent wretch who dares to criticise the special position of the sciences.

The questions reach their polemical aim only if one assumes that the results of science *which no one will deny* have arisen without any help from non-scientific elements, and that they cannot be improved by an admixture of such elements either. 'Unscientific' procedures such as the herbal lore of witches and cunning men, the astronomy of mystics, the treatment of the ill in primitive societies are totally without merit. *Science alone* gives us a useful astronomy, an effective medicine, a trustworthy technology. One must also 'assume that science owes its success to the correct method and not merely to a lucky accident. It was not a fortunate cosmological guess that led to progress, but the correct *and cosmologically neutral* handling of data. These are the assumptions we must make to give the questions the polemical force they are supposed to have. Not a single one of them stands up to closer examination.

Modern astronomy started with the attempt of Copernicus to adapt the old ideas of Philolaos to the needs of astronomical predictions. Philolaos was not a precise scientist, he was a muddle-headed Pythagorean, as we have seen, and the consequences of his doctrine were called 'incredibly ridiculous' by a professional astronomer such as Ptolemy. Even Galileo, who had the much improved Copernican version of Philolaos before him, says: 'There is no limit to my astonishment when I reflect that Aristarchus and Copernicus were able to make reason to conquer sense that, in defiance of the latter, the former became mistress of their belief' (*Dialogue*, 328). 'Sense' here refers to the experiences which Aristotle and others had used to show that the earth must be at rest. The 'reason' which Copernicus opposes to their arguments is the very mystical reason of Philolaos combined with an equally mystical faith ('mystical' from the point of view of today's rationalists) in the fundamental character of circular motion. I have shown that modern astronomy and modern dynamics could not have advanced without this unscientific use of antediluvian ideas.

While astronomy profited from Pythagoreanism and from the Platonic love for circles, medicine profited from herbalism, from the psychology, the metaphysics, the physiology of witches, midwives, cunning men, wandering druggists. It is well known that 16th- and 17th-century medicine while theoretically hypertrophic was quite helpless in the face of disease (and stayed that way for a long time after the 'scientific revolution'). Innovators such as Paracelsus fell back on the earlier ideas and improved medicine. Everywhere science is enriched by unscientific methods and unscientific results, while procedures which have often been regarded as essential parts of science are quietly suspended or circumvented.

The process is not restricted to the early history of modern science. It is not merely a consequence of the primitive state of the sciences of the 16th and 17th centuries. Even today science can and does profit from an admixture of unscientific ingredients. An example which was discussed above, in Chapter 4, is the revival of traditional medicine in Communist China. When the Communists in the fifties forced hospitals and medical schools to teach the ideas and the methods contained in the *Yellow Emperor's Textbook of Internal Medicine* and to use them in the treatment of patients, many Western experts (among them Eccles, one of the 'Popperian Knights') were aghast and predicted the downfall of Chinese medicine. What happened was the exact opposite. Acupuncture, moxibustion, pulse diagnosis have led to new insights, new methods of treatment, new problems both for the Western and for the Chinese physician.

And those who do not like to see the state meddling in scientific matters should remember the sizeable chauvinism of science: for most scientists the slogan 'freedom for science' means the freedom to indoctrinate not only those who have joined them, but the rest of society as well. Of course - not every mixture of scientific and non-scientific elements is successful (example: Lysenko). But science is not always successful either. If mixtures are to be avoided because they occasionally misfire, then pure science (if there is such a thing) must be avoided as well. (It is not the *interference* of the state that is objectionable in the Lysenko case, but the *totalitarian* interference that kills the opponent instead of letting him go his own way.)

Combining this observation with the insight that science has no special method, we arrive at the result that the separation of science and non-science is not only artificial but also detrimental to the advancement of knowledge. If we want to understand nature, if we want to master our physical surroundings, then we must use *all ideas*, all methods, and not 'just a small selection of them'. The assertion, however, that there is no knowledge outside science - *extra scientiam nulla salus* - is nothing but another and most convenient fairy-tale. Primitive tribes have more detailed classifications of animals and plants than contemporary scientific zoology and botany, they know remedies whose effectiveness astounds physicians (while the pharmaceutical industry already smells here a new source of income), they have means of influencing their fellow men which science for a long time regarded as non-existent (Voodoo), they solve difficult problems in ways which are still not quite understood (building of the pyramids; Polynesian travels), there existed a highly developed and internationally known astronomy in the old Stone Age, this astronomy was factually adequate *as well as* emotionally satisfying, *it solved both physical and social problems* (one cannot say the same about modern astronomy) and it was tested in very simple and ingenious ways (stone observatories in England and in the South Pacific; astronomical schools in Polynesia - for a more detailed treatment and references concerning all these assertions c.f. my *Einführung in die Naturphilosophie*). There was the domestication of animals, the invention of rotating agriculture, new types of plants were bred and kept pure by careful avoidance of cross fertilisation, we have chemical inventions, we have a most amazing art that can compare with the best achievements of the present. True, there were no collective excursions to the moon, but single individuals, disregarding great dangers to their soul and their sanity, rose from sphere to sphere to sphere until they finally faced God himself in all His splendour while others changed into animals and back into humans again. At all times man approached his surroundings with wide open senses and a fertile intelligence, at all times he made incredible discoveries, at all times we can learn from his ideas.

Modern science, on the other hand, is not at all as difficult and as perfect as scientific propaganda wants us to believe. A subject such as medicine, or physics, or biology appears difficult only because it is taught badly, because the standard instructions are full of redundant material, and because they start too late in life. During the war, when the American Army needed physicians within a very short time, it was suddenly possible to reduce medical instruction to half a year (the corresponding instruction manuals have disappeared long ago, however. Science may be simplified during the war. In peacetime the prestige of science demands greater complication.) And how often does it not happen that the proud and conceited judgement of an expert is put in its proper place by a layman! Numerous inventors built 'impossible' machines. Lawyers show again and again that an expert does not know what he is

talking about. Scientists, especially physicians, frequently come to different results so that it is up to the relatives of the sick person (or the inhabitants of a certain area) to decide *by vote* about the procedure to be adopted. How often is science improved, and turned into new directions by non-scientific influences! it is up to us, it is up to the citizens of a free society to either accept the chauvinism of science without contradiction or to overcome it by the counterforce of public action. Public action was used against science by the Communists in China in the fifties, and it was again used, under very different circumstances, by some opponents of evolution in California in the seventies. Let us follow their example and let us free society from the strangling hold of an ideologically petrified science just as our ancestors freed *us* from the strangling hold of the One True Religion!

The way towards this aim is clear. A science that insists on possessing the only correct method and the only acceptable results is ideology and must be separated from the state, and especially from the process of education. One may teach it, but only to those who have decided to make this particular superstition their own. On the other hand, a science that has dropped such totalitarian pretensions is no longer independent and self-contained, and it can be taught in many different combinations (myth and modern cosmology might be one such combination). Of course, every business has the right to demand that its practitioners be prepared in a special way, and it may even demand acceptance of a certain ideology (I for one am against the thinning out of subjects so that they become more and more similar to each other; whoever does not like present-day Catholicism should leave it and become a Protestant, or an Atheist, instead of ruining it by such inane changes as mass in the vernacular). That is true of physics, just as it is true of religion, or of prostitution. But such special ideologies, such special skills have no room in the process of *general education* that prepares a citizen for his role in society. A mature citizen is not a man who has been *instructed* in a special ideology, such as Puritanism, or critical rationalism, and who now carries this ideology with him like a mental tumour, a mature citizen is a person who has learned how to make up his mind and who has then *decided* in favour of what he thinks suits him best. He is a person who has a certain mental toughness (he does not fall for the first ideological street singer he happens to meet) and who is therefore able *consciously to choose* the business that seems to be most attractive to him rather than being swallowed by it. To prepare himself for his choice he will study the major ideologies as *historical phenomena*, he will study science as a historical phenomenon and not as the one and only sensible way of approaching a problem. He will study it together with other fairy-tales such as the myths of 'primitive' societies so that he has the information needed for arriving at a free decision. An essential part of a general education of this kind is acquaintance with the most outstanding propagandists in all fields, so that the pupil can build up his resistance against all propaganda, including the propaganda called 'argument'. It is only *after* such a hardening procedure that he will be called upon to make up his mind on the issue rationalism-irrationalism, science-myth, science-religion, and so on. His decision in favour of science - assuming he chooses science - will then be much more 'rational' than any decision in favour of science is today. At any rate - science and the schools will be just as carefully separated as religion and the schools are separated today. Scientists will of course participate in governmental decisions, for everyone participates in such decisions. But they will not be given overriding authority. It is the *vote of everyone concerned* that decides fundamental issues such as the teaching methods used, or the truth of basic beliefs such as the theory of evolution, or the quantum theory, and not the authority of big-shots hiding behind a non-existing methodology. There is no need to fear that such a way of arranging society will lead to undesirable results. Science itself uses the method of ballot, discussion, vote, though without a clear grasp of its mechanism, and in a heavily biased way. But the rationality of our beliefs will certainly be considerably increased.