Feyerabend as historian

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1 The use and nature of history

'I never thought of myself as an intellectual, much less as a philosopher,'[1] we are told by the well-known philosopher of science Paul Feyerabend in his autobiography *Killing Time*. He will certainly not have thought of himself as a historian either. Yet what we *are*, and what we *think* we are, need not be identical – and Feyerabend's most famous book, *Against Method*, is a fruitful object of meta-historical study. It is in the first place a philosophical work, and a rather strange one at that. Its main thesis is that 'the events, procedures and results that constitute the sciences have no common structure,'[2] which would have important implications for the history of science if it were true. 'Scientific successes cannot be explained in a simple way. [...] All we can do is to give a historical account of the details, including social circumstances, accidents and personal idiosyncracies.'[3] But if scientific success cannot be described within a rigid scheme, Feyerabend reasons, then there can be no valid universal scientific method. Any methodology, be it the inductive ones of the logical positivists, the falsificationism of Karl Popper or the more relaxed idea of 'research programs' of Imre Lakatos, tries to prescribe a rigid scheme of behaviour. In opposition to these ideas, Feyerabend holds that there are no methodological rules that have been applied at all times in history; and, more importantly, that if they had been so applied, science as we know it could not have come into existence.

It is clear that the only way to make this initially outrageous thesis plausible, is by providing concrete examples from the history of science. In *Against Method*, Feyerabend gives a detailed – if not comprehensive – analysis of the rise of Copernicanism in general, and the case of Galileo in particular. He tries to show that all generally accepted methodological rules were violated by Galileo: he clung to theories that were decisively falsified; he replaced comprehensive, adequate theories by dubious ones with a limited applicability; he denied the validity of well known observations and 'invented' new ones; and in general, he relied more on propaganda and deceit than on rational argument. It should be noted that Feyerabend does not wish to criticize Galileo – in fact, he explicitly assumes that his readers view the rise of Copernicanism as a 'Good Thing', a commendable example of scientific progress. Rather, the point he is trying to make is that this progress did in fact come about through irrational means that

[1]'Killing Time', p. 162. In the rest of this essay, *KT* will stand for 'Killing Time', *AM* for 'Against Method', and *SFS* for 'Science in a Free Society'.

[2]*AM*, p. 1, original in italics.

[3]*AM*, p. 1-2.

clash with all accepted scientific methods, and that it could not have occurred had these methods not been violated.

By looking at historical examples, we will be able to find out how science works in practice. The use of history, it seems, is to give us a greater insight into the nature of science, and to provide us with arguments in philosophical debates on science. For this purpose, however, traditional historical accounts of what actually happened are not enough – to show that progress 'could not have occurred' unless specific actions were taken, one has to use history in a hypothetical way. We should look not only at what happened, but also use our historical understanding to speculate on what would have happened if certain conditions had not been met. Feyerabend shows himself to be aware of this somewhat liberal use of history in a later book, *Science in a Free Society*, where he tells that in *Against Method* he had to make 'some rather far-reaching assumptions not only about what *did* happen, but also about what *could* and what *could not* have happened given the material, intellectual, scientific conditions of a particular time.'[4]

But the merits of history are certainly not exhausted by showing us how science works in practice. Before we turn to these other merits, we should take a look at Feyerabend's conception of the history of science. Paraphrasing Lenin, he claims that 'history generally, and the history of revolution in particular, is always richer in content, more varied, more many-sided, more lively and subtle than even the best historian and the best methodologist can imagine.'[5] All attempts to fit historical events into a preconceived, universal scheme, such as Hegel's syntheses, must fail – in exact analogy to the failure of scientific methodology in describing the actual progress of science. After all 'the history of science will be as complex, chaotic, full of mistakes, and entertaining as the ideas it contains, and these ideas in turn will be as complex, chaotic, full of mistakes, and entertaining as are the minds of those who invented them.'[6] It is of the highest importance that the historian acknowledges this complexity, since 'a little brainwashing will go a long way in making the history of science duller, simpler, more uniform, more 'objective' and more easily accessible to treatment by strict and unchangeable rules.'[7] Studying the history of science, in its full glory, thus shows us the true complexity of science and safeguards us against the stifling tyranny of methodological rules. It keeps scientists critical and capable of abandoning 'the rules' when necessary. Modern scientific education stands in sharp contrast with this, Feyerabend continues, as its aim is not to make the student critical, but to absorb him into an existing research tradition, with its own language, logic, undeniable facts and aims. This is an outrage, since 'the attempt to increase liberty, to lead a full and rewarding life, and the corresponding attempt to discover the secrets of nature and of man, entails [...] the rejection of all universal standards and all rigid traditions.'[8] History liberates man from intellectual slavery.

Knowledge of history is not only necessary for a critical appraisal of scientific methods, but also of theories and even facts. Indeed, history of science is needed to *understand* contemporary theories. How could this be the case?

[4] *SFS*, p. 13.
[5] *AM*, p. 9.
[6] *AM*, p. 11.
[7] *AM*, p. 11.
[8] *AM*, p. 12.

According to Feyerabend, in order to understand a scientific theory we must contrast it with other, rival, theories. For example, the meaning of the special theory of relativity becomes clear only once we contrast it with the dynamics of Newton and Galileo. If we knew only the former, and not the latter, we would for instance not be aware of the fact that the existence of a finite maximum speed is a highly non-trivial feature of our universe, an experimental result. 'A scientist who wishes to maximize the empirical content of the views he holds and who wants to understand them as clearly as he possibly can must therefore introduce other views; that is, he must adopt a *pluralistic methodology*. He must compare ideas with other ideas rather than with 'experience' and he must try to improve rather than discard the views that have failed in the competition.'[9] The history of science is therefore essential for understanding scientific theories: we need accounts of older theories and of the reasons why they were discarded and replaced by more 'modern' views. Insight in this process shows us the true meaning and content of our present-day theories, and their strengths and weaknesses. Thus, 'the *history* of a science becomes an inseparable part of the science itself - it is essential for its further *development* as well as for giving *content* to the theories it contains at any particular moment.'[10]

History can not only be used to show us the content of *theories*. On an even more fundamental level it should look at the way in which our observational evidence, our facts, indeed our very *way of perception* was created. It is by now a commonplace in the philosophy of science that all observations are theory-laden: when I see a chair, I am unconsciously using the theoretical object 'chair' to give meaning to the colours I perceive. Accepted facts and observations, the way we see the world, may, claims Feyerabend, be infected by false background theories we are not aware of. An example is the observation that the earth is not moving, which was completely unproblematic to the Aristotelians. However, it was based on background theories, which Feyerabend calls 'natural interpretations', such as that 'you can always clearly notice whether you are moving or not'. The only way to recognise such natural interpretations in our own perceptions is by looking at contrasting theories – which should be unearthed by historians, since it will be very hard to think them up ourselves. History is needed to allow us to be critical towards observational evidence, which always has a '*historico-physiological character*', and is plagued by 'the fact that it does not merely describe some objective state of affairs *but also expresses subjective, mythical, and long-forgotten views*.'[11]

From this two main conclusions can be drawn. Firstly, that history has a very important role to play in the actual process of science itself, and that it contains many aspects that are generally called 'foundational'. Indeed, Feyerabend tells us that 'the whole history of a subject is utilized in the attempt to improve its most recent and most 'advanced' stage. The separation between the history of a science, its philosophy and the science itself dissolves into thin air.'[12] Secondly, that for Feyerabend the history of science is primarily a history of *ideas* – he is less concerned with social, economical, political and other influences on scientific practice.

A final word on the conception of history; Feyerabend exclaims in one of

[9] *AM*, p. 21.
[10] *AM*, p. 21.
[11] *AM*, p. 52.
[12] *AM*, p. 33-34.

his more polemic passages that he is addressing himself to people who 'look at the rich material provided by history, and who are not intent on impoverishing it in order to please their lower instincts, their craving for intellectual security in the form of clarity, precision, 'objectivity', 'truth'.'[13] History is not merely useful, it is also *beautiful* – and we are asked to put aesthetics above a limiting rationality.

The preceding discussion suggests two main questions concerning Feyerabend's description of the Galileo-affair: What are his views on this historical episode? And how does it prove his methodological thesis? Put differently: What does Feyerabend have to say on Galileo, and what does Galileo have to say on Feyerabend?

2 Galileo on Feyerabend

2.1 The tower argument: changing sensations

Suppose that the Copernicans are right; then the earth revolves around its axis in 24 hours. This means that, at the equator, the earth's surface has a speed of almost 1700 kilometers per hour; and at higher latitudes it is still a sizable fraction of this number. It seems that some people have so little common sense that they assume this could be the case without us noticing it! Yet we reasonable people have not just common sense, but solid experimental data to back us. For if we were to drop a ball from the top of a tower, according to the aforementioned view the earth would have turned quite a bit before the ball hit the ground; necessarily, it would fall some distance from the tower's base. But everyone knows that balls fall straight down, so we have an irrefutable argument against the silly opinion of Copernicus and his followers.

And so they had, the Aristotelians of the late 16^{th} and early 17^{th} century. And Galileo Galilei, a supporter of Copernicus, saw this with utter clarity – and instead of *refuting* the argument, he *defused* it. The experimental data were unproblematic: everyone, including Galileo, agreed that stones fall perpendicular to the earth's surface. But in his *Dialogue concerning the two chief world systems*, he tells us that it is 'better to put aside the appearance, on which we all agree, and to use the power of reason to either confirm its reality or to reveal its fallacy.'[14] But how could an appearance be a 'fallacy'? Galileo gives us an example 'from which [...] one may learn how easily anyone may be deceived by simple appearance, or let us say by the impression of one's senses. This event is the appearance to those who travel along a street by night of being followed by the moon, with steps equal to theirs, when they see it go gliding along the eaves of the roofs. There it looks to them just as would a cat really running along the tiles and putting them behind it; an appearance which, if reason did not intervene, would only too obviously deceive the senses.'[15] This is a perfect example of what Feyerabend calls a 'natural interpretation': noticing a phenomenon, we automatically express it in language – but this expression is not theory-neutral, and contains hidden assumptions we are not aware of. The task of reason is to interfere with these natural interpretations when necessary. This is exactly

[13] *AM*, p. 18.
[14] Taken from *AM*, p. 56.
[15] Taken from *AM*, p. 56.

what Galileo will attempt to do in the case of the tower argument.

The natural interpretation in this case is that *real* motion and *observed* motion are the same. The Copernicans claim that the motion of the falling stone is a complicated mixture of a straight motion and at least two circular ones. But the observed motion is simply straight; therefore, Copernicanism is refuted, argue the Aristotelians. What Galileo has to do is show that the Copernicans and the Aristotelians are in fact speaking about different kinds of motion – the first about 'real motion', motion in absolute space, the second about 'observed motion', motion relative to the observer. For this purpose, Galileo must create the new concepts of absolute and relative motion, which simply do not exist in the Aristotelian scheme, and he must destroy the natural interpretation that makes people equate the two.

It is important to notice that the Copernican theory was absolutely necessary to unearth the hidden natural interpretations contained by the Aristotelian world-view. That the idea of a moving earth was refuted by simple observations was entirely clear; but Galileo, wishing to retain it, invented a new observation language with terms like 'relative motion' and 'absolute motion'. This change in language brought about a corresponding change in the interpretation of sensations, and therefore in the sensations themselves. It was only possible because the refuted theory of Copernicus was not abandoned, but used to challenge the experimental evidence. 'This [...] is one of the reasons one can give for *retaining*, and, perhaps, even for *inventing*, theories which are inconsistent with the facts. Ideological ingredients of our knowledge and, more especially, of our observations are discovered with the help of theories which are refuted by them. *They are discovered counterinductively.*'[16]

2.2 Telescopic observations: disregarding refutations

The Copernican theory was not just refuted by kinematical arguments, but also by celestial observations. Here it is not the natural interpretations, but the very observations themselves that are a danger to Galileo's pet theory. He concedes this in his *Dialogue*, where Salviati – the Copernican – boldly speaks the following words: 'You wonder that there are so few followers of the Pythagorean opinion [that the earth moves] while I am astonished that there have been any up to this day who have embraced and followed it. Nor can I ever sufficiently admire the outstanding acumen of those who have taken hold of this opinion and accepted it as true: they have, through sheer force of intellect, done such violence to their own senses as to prefer what reason told them over that which sensible experience plainly showed them to be the contrary.'[17] What is this experience that plainly contradicts the Copernican scheme? It has to do with the sizes of Mars and Venus, which, in the Copernican system, are at some times much closer to the earth than at others. At its closest, Mars should look sixty times larger than at its farthest, yet the observed difference in size is only a factor of five or six. Even worse is Venus, which should change in size by a factor of forty, whereas the actual difference is almost imperceptible.

What is Galileo's answer to this glaring problem? He claims that he has a 'superior and better sense than natural' available: the *telescope*. Could he make

[16] *AM*, p. 61.
[17] Taken from *AM*, p. 79.

observations with this instrument that would support Copernicanism? Why, in particular, should anyone accept telescopic observations as reliable observational evidence? Were there theoretical reasons available to trust the telescope? If not, were there experimental reasons? According to Feyerabend, the last two questions should be answered in the negative.

Galileo claims in the *Sidereus Nuncius*, the book that made him famous, that he 'succeeded (in building the telescope) through a deep study of the theory of refraction.'[18] But this theoretical reason for the reliability of telescopic vision is not correct, because there exist serious doubts as to Galileo's knowledge of contemporary optics. Feyerabend quotes with approval from E. Hoppe's *Die Geschichte der Optik*: 'Galileo's assertion that having heard of the Dutch telescope he reconstructed the apparatus by mathematical calculation must of course be understood with a grain of salt; for in his writings we do not find any calculations and the report, by letter, which he gives of his first efforts says that no better lenses had been available; six days later we find him on the way to Venice with a better piece to hand it as a gift to the Doge Leonardi Donati. This does not look like calculation; it rather looks like trial and error. The calculation may well have been of a very different kind, and here it succeeded, for on 25 August 1609 his salary was increased by a factor of three.'[19] The telescope was a huge success, allowing highly improved terrestrial vision, with immediate commercial and military applications. 'Its application to the *stars*, however, was an entirely different matter.'[20]

In the first place, it was highly dubious on theoretical grounds that the telescope would work for the heavens as well as for earth-bound objects. In the Aristotelian philosophy, celestial objects are made of a material entirely different from that found on earth, thus obeying different laws. There was no reason to assume that what worked on earth also worked in space. Furthermore, the Aristotelian theory of knowledge predicted that the senses, being acquainted with terrestrial objects from close by, would perceive them distinctly even if the telescope created all kinds of optical illusions. But the senses are not acquainted with celestial objects from close by, and thus would not be able to correct the telescope's faults when applied to the heavens.

These theoretical fears were soon strengthened by empirical evidence. Horky, a pupil of Kepler, was present at a meeting where Galileo showed his telescope to twenty-four professors in Bologna. He wrote about the device: 'Below it works wonderfully; in the heavens it deceives one, as some fixed stars are seen double. I have as witnesses most excellent men and noble doctors [...] and all have admitted the instrument to deceive.'[21] This is not at all surprising, as the early telescopes surely *did* produce very strong optical illusions; in fact, 'many reports of even the best observers were either plainly *false*, and capable of being shown as such at the time, or else *self-contradictory*.'[22] An example are Galileo's celebrated pictures of the moon, which actually do not look like the moon at all. '[W]e must admit that Galileo's observations could be checked with the naked eye and could in this way be exposed as illusory.'[23]

[18] Taken from *AM*, p. 82.
[19] Taken from *AM*, p. 83.
[20] *AM*, p. 85.
[21] Taken from *AM*, p. 88.
[22] *AM*, p. 91.
[23] *AM*, p. 98.

The validity of telescopic observations, then, was decisively refuted. But the changes in size of Mars and Venus, which Galileo so desperately needed, *could* be seen through it. Although there were many good reasons to discard the telescope as unreliable, this agreement between Copernicanism and the new instrument convinced Galileo that the former was true and the latter useful. '*It is this harmony* rather than any deep understanding of cosmology and of optics *which for Galileo proves Copernicus and the veracity of the telescope* in terrestrial *as well as* celestial matters. And it is this harmony on which he builds an entirely new view of the universe.'[24] Here Feyerabend has found a very strong case against all naive scientific methodologies. Anyone will agree that the rise of Copernicanism under the influence of the telescope was a great step forwards in the development of science. But the case seems to be that 'one refuted view – Copernicanism – [had] a certain similarity to phenomena emerging from another refuted view – the idea that telescopic phenomena are faithful images of the sky.'[25] Hardly something that would count as a solid basis for science in most methodologies. Had a naive falsificationism been practiced by Galileo, both Copernicanism and the telescope would have succumbed to it.

2.3 From Aristotle to Copernicus: a step backwards

It is generally believed that scientific theories are better the more encompassing they are; and that new theories should explain more, and be more broadly applicable, than the older theories they are trying to replace. But, claims Feyerabend, in the case of Galileo the very opposite happened. 'Astronomy, physics, psychology, epistemology – all these disciplines collaborate with the Aristotelian philosophy to create a system that is coherent, rational and in agreement with the results of observation as can be seen from an examination of Aristotelian philosophy in the form in which it was developed by some medieval philosophers.'[26] Compared to this intricate, well-developed world-view, the new science of Galileo and his followers was crude and incomplete, with nowhere near the predictive and explanatory power of the venerable philosophy. For example, Galileo is often praised for creating the science of dynamics, the study of motion. But in doing this he destroyed the Aristotelian dynamics, which was a 'general theory of change, compromising locomotion, qualitative change, generation and corruption', and which 'could also be applied to mental processes.'[27] The new dynamics was about locomotion only, and further restricted to matter. Other kinds of motion are disregarded, the idea being that in the end they can be reduced to locomotion. A very limited theory, combined with a metaphysical idea of motion, thus replaces a comprehensive, broadly applicable theory. In a way, this is a huge step backwards.

On the other hand, it was also necessary. The change from Ptolemy to Copernicus was not just a matter of changing a few assumptions about the movement of the planets; Copernicanism could only become acceptable after the Aristotelian world-view had been replaced by an entirely new world-view, with a new epistemology and scientific methodology, new optics, dynamics, meteorology – and so on. But such a change is not a matter of days. 'Today

[24] *AM* p. 103-104.
[25] *AM*, p. 103.
[26] *AM*, p. 109.
[27] *AM*, p. 77-78.

Copernicus, tomorrow Helmholtz – this is but a Utopian dream.'[28] Such a change can only take place if people hold on to theories that are weaker – in all respects – than established ones long enough to create a critical mass of related theories and philosophies that protect it from refutations and expand its explanatory and predictive power. The change from Aristotle to modern science shows very clearly something which happens very often, though on a smaller scale, in our scientific enterprise: that we must choose the weaker theory above the stronger, if we wish to progress. 'We may, of course, try to explain our action by saying that the critical observations are either not relevant or that they are illusory, but we cannot support such an explanation by a single objective reason. Whatever explanation we give is nothing but a *verbal gesture*, a gentle invitation to participate in the development of the new philosophy.'[29] And indeed, contrary to popular methodological ideas, 'a new period in the history of science commences with a *backward movement* that returns us to an earlier stage where theories were more vague and had smaller empirical content.'[30]

3 Feyerabend on Galileo

3.1 An irrational crystal

We have seen a number of ways in which the Galileo-affair supports Feyerabend's methodological claims. But a number of questions remain to be answered. According to popular opinion Copernicanism became accepted, in spite of the Church's opposition, because it was the only rational choice. Feyerabend denies that rationality had anything to do with it, so how *does* he explain the rise of Copernicanism? And how does he view the role of the Church in the scientific debate surrounding Galileo? Should this interference on the part of the Church be condemned, as popular historiography often does?

If Copernicanism was indeed a refuted, narrow theory backed only by other refuted theories and the most dubious kind of observations, how is it possible to explain the fact that within a century after Galileo the entire scientific community had embraced it? Galileo and the other Copernicans could not get people over to their side by rational argument. 'It [would] have to be brought about by *irrational means* such as propaganda, emotion, *ad hoc* hypotheses, and appeal to prejudices of all kinds.'[31] It is certainly true that Galileo was a master of propaganda and rhetoric – but why did he find a receptive audience? 'It is in this context that the rise of a new secular class with a new outlook and considerable contempt for the science of the schools, its methods, its results, even for its language, becomes so important.'[32] The new class of merchants looks down upon the Latin of the scholars, the other-worldliness and supposed uselessness of the academic science and it's connection with the Church; and associates them with the Aristotelian cosmology. All Aristotelian arguments become suspect because of the contempt one feels for the tradition they come from. 'This guilt-by-association does not make the arguments less *rational*, or less conclusive, *but*

[28] *AM*, p. 113.
[29] *AM*, p. 113.
[30] *AM*, p. 114.
[31] *AM*, p. 114.
[32] *AM*, p. 114.

it reduces their influence on the minds of those who are willing to follow Copernicus.'[33] Copernicus becomes a symbol of progress, of the ideals of a new class – the heliocentric world-view reaches dominance not because of brilliant new arguments or observations, but because it becomes stylish among the upcoming elite. Copernicanism becomes a crystallization point for new theories, ideas and observations – and thus the seed from which the Scientific Revolution would grow.

3.2 Champions and shepherds

Let's turn to Galileo's trial. The popular image – which is no longer adhered to by any serious historian – is that of a lone, rational genius in conflict with the powerful, irrational Church trying to protect itself from the advancement of knowledge. Obviously, Feyerabend comes much closer to making the opposite claim: that Galileo was irrational, and the Church merely the champion of rationality. The trial's importance is highly exaggerated, he claims. '[It] was one of many trials. It had no special features except perhaps that Galileo was treated rather mildly, despite his lies and attempts at deception. But a small clique of intellectuals aided by scandal-hungry writers succeeded in blowing it up to enormous dimensions so that what was basically an altercation between an expert and an institution defending a wider view of things now looks almost like a battle between heaven and hell.'[34] There were in fact two trials: that of 1616, in which Copernicanism itself was examined, and that of 1632/33, where the point in question was Galileo's obedience to the Inquisition's decrees. If the historical relation between science and religion is our concern, the former is the more important.

The Inquisition asked experts to judge the Copernican doctrine on two points: its *scientific content* and its *ethical implications*. On the first point, they declared it to be 'foolish and absurd in philosophy', a statement based not on religious beliefs, but on the scientific situation of the time. As we have seen in the preceding chapter, this was largely correct. Within the context of the available theories, observations and scientific standards, Copernicanism *was* an absurd and refuted theory. Any modern rationalist ought to praise the Church for its reasonable decision, claims Feyerabend.

On the second point, the experts condemned the new theory as 'formally heretical'. This meant that it contradicted Holy Scripture as interpreted by the Church, *and* did so in full awareness of the fact. Why was any importance attached to this? Not, as is often believed, because the Church was mindlessly bent upon eradicating all beliefs inconsistent with its own, but because it believed that a correct knowledge of Holy Scripture is a necessary condition for leading a good life. The Church felt it had an ethical task: to protect the people from beliefs that would endanger their happiness and grace. Copernicanism, which clearly contradicted the Bible, was such a danger; and unless it were decisively proven to be true – which was not the case at the time of Galileo – it should not be allowed to corrupt the masses. The Church, then, had both reason and ethics on its side. Its decision to forbid Galileo to teach the Copernican doctrine as truth was commendable. The Church's 'indictment of Galileo was rational

[33] *AM*, p. 115.
[34] *AM*, p. 127.

and only opportunism and a lack of perspective can demand a revision.'[35] Its consciousness of the social implications of science was especially laudable, and a 'revision of the judgement might win the Church some friends among scientists but would severely impair its functions as a preserver of important human and superhuman values.'[36] The Church *did* revise its judgement since *Against Method* was first published – I leave to the reader the decision whether Feyerabend was right in proclaiming that this proves the Church's irrelevance to the problems of our modern age.

4 The lessons of history

Is Feyerabend's description of the Galileo-affair and the rise of Copernicanism *correct*? We might say that it is not sufficiently supported by systematic analysis – but that would be a bit like telling Mondriaan that his paintings don't depict recognisable objects. After all, Feyerabend tells us that *Against Method* 'is not a book, it is a collage.'[37] His primary goal is to teach us a lesson about methodology: he uses the Galileo-affair to show that scientific research cannot be restrained by 'rational' methodologies without losing much of its potential for innovation. The *correctness* of his historical account is not even a necessary condition: 'If my account of Galileo is historically correct, then the argument stands as formulated. If it turns out to be a fairy-tale, then this fairy-tale tells us that a conflict between reason and the preconditions of progress is *possible*, it indicates how it might arise, and it forces us to conclude that our chances to progress *may* be obstructed by our desire to be rational.'[38] This is an extremely liberal use of history: it can teach us important lessons, even if we do not have all the relevant details correct – and the lessons, not the correctness of the historical account, are of prime importance.

Yet, in a way, the methodological lesson is only a stepping stone for Feyerabend, something he uses to get to his real message – the real lesson the history of Galileo can teach us. We have seen how Galileo changed many concepts of the Aristotelian philosophy, changes that would bring down an entire philosophy and, in time, perhaps an entire religion. And with this, many social constraints, human values, beliefs that gave structure and meaning to life would come crashing to the ground. This did not concern Galileo and his fellow scientists – most probably they weren't even aware of it. The Church, however, perceived the difficulties and acted accordingly. 'The trial of Galileo raises important questions about the role products of specialists, such as abstract knowledge, are supposed to play in society.'[39] Feyerabend tells us that our modern governments have forgotten what the Church was well aware of: that scientific developments have social and ethical implications too – as is shown by historical analysis of science – and that it can be necessary to control research. 'Science is only *one* of the many instruments people invent to cope with their surroundings. It is not the only one, it is not infallible and it has become too powerful, too pushy, and too dangerous to be left on its own.'[40] Political control over science is necessary.

[35] *AM*, p. 125.
[36] *AM*, p. 133.
[37] *KT*, p. 142.
[38] *AM*, p. 117.
[39] *AM*, p. 124.
[40] *AM*, p. 160.

The Galileo-affair has taught us, furthermore, that theories opposed to the scientific status quo – even opposed to the accepted scientific methodology – can be necessary for scientific progress. History teaches us the necessity of theoretical pluralism. For Feyerabend, the advantage of this goes well beyond the improved advancement of science. If young people are educated in a variety of different theories and methodologies, they will become more creative and imaginative than when they are forced to learn by heart only the presently accepted canon of scientific theories. 'It is possible to *retain* what one might call the freedom of artistic creation *and to use it to the full*, not just as a road of escape but as a necessary means for discovering and perhaps even changing the features of the world we live in.'[41] The importance of historical research in furnishing us with competing theories and modes of thought has already been stressed in the first part of this paper. History – or 'possible history' – has shown us what is wrong with modern science and education, *and* gives us the tools to improve it. It is a necessary ingredient of social reform towards a free society. '[I did not] assume that my critique was the end of the matter. It was a beginning, a very difficult beginning – of what? Of a better understanding of the sciences, better societal arrangements, better relations between individuals, a better theatre, better movies, and so on.'[42]

References

[1] **Feyerabend, Paul**: *Against method*, Third edition, 1993, Verso

[2] **Feyerabend, Paul**: *Science in a Free Society*, 1978, NLB

[3] **Feyerabend, Paul**: *Killing Time - The autobiography of Paul Feyerabend*, 1995, The University of Chicago Press

[41] *AM*, p. 38.
[42] *KT*, p. 134.