Feyerabend and Popper on Theory Proliferation and Anomaly Import: A Peace Proposal

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Symposium "Feyerabend's Theoretical Pluralism vs. Popper's Critical Rationalism Continuities and Ruptures"

CLMPS 2015, Helsinki
7 August 2015

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Feyerabend's Theoretical Pluralism

Theoretical Pluralism is a package consisting of two components:

1) The Principle of Proliferation (PP)

"Hence, if change of paradigms is our aim then we must be prepared to introduce and articulate alternatives [...], we must be prepared to accept a *principle of proliferation*. Proceeding in accordance with such a principle is *one* method of precipitating revolutions. [...] Science as we know it is not a temporal succession of normal periods and periods of proliferation; it is their *juxtaposition*." (Feyerabend 1970, p. 205f.)

2) The Anomaly Importation Thesis (AIT)

'[A]lternatives are both used and needed; and the are needed as it is only with their help that it is possible to find anomalies in whatever theory is being held at a special moment."
Feyerabend in a letter to Kuhn, 1960 (Hoyningen-Huene 1995, p. 336)

(A note on terminology: AIT is a neologism by Hoyningen-Huene (2000), used in his discussion of Feyerabend's critique on Kuhn.)

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Feyerabend's Theoretical Pluralism (cont.)

How are PP and AIT related?

- PP and AIT are independent but closely related components in Feyerabend's argumentative framework.
- $\Rightarrow$ AIT **justifies** PP

AIT-PP in a nutshell

If we look at a theory T through the glasses of an alternative T', the empirical content of T might appear richer and new relevant facts might become available.
Should we decide to replace T by T', it is because T' explains certain facts that T was unable to explain, and it also shows *why* T failed to explain them. We end up with a better theory and *ipso facto* with scientific progress. Hence, theory proliferation is essential for progress!

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Feyerabend's Theoretical Pluralism (cont.)

The Argument for AIT

Feyerabend attacks the **monistic test model** of the empiricist tradition, which is based on the Principle of Autonomy:
The empirical facts relevant for a theory are available whether or not one considers alternatives to the theory.

Feyerabend against Autonomy

"Not only is the description of every single fact dependent on *some* theory [...], but there also exist facts which cannot be unearthed except with the help of alternatives to the theory to be tested, and which become unavailable as soon as such alternatives are excluded. This suggests that the methodological unit to which we must refer when discussing questions of test and empirical content is constituted by a *whole set of partly overlapping, factually adequate, but mutually inconsistent theories.*" (Feyerabend, *Against Method*, 1975, p. 27)

Feyerabend's Theoretical Pluralism (cont.)

The Argument for AIT (cont.)

The Case of Brownian Motion

BM became a refuting instance for Thermodynamics *not* through the confrontation of Thermodynamics with the mere fact of BM, but by putting Thermodynamics in the context of the larger but incommensurable framework of the Kinetic Theory. Only in this constellation the phenomenon of BM became a genuine anomaly for Thermodynamics.

- Certain counterinstances against a specific theory become **relevant** counterinstances for that theory only in the context of alternatives.
- Anomalies are "imported" into the theory with the help of alternatives. Therefore, if we are interested in **increasing the empirical content** of a theory, we must have alternatives at hand.
- Incommensurable alternatives offer a **better** way of comparing theories.

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Popper on Theory Proliferation and Anomaly Import

Was Popper a proponent of the monistic test model?

Oberheim (2006), p. 227:

8.1. Feyerabend's pluralistic test-model

As we have seen, following Popper, Feyerabend emphasized the *critical* nature of scientific knowledge and its development. He argued both that the potential to criticize and to challenge any aspect of science is science's distinguishing characteristic, and that this critical element of scientific research is responsible for science's progressive nature. Science is thus distinguished from myth, which is dogmatic. Feyerabend often contrasted science as a critical enterprise with myths that are held dogmatically. (e.g. 1961i; rp 1999a, pp. 50-77). However, Feyerabend did not accept any of the predominate views on exactly how theories are critically put to the test. Both the Popperian and logical empiricist models of theory testing are based on the idea that a single theory is tested against the given facts:

> All these investigations [such Popper and logical empiricists' into questions of confirmation and test] use a model in which a *single* theory is compared with a class of facts (or observation statements) which are assumed to be '*given*' somehow (1963a; rp 1999a, p. 91, italics inserted. Also see 1962a, p. 30; rp 1981a, p. 46).

According to Feyerabend:

> This manner of discussion [a monistic test-model] does not allow us to give an adequate account of crucial experiments (1965b, p. 216).

Popper on Theory Proliferation and Anomaly Import (cont.)

things. And the function of the consistency condition lies precisely in this. It eliminates such fruitless discussion and it forces the scientist to concentrate on the facts which, after all, are the only acceptable judges of a theory. This is how the practising scientist will defend his concentration on a single theory to the exclusion of all empirically possible alternatives.[26]

It is worthwhile repeating the reasonable core of this argument: theories should not be changed unless there are pressing reasons for doing so. The only pressing reason for changing a theory is disagreement with facts. Discussion of incompatible facts will therefore lead to progress. Discussion of incompatible alternatives will not. Hence, it is sound procedure to increase the number of relevant facts. It is not sound procedure to increase the number of factually adequate, but incompatible alternatives. One might wish to add that formal improvements such as increase of elegance, simplicity, generality and coherence should not be excluded. But once these improvements have been carried out, the collection of facts for the purpose of test seems indeed to be the only thing left to the scientist.

5 RELATIVE AUTONOMY OF FACTS

And this it is – provided these facts *exist, and are available independently of whether or not one considers alternatives to the theory to be tested*. This assumption on which the validity of the argument in the last section depends in a most decisive manner I shall call the assumption of the relative autonomy of facts, or the autonomy principle. It is not asserted by this principle that the discovery and description of facts is independent of *all* theorizing. But it *is* asserted that the facts which belong to the empirical content of some theory are available whether or not one considers alternatives to *this* theory. I am not aware that this very important assumption has ever been explicitly formulated as a separate postulate of the empirical method. However, it is clearly implied in almost all investigations which deal with questions of confirmation and test. All these investigations use a model in which a *single* theory is compared with a class of facts (or observation statements) which are assumed to be 'given' somehow. I submit that this is much too simple a picture of the actual situation. Facts and theories are much more intimately

[26] More detailed evidence for the existence of this attitude and for the way in which it influences the development of the sciences may be found in Kuhn's book *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962). The attitude is extremely common in the contemporary quantum theory. 'Let us enjoy the successful theories we possess and let us not waste our time with contemplating what *would* happen if *other* theories were used' – this seems to be the motto of almost all contemporary physicists (<see> Heisenberg, *Physics and Philosophy*, pp. 56, 144) and philosophers (<see> N. R. Hanson, 'Five Cautions for the Copenhagen Interpretation's Critics', *Philosophy of Science*, vol. 26, 1959, pp. 325–37). It may be traced back to Newton's papers and letters (to Hooke, and Pardies) on the theory of colour. See also footnote 23, above.

Within contemporary empiricism, discussions of test and of empirical content are usually carried out in the following manner: it is inquired how a theory is related to its empirical consequences and what these consequences are. True, in the derivation of these consequences reference will have to be made to principles or theorems which are borrowed from other disciplines and which then occur in the correspondence rules. However, these principles and these theorems play a subordinate role when compared with the theory under review; and it is, of course, also assumed that they are mutually consistent and consistent with the theory. One may therefore say that, for the orthodox procedure, the natural unit to which discussions of empirical content and of test methods are referred is always a single theory taken together with those of its consequences that belong to the observation language.

This manner of discussion does not allow us to give an adequate account of crucial experiments which involve more than one theory, none of which are expendable or of psychological importance only. A very good example of the structure of such crucial tests is provided by the more recent development of thermodynamics. As is well known, the Brownian particle is a perpetual motion machine of the second kind, and its existence refutes the (phenomenological) second law. However, could this fact have been discovered in a direct manner, i.e., by a direct investigation of the observational consequences of thermodynamics? Consider what such a refutation would have required! The proof that the Brownian particle is a perpetual motion machine of the second kind would have required (a) measurement of the exact motion of the particle in order to ascertain the changes of its kinetic energy plus the energy spent on the overcoming of the resistance of the fluid, and (b) precise measurements of temperature and heat transfer in the surrounding medium in order to ascertain that any loss occurring here was indeed compensated by the increase of the energy of the moving particle and the work done against the fluid as mentioned in (a). Such measurements, however, are beyond experimental possibilities.[78] Hence, a direct refutation of the second law, i.e., a refutation based upon an investigation of the testable consequences of thermodynamics alone, would have had to wait for one of those rare, not repeatable, and therefore, prima facie suspicious, large fluctuations in which the transferred heat is indeed

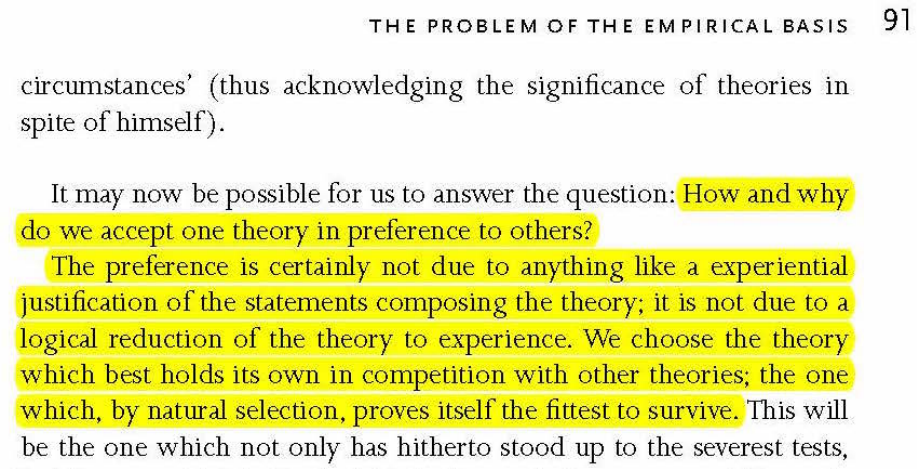
[78] Concerning the extreme difficulties of following the motion of the Brownian particle in all its details, see R. Fuerth [41].

Popper on Theory Proliferation and Anomaly Import (cont.)

Popper on the role of alternatives in theory testing in the Logic of Scientific Discovery

Tests of theories involve (*LSD*, 1.3):

1) logical consistency
2) logical form (falsifiabiltiy)
3) **comparison with other theories**
4) empirical tests



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circumstances' (thus acknowledging the significance of theories in spite of himself).

It may now be possible for us to answer the question: How and why do we accept one theory in preference to others?

The preference is certainly not due to anything like a experiential justification of the statements composing the theory; it is not due to a logical reduction of the theory to experience. We choose the theory which best holds its own in competition with other theories; the one which, by natural selection, proves itself the fittest to survive. This will be the one which not only has hitherto stood up to the severest tests,

Logic of Scientific Discovery, 5.30

⇒ Alternatives play a crucial role in theory testing.
⇒ Facts **refute** theories. But only theories make us **reject** theories.
⇒ Theory proliferation (PP) is acceptable in principle.

Popper on Theory Proliferation and Anomaly Import (cont.)

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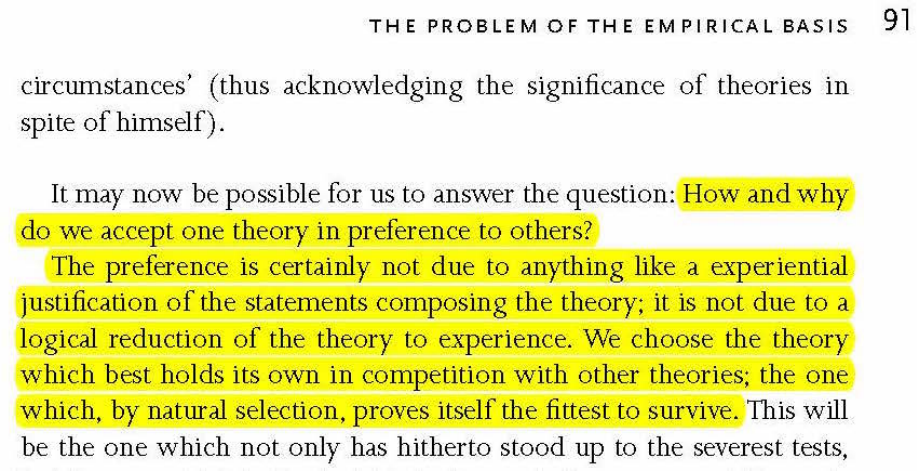

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Popper on Theory Proliferation and Anomaly Import (cont.)

Popper's pluralistic test model

question. Criticising and testing go hand in hand: the theory is criticised from very many different standpoints in order to bring out those points which may be vulnerable. And the testing of the theory proceeds by its vulnerable sides to as severe an examination as possible. This again is the trial and error method. Theories are put forward tentatively and tried out. If the outcome of a test shows that the theory is erroneous, then it is eliminated: the trial and error method is essentially a *method of elimination*. Its success depends mainly on three conditions, namely, that sufficiently many and sufficiently different theories are offered, and that sufficiently severe tests are made. In this way we may secure, if we are lucky, the survival of the fittest theory by a process of elimination.

Assuming this description [1] of the development of human thought in general and of scientific thought in particular to be more or less correct, we are able to understand why such a

Popper, *What is Dialectic?* (1940)

is *linear*, in the sense that theories are followed by eliminating refutations, and these refutations in turn by new theories.[49] According to Popper_2, the growth of science is pluralistic: '[Elimination] depends on [the condition] that sufficiently many and sufficiently different theories are offered'.[50] This pluralistic aspect of Popper_2's philosophy was elaborated and further developed by Paul Feyerabend.[51]

However, even our improved Popper_2 has left the problem of the remarkable *continuity* in science unsolved. Scientists (and, as I have shown, mathematicians too) tend to ignore counterexamples, or as they prefer to call them, 'recalcitrant' or 'residual' instances;

[48] I discussed the problem of 'hidden' background knowledge in my [1963–4], esp. pp. 224–6.

[49] E.g. Popper [1934], section 85, p. 279 of the 1959 English translation.

[50] Popper [1940] and Popper [1968e], p. 96.

[51] Feyerabend acknowledges that he learned the gist of his 'principle of proliferation' from Popper_2's lectures which he attended in 1948 and 1952. (Feyerabend [1962], p. 32.)

Lakatos, *Criticism and the Methodology of Scientific Research Programmes* (1968)

According to Karl Popper, whose procedure most adequately reflects what is going on in the sciences, T is scientific only if it has potential falsifiers, that is, only if there exist observational statements S_i such that S_i & T is a contradiction (we omit mentioning the conditions that must be imposed in order to eliminate trivial cases). Now in determining the truth value of the S_i, one usually refers to auxiliary theories T' (the test of Newton's celestial mechanics involves optical theory, theory of elasticity, physiology, chemistry, and so on). These auxiliary theories help us to test the S_i, and they also have an influence upon the terms of S_i. It is clear that the strength of the tests of T which are provided by the S_i will be the greater as the number of potential falsifiers of T' becomes greater. These potential falsifiers involve further auxiliary theories T'', and so on. But $T^i \neq T^k$ for any $i \neq k$ as circularity must be avoided. The result is that we are involved in an infinite regress unless we admit that there is some T^i without potential falsifiers. And as tests are carried out, this is not only a possibility but a fact of scientific procedure: every test involves metaphysical auxiliary assumptions.

A look at the history of science convinces one that this abstract scheme corresponds quite closely to reality. Thus some of Galileo's arguments against his opponents were based upon what was seen through the telescope. At the time in question the auxiliary theory involved, namely optics (physical and physiological), was non-existent and *a fortiori* metaphysical. Similarly, cosmological hypotheses are often measured by their agreement or non-agreement with the red shift of distant galaxies interpreted as a Doppler effect. This interpretation is again without potential falsifiers. Both abstract considerations and historical inquiry teach us that many tests involve metaphysical assumptions.

Turning the argument around, we now realize that we can increase the strength of experimental refutations by replacing these metaphysical assumptions with scientific theories, that is, by again developing alternatives to the theories under test: decisive refutation is impossible without proliferation (this is one of the features which distinguish Popper's criterion of falsifiability from such anticipations as may be found in Peirce, Dubislav, and others).

To sum up, proliferation is required both in order to strengthen our tests and in order to bring to light refuting facts that would otherwise remain inaccessible. The progress of science is unthinkable without it.

Feyerabend, *Outline of a Pluralistic Theory of Knowledge and Action* (1968)

Popper on Theory Proliferation and Anomaly Import (cont.)

Critical Rationalism and AIT

What does Popper say about the relationship between successive theories? Examples in *The Aim of Science* (1957):

Kepler: $a^3/T^2 = const.$
Newton: $a^3/T^2 \propto m_0 + m_1$.

Galileo: Acceleration in free fall is constant.
Newton: Acceleration in free fall increases.

Are these examples for:

a) **logically inconsistent** (i.e. quantitatively incompatible) theories where the later **corrects** the earlier?

b) **incommensurable** (i.e. qualitatively incompatible, logically unrelated) theories where the later highlights anomalies in the earlier?

There are strong indications that Popper has a) in mind. After all he did not think in terms of incommensurability. However...

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Critical Rationalism and AIT (cont.)

all about the mutual attraction between the planets, Kepler's third law (2) contradicts Newton's theory which yields (1).

It is important to note that from Galileo's or Kepler's theories we do not obtain even the slightest hint of how these theories would have to be adjusted—what false premisses would have to be adapted, or what conditions stipulated—should we try to proceed from these theories to another and more generally valid one such as Newton's. *Only after we are in possession of Newton's theory can we find out whether, and in what sense, the older theories can be said to be approximations to it.* We may express this fact briefly by saying that, although from the point of view of Newton's theory, Galileo's and Kepler's are excellent approximations to certain special Newtonian results, Newton's theory cannot be said, from the point of view of the other two theories, to be an approximation to their results. All this shows that logic, whether

deductive or inductive, cannot possibly make the step from these theories to Newton's dynamics.[11] It is only ingenuity which can make this step. Once it has been made, Galileo's and Kepler's results may be said to corroborate the new theory.

Here, however, I am not so much interested in the impossi-

Popper, *The Aim of Science* (1957)

Popper on Theory Proliferation and Anomaly Import (cont.)

Is this AIT? $\Rightarrow$ Not quite!

Does Popper speak in terms of incommensurability? $\Rightarrow$ No!

However, Popper's examples do show that incompatible alternatives are necessary in order to understand why and in what way earlier theories were flawed!

- AIT is **not incompatible** with Critical Rationalism
- AIT can be seen as **a fruitful extension** of Critical Rationalism

Summary

	Popper	Feyerabend
Competition essential for progress	√	√
Theory-dependence of facts	√	√
Alternatives enhance criticism	√	√
Pluralistic test model	√	√
Anomaly Import	x	√
Incommensurability	x	√
Convergence to truth; truthlikeness; convergent realism	?	x

Popper and Feyerabend agree that progress results from the critical discussion of theoretical alternatives!

Thank you!

For details see:

Bschir, Karim. 2015. "Feyerabend and Popper on Theory Proliferation and Anomaly Import: On the Compatibility of Theoretical Pluralism and Critical Rationalism." *HOPOS: The Journal of the International Society for the History of Philosophy of Science* 5 (Spring): 24–55.