**Falsification and its critics**

***Lakatos’ Sophisticated Falsification*** - “Methodology of research programmes”

**Lakatos** brings in a different perspective which took Popper’s falsificationism a step further. With “*Methodology of research programs*” falsifiability continues to play a role but with a re-contextualized importance.

*Not one but a sequence of theories*

We should not look to a single theory, but we should look in theories in sequence, because they’re not isolated units. We should see at falsification in a whole sequence.  A sequence of theory (**Research Program**) is characterized by two important features:

1. A hard core (central assumptions, beliefs… that as such prove to be non-refutable),
2. A set of auxiliary hypotheses (extra assumptions that allow the application of the general case to the specific circumstances = position of the body, mass, velocity…).

What makes a theory falsifiable is the mixture of these two characteristics. Falsification then becomes harder to achieve.

**How do we falsify?**

“If “hard core + ah” Then O, Not-O

Therefore not “hard core + ah”.

***Negative Heuristic***

* Save the hard core (from Modus Tollens)
* Modify the auxiliary hypotheses (or event new ones) = Protective belt that gets tested, readjusted or replaced to defend the hardened core.
* Build a new theory with some hard core and new auxiliary Hs

The hard core is more difficult to get rid of, so we think that some of the auxiliary hypotheses are not good. So we start revising our hypotheses, in order to try to defend our hard core.

***Positive Heuristic***

When refutation strikes, we have a situation in which the first reaction is to keep the hard core and change, modify the refutable protective belt.

It consists on a set of suggestions on how to change the refutable variants and on how to modify the refutable protective belt.

Lakatos thinks that scientist can legitimately stick to the theories they made. Is this all rational? Are scientist rationally doing this? Or are they just stubborn?

We need a way to distinguish science to pseudo-science.

**The problem of demarcation - Good and Bad Science**

A research program must meet two conditions. We must look at it in terms of how Progressive and Degenerating it is.

A research program is progressive both:

* Theoretically, each theory in the sequence shows to have an excess of empirical content, and can make new predictions
* Empirically, at least some of the predictions turn out to be true.

***Degenerating Programmes***

A research program is progressive if at least some of the prediction it can produce become corroborated. A research program that doesn’t do either of this has a lot of chances of being degenerating: it does not deliver novel prediction, or the predictions turn out to be false.

*Novel Predictions:*

* Competitive theories
* [Talking about Marxism trying to explain every anomaly] “But their auxiliary hypotheses were all cooked up after the event to protect Marxian theory from the facts. The Newtonian programme led to novel facts; the Marxian lagged behind the facts and has been running fast to catch up”

**Departures from Popper**

1. **Falsification is not the criterion of demarcation.** Lakatos abandons falsifiability as the criterion of demarcation.  “*The discovery of an inconsistency—or of an anomaly—[need not] immediately stop the development of a programme. It may be rational to put the inconsistency into some temporary, ad hoc quarantine, and carry on with the positive heuristic of the programme.”*
2. He also says that within the issue of demarcation, **being scientific** is not a matter of either/or, but it **is a matter of more or less**, and the more or less is something that we can capture in time. We can judge it by testing them with logical devices. If we accept this we can say that a RP might be more scientific in a certain stage, less in another and so on.

*History, not just logic*

**Focus on the scientific change**. Lakatos was more interested in seeing how theories changed in time, and a way to do so was to introduce history in science.

“Philosophy of science without history of science is empty; history of science without philosophy of science is blind”.

*Methodologically informed history*

“Rational” reconstruction of how science proceeds and develops. Internal vs External Factors

History informs Method, **Thomas Kuhn** - *From The Copernican Revolution (1957) to The Structures of Scientific Revolutions*

He was actually a physicist, but he always had a passion on how scientific ideas born and develop. He saw that the History of science they talked about was a sort of one-sided history, speaking only about successes and triumphs. The Copernican Revolution is his starting point, and from there he started drawing theoretical frameworks on the structure of science and its method (*The Structures of Scientific Revolutions*).

According to him the development of science doesn’t follow an uniform path. Science alternates periods of normality and periods of revolution.

**Normal science**

1. It is described by Kuhn as ‘puzzle-solving’. The scientist performs science as cross-words, as a puzzle. Within normal science scientists have a pretty high expectation of solving all problems.
2. There is another important aspect, which is the shared commitments. Scientist shares commitment in terms of what instruments to employ, in terms of the beliefs they have… In other words before scientific enquiry could even start, a scientific community must agree on some fundamental (which goes into shared commitments). This array of shared commitments allow to solve puzzle and constitutes what Kuhn calls “a scientific paradigm”.

Scientific Paradigm:The Newtonian paradigm:

1. It puts forward a certain picture of the world (material particles which interact each other… = deterministic picture)
2. Which is based on some laws of nature.
3. This paradigm has available a number of techniques to pursue science
4. It is also built on a series of shared values. All these features is what we can derive by reading Newton’s *Principia Mathematica*.

All the scientists doing science within the Newtonian paradigm are ‘Normal Newtonian scientists’ and the paradigm give them all the resources to deal with problems. Scientists get more and more confident when they work within a certain paradigm.

*Popper against normal scientists*

Popper dislikes this idea of paradigmatic science. The price to pay in Popperean view is dogmatism: “*Normal science, in Kuhn's sense, exists. It is the activity of . . . the not-too-critical professional: of the science student who accepts the ruling dogma of the day*”.

* *“The 'normal' scientist, in my view, has been taught badly. . . He has been taught in a dogmatic spirit: he is a victim of indoctrination.”*
* *“Danger to science and, indeed, to our civilisation”*

**Anomalies**

But anomalies comes in anywhere.

* So we enter in a period of crises, where the paradigm is in crises. How do scientists respond to the crisis?
* At some point scientist find themselves looking at the anomaly (revision) and decide they need to solve it
* We find ourselves at the beginning of a scientific revolution that brings to a new domain, to a new paradigm.
* But the decision of revising and changing a paradigm is not rationally compelled. Sometimes the options are so far from each other that they are incommensurable vis-a-vis other options. What enters this period is an array of extra-scientific factors. In the literature about Kuhn all the extra-factors have been exaggerated, at the point that it seems that all that counts are the extra-factors.

**Paul Feyerabend** - “Anything Goes”

Somebody who wouldn’t mind being interpreted like that is **Paul Feyerabend**. He was one of Popper’s student. His most famous book was *Against Method* (1975).

*Methodological anarchism [His life’s periods]*

1. He starts from a normative (ruled) epistemology
2. Then he passed to a more pluralistic epistemology in a period in which he thought that there are different sets of rules.
3. He ended up with a far more radical view, which is a no-rule epistemology. The way in which he develops this view is by History of Science. In fact he goes even further to those kind of methodology, we kind of restrict the possibility that history has to develop, and end up by inhibiting progress. The only rule we can adopt is the no-rule (“Anything goes”).

Violating the rules

* *“Violations are not accidental […] we see that they are necessary to the progress”*
* *“This liberal practice is not just a fact of the history of science […] it is reasonable and absolutely necessary for the growth of knowledge”*
* *“Considering any rule, however fundamental, there are always circumstances when it is advisable not only to ignore the rule but to adopt its opposite”*