

## PHYSICS AND THE SOCIAL SCIENCES

Lee Smolin writes in his book “The trouble with physics” about the problems some physicists have with string theory; a theory that is still untested but believed to be true by nearly the whole scientific community.

In the introduction of his book he writes that in science, “for a theory to be believed, it must make a new prediction, different from those made by previous theories, for an experiment not yet done. Only when a theory has been tested and the results agree with the theory do we advance the theory to the ranks of true theories”.

Then he mentions that Lisa Randall defines a theory as “definite physical framework embodied in a set of fundamental assumptions about the world, and an economical framework that encompasses a wide variety of phenomena. A theory yields a specific set of equations and predictions, ones that are borne out by successful agreement with experimental results”.

Smolin continues: “We tell our students that belief in a scientific theory must always be based on an objective evaluation of the evidence”.

He then writes that there can be good reasons to take a theory seriously as hypothesis about nature, but that it is not the same as declaring it true: “every unproved idea is met with a healthy dose of skepticism and criticism until it is proved”.

And continues by stating that there are two ways of doing science: research that arises from reflection on foundational problems (deep thought on the most fundamental questions surrounding its most basic concepts – the work of Einstein, Bohr, Schrödinger and others) and research that is pragmatic and directed towards excellence in performing calculations (the work of Feynman, Dyson, etc.).

Two ways of doing science that solves different kind of problems, requiring very different ways of thinking.

So far Smolin. Let me resume the salient aspects of the scientific enterprise as he discusses them in his introduction:

- Experimentation
- Prediction
- Deep thinking of basic concepts
- Development of the mathematics
- Hypothetical theories
- True theories
- Skepticism
- Believe in (true) theory.

An important aspect of physical science is measurement. But Smolin doesn't mention this because, I guess, it is so fundamental to its methodology (no measurement, no math and no answers).

Mainstream social sciences has tried to copy the physical sciences in its methodology. But the results of this endeavor are very bad. In my opinion we should rethink the way we do social science and radically change our course.

First of all the problems in the social sciences are of a very different nature than the problems in the physical sciences: Newton's first law, for example, is about velocity and forces; a change in the velocity of an object is the result of a cause working on it.

In the social sciences we deal with phenomena that are complex and non-deterministic, like 'leadership in organisations'. The interesting question here is: why do some people accept another person as a leader. Or in other words: which aspects of the leader, his followers and the environmental setting make a certain person a leader for a certain group (or nation)?

As said, in the situation of the social sciences the problem under study is complex: we study the interaction of human beings (brains) with a memory and a learning capability; we study the interaction of living, goal seeking systems. And goal seeking really means: constructing the future.

We should remember though, that there is no social reality, a reality that is the same for all participants. Reality is always an interpreted reality that changes. A stone today is a stone tomorrow, but a leader today can be a prisoner tomorrow.

When we think of velocity of objects and forces working on them, the first relevant questions to be asked are for example: how far will an object get in a certain time? Or how much force should I use to change the direction of an object with 15 degrees? Time, distance, velocity and force are all entities that can be measured.

With 'leadership in organisations' the story is very different. Here the first relevant question is for example: which factors determine effective leadership? And the factors involved are the elements of the following three sets:

- the characteristics of the followers (like gender, age, acceptance of authority, etc.);
- the characteristics of the leader (like gender, age, ability, etc.);
- the organisational factors (like the nature of the task, the culture and the structure of the organisation).

So the first question of the social sciences has to do with the consideration of the totality of the relevant conditions. The second question is the question of the possibility of true (valid) measurement. I will not discuss this problem here, but the problem is big.

That being said, let's look at the characteristics of science as mentioned by Smolin. I will place after each characteristic a short comment on its use in the social sciences.

- Experimentation (mostly impossible in the social domain, but sometimes it can be done)
- Prediction (possible, but by other means than by mathematical models)
- Deep thinking of basic concepts (possible)
- Development of the mathematics (possible, but validity of the measurements is often a problem)
- Hypothetical theories (we have plenty of them)
- True theories (I wonder ...)
- Skepticism (not enough)
- Believe in (true) theory (ugh...).

The difference between physical sciences and social sciences are huge. In the past a lot of physicists and mathematicians have worked on subjects that belongs to the social sciences and done all sorts of research. Their results are not spectacular.