FQXi asked: How Could Science be different?

No Standstill in Fundamental Science

-
- 1 Science must be ready for renewal as to live up to full responsibility.

We should not be discouraged by the failure of overly ambitious essays, e.g.[1]. Barbour intended explaining the phenomenon time and reveal a related different science which he hoped could in future unite quantum with classical physics. Instead, it is perhaps more promising to go on giving better orientations how to steer the many mutually interwoven branches of science that are permanently ruling our life. Science does not need answering stunning but irrelevant questions.

Science aims to provide a safe and eventually useful background for progress in many branches including technology, biology, physiology, psychology, medicine, ecology, economy, forecast, planning, sociology, ethics, so called defense, etc.

Science comprehensively accumulates and combines acceptable knowledge which is easily available worldwide online and in libraries.

The whole mankind does, in principle, benefit for free from accumulated scientific results.

Science is the work of communities. It always arises from exchange of observations and ideas, trial and error, even if we tend to attribute it to single persons.

Once it is discovered or invented, basic knowledge may be reliable for good.

Unfortunately, the necessary awareness of unseen risks and limitations is still in the infancy in almost all branches.

Can science reach full perfection, and will all present questions get answered? Perhaps no, although effects of saturation are well known in particular disciplines. For instance the periodic system of elements may be considered pretty perfect.

I will try and show, why fundamental science is not dying, at least not yet.

2 Let's be more aware of coming challenges.

I see a new risk emerging: Ongoing rapid progress in science implies side-effects. Well, most scientists will agree: It is now necessary to make anybody, including the final consumers, aware of their role in already anticipated global challenges. However, prediction of future science is still uncertain. Realistic plans how to cope with surprising changes do as a rule not yet exist, and thinkable solutions will require intelligent free cooperation of individuals. They may have a lot of difficult calculable aims and influences.

Let me begin and address seeming trifles: There are many so far unseen or just ignored possibilities to adapt to growth issues the efforts and directions of work in science. Because quality and efficiency must not be damaged, there is an urgent need to stop unnecessary growth in scientific work.

How to hinder in science the expected explosion of the already hugely risen number of printed or electronic publications which are often mediocre work? Even in highly specialized papers, one cannot read more than a tiny part of all new offered texts, not to mention digesting them carefully.

Lazy tools for visual and acoustic communication, advertizing videos and AI will worsen the situation for students and their teacher.

Last but not least, one should already ask: Why have so many students to learn Cantor's obviously useless set theory? It claims to be counterintuitive, while it actually arose itself from naïve intuition.

I also consider it a waste of student's mental capacities when we cause them to get fanatically interested e.g. in premature quantum technology. Unlimited and unjustified excessive use of mental capacity reminds me a bit of reckless misuse of global natural resources.. Of course the latter is more risky because we have only one earth. Nonetheless, students should perhaps concentrate their limited ability to train their brain by dealing with more useful topics.

In general, deliberate and reasonably controlled shrinking of human activities seems obviously unavoidable. An essay [2} claimed with respect to birthrate and consumption of natural resources: “There are just too many people”.

I do not just also support modest shrinking. I vote for consequent decisions, if required.

- 3 Science deserves consequent decisions.

Any theories deserve to be scrutinized and - if necessary - purged from a lot of prejudice, and/or or outdated and useless tradition. There is not just a “German angst” to lose ideas that could possibly be valuable. Scientists tend also to shy back from accepting necessary while unwelcome new restrictions.

For instance, I suspect that it is overdue to ask whether or not the widely accepted transfinite set theory can really be applied to practice. at all after more than a hundred years.

Decades ago, I learned a lot of historical facts and sound arguments from a proponent, the author of a brand-new online available source book “Transfinity”. When he called in [3] Leibniz’ lowest level of infinity the “mathematical” one, I understood a lot of ongoing confusion between this relative expression (larger than …) and the original logical opposite of being finite.

And I Learned from him the historic fact that a group which is known under pseudonym “Nicolas Bourbaki” claimed having made set theory “the fundament of the whole mathematics” [3]. I reiterate: So far I came not across with any according application of set theory in science. Let me instead of saying “in dubio pro” in this case decide “less is more”.

4 Outside the laws of nature – or just of their misinterpretation?

I rarely disagree with Einstein and admire him for many reasons. However I differ when he admitted that the now worries him seriously and he suspected it to be

something outside science, cf. [4]. His denial of the border between past and future in a letter of condolence corresponds to still mandatory physics.

I feel one of a few who dare considering the logical separation of anticipated future from an in reality fixed past not in conflict with the fact that in models (!] the laws of nature are invariant under time shift and even time reversal.

Models are closed constructs, abstracted from open reality. Therefore they are necessarily incomplete pictures. Maps describe territories, not the other way round. Shannon and Popper were ignored – perhaps because the idolized late Einstein declared in a letter of condolence such distinction an illusion: And already the young Einstein had agreed to disagree with Ritz [5]. Mathematics was adapted to old naïve speculations centuries before Einstein. I just remind of eternal life, rebirth, and Ben Akiba's time symmetry.

The whole community of physicist, not only Einstein inherited the notion time in two different meanings. Physics, (in Einstein's words science) calculates with a generalized quantity that was abstracted from the real observable one. I don't know: Why did religion presumably not like to learn to distinguish between them? May science be different?

Maybe, the young Einstein was a bit too self-confident. The late one confessed to be a believer.

5 Bigotry is understandable but not not justified

Someone asked: Did Einstein use complex calculus in his GTR? A bewildering number of answers may have felt this like an attack against him and tried to just provide known arguments in support of GRT as if it was questioned at all. They avoided the correct answer "no".

In contrast to very bad bigotry in religion and politics, this is certainly not a seriously alarming indication. It is rather an example that demonstrates typical behavior of groups to be investigated elsewhere.

Fortunately, many people tend to reject naive believe in science fiction, soon available quantum personal computers, feasibility of fusion reactors, human colonies outside earth, etc.

It is perhaps prudent if ordinary people do not fear that they have to learn quantum physics as a replacement of classical one. Let's wait until functioning as promised personal quantum computers will justify trust of laymen in QM and/or QFT. Many scientists seem to be worried by seemingly abstruse details of Copenhagen interpretation, some of which were already reasonably questioned by Einstein. Feynman even declared QM not understandable at all.

So far, we may only hope that confirmation of quantum physical tenets will reach a sufficient level, comparable to application and experimental evidence for the basic ideas behind Einstein's theories. I do not yet see Einstein's objections compellingly invalidated.

.

6 A perfect system of numbers in IR is based on Dedekind's cut.

Symmetry has been declared a pillar of physics. As I already wrote above, set theory is anyway obviously useless and it is presumably ill-founded. When I dealt with the extension-less point zero as the ideal border between past and future, because I had suggested using spectral analysis in IR+, I got aware that set theory ignores negative numbers, arbitrarily introduced an empty set, and can therefore not perform a truly symmetrical cut exactly at zero. This worried engineers like Terhardt and me.

This fundamental dilemma in mathematics can only be avoided when any ideal point in the line IR is no longer understood as it usually was. i.e., like a pixel that has shrunk to infinitely small size. Shrinking is a reasonably imagined procedure applied on symmetrical intervals which makes sure that any point is unique and the belonging number is exact i.e., different from all others. Even after shrinking, the pixel was still imaginable like a body, having a left and a right side of approaching the common ideal limit point. Only actually infinitely many of the

usual numbers together could be thought to create the composed dense continuum of a line.

The alternative Dedekind cut is also a point alias a number. It is inverse to the usual view. Being not a nested interval of distances, it fits from the very beginning the definitions that a point has no parts, and a continuum is something every part of which has parts. It does not need the metaphor of shrinking and does not need the hard to imagine composition of continuum as a set of points. The continuum is instead assumed as a priori given. Peirce called it “mere potentialities” of location. Any number is then exactly defined simply as a precise cut.

Only Dedekind’s cut agrees with the “tertium non datur” (law of excluded middle). This is relevant to theoretical physics, too: There is logically no physical state “at” any numerical value in between the two adjacent limits from both sides.

In integral tables, the distinction between the two cases <t and > t for a parameter t is sufficient. We do not need the case =a in between them anymore.

There is no justification for the arbitrary definition sign(x)=0 at x=0.

7 Foundational question outside physics are getting more important.

Wasn’t an essay [6] too naïvely promising peace via discoveries and invention? Well, almost nobody predicted WW1 and more recently the sudden return of war to a European country. Psychology in politics has its own fundamental laws. We have to condemn without exception all celebrations of heroic military victories and in particular demonstration of nuclear power. Propaganda for stupid ideology and bigotry is also intolerable around the globe. People should neither feel like cheated winners nor belonging to an unbeatable great nation.

Prudent scientists will observe and support necessary gradual changes concerning agreeable meanings of notions like freedom, humanity, and even ethics. Strong resistance is to be expected from the shadows of past empires and their doctrines.