

# CRISES IN PHYSICS

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## **Analysis or agitation?**

In 2007, when the Higgs boson had not yet been discovered at the Large Hadron Collider, the Nobel Prize had not yet been awarded for this discovery, and gravitational waves had not yet been registered, a book was published by Lee Smolin, a specialist in loop quantum gravity and string theory, entitled " Trouble with physics: the rise of string theory, the decline of science, and what follows." The author writes about "the stagnation that has taken hold of theoretical physics".

"There may or may not be a God. Or the gods. However, there is something ennobling about our search for the divine. And also something humanizing that is reflected in each of the ways that people have opened up to lead us to deeper levels of truth. Some seek the transcendent in meditation and prayer; others seek it in the service of their loved ones; still others, who are happy enough to have talent, seek the transcendent by practicing art. Another way that touches on the deepest questions of life is science".

That is: there was a stage in the development of capitalism when physicists started talking about religion. Although in the XVI century, it was capitalism that called on science to overthrow religion, although Lenin still explained that "any flirtation with religion is a cadaver".

"...we failed, - writes Lee Smolin. - We inherited a science, physics, that progressed so quickly and for so long that it was often taken as a model for how other fields of science should work. For more than two centuries until today, our understanding of the laws of nature has expanded rapidly. But today, despite all our efforts, what we know for certain about these laws does not exceed what we knew about them in the 1970s... "What have we discovered that our generation could be proud of?" If we mean new fundamental discoveries established by experiment and explained by theory-discoveries on the level of those just mentioned — the answer we must admit is: "Nothing!" ... we have made two experimental discoveries in the last two decades: that neutrinos have mass and that the universe is dominated by a mysterious dark energy that seems to be accelerating the expansion of the universe... its discovery cannot be regarded as a success... many great ideas have been explored, and there have been outstanding particle accelerator experiments and cosmological observations, but they have mostly served to confirm existing theories. There were several leaps forward, but none as decisive or important as in the previous 200 years... For the experiment to be meaningful, we must be able to get an answer that is at odds with these predictions. When this is the case, we say that the theory is falsifiable - vulnerable to being refuted".

The author calls the criterion of the truth of the theory the principle of falsifiability of Popper. If we ask ourselves whether the principle of falsifiability is false, and WHY Popper needed it – we will immediately get an answer to the question of whether the principle is false or true.

In his excursion into the history of "philosophical" ideas, Lee Smolin mentions the principle of verification as refuted.

First, the verification principle extends the principle of practice as a criterion of truth by adding a comparison with accepted algorithms, programs that themselves require verification by practice. But the same principle narrows down the criterion of practice.

Secondly, where did Smolin get the idea that the thesis of practice as a criterion of truth was refuted? Although, of course, not every practice is a criterion of truth, measurement by a faulty instrument cannot be a criterion of truth.

But in fact, among the "verificationists" of the Vienna Circle, that is, the neo-positivists, Wittgenstein argued that "it is not necessary to know whether a sentence is true or false, but to know the circumstances that make it possible to establish its truth".

In fact, the principle of verification appeals not to the comparison of theory and experience, but to the verifiability of "atomic" judgments.

In science, the neo-positivists preached, there should remain two classes of scientific propositions - analytical truths that have no objective content, and factual truths, empirical facts of specific sciences, the meaning of which can be verified in a special way - the principle of verification. The procedure of verification by means of protocol propositions of an empirical nature, which "purifies" science from metaphysics – read from philosophy, more precisely, from dialectical materialism - is the basis of logical positivism. Verification, the procedure for verifying the truth of knowledge, according to neo-positivists, suggests that complex sentences should be divided into protocol sentences. The truth of protocol sentences is absolutely certain, since it corresponds to the observed reality. Thus, practice as a criterion of truth does not even appear in the principle of verification.

In 1935, Popper, who criticized the principle of verification, put forward the principle of falsification. The theory meets the Popper criterion, is falsifiable and, accordingly, scientific if there is a possibility of its experimental or other refutation.

The principle is meaningless. Indeed:

1) what if all the available experiments confirm the theory, but no one can come up with an experiment that would refute it?

(2) It immediately follows from Popper's principle that all theories, at least until 1935, were not scientific unless scientists sought to refute them experimentally. But scientists did not just look for, but conducted experiments that could confirm or refute any theory, including the "experiments of the cross", designed to answer the question "yes" or "no". Consequently, the scientists acted correctly without any principle of falsification. Popper confuses the possibility of an experiment and the experiment itself.

Consider the theory that there is another Universe near our Universe that does not interact with our Universe in any way. It is impossible to refute this "theory" experimentally. It would seem that the Popper principle is designed to weed out such theories. But their unscientific nature is obvious, and no principle is required to eliminate them.

Whether the very speculative possibility of a refuting experiment is correct, the principle of falsification does not consider.

Every theory has limits of applicability, this is well known, and this does not mean that limited theories are unscientific. However, the limits of applicability are set only by future experience, about which nothing can be known.

But if the possibility of experimental refutation was realized, and the experiment refuted the theory? This means absolutely nothing, because according to the principle of falsification, this theory is scientific. Thus, the concept of scientific knowledge loses its meaning.

Unfortunately, Popper is now revered by professors of all Russian universities.

And we know these professors by name, don't we?

So, on the first pages of the book, Lee Smolin only follows the standard bourgeois ideology, the bourgeois indicates how a scientist should think, and Lee Smolin thinks with anti-communist, anti-Soviet clichés.

"Neither a Marxist country nor a fundamentalist religious structure is a creative community," says Lee Smolin. For proof, he refers to his Marxist grandmother and his Marxist friends.

First, today, hundreds of thousands of people who claim to be Marxists actually adhere to castrated, perverted Marxism, that was in the USSR.

Secondly, whether Smolin should know what high Arab culture, including astronomy, is. In the bowels of Hinduism, a system of numbers, which we now call Arabic, appeared, and writing, history, and mathematics began to develop in the churches. Even in Hitler's Germany, there was a lot of creativity. Lee Smolin probably doesn't know that the success of American space exploration is due solely to the Nazi SS officer Werner von Braun.

Third, Lee Smolin calls the Soviet leading world schools in cosmonautics, philosophy, cinema, literature, and theater not creative. It was necessary to think of declaring Blokhintsev, who discovered the Lamb shift, Landau, Kapitsa, chemist Semenov, Michurin, Zeldovich, Ermolyeva, Kurchatov, Ginzburg, Keldysh, Petrovsky, Kolmogorov, Pontryagin, etc., etc., not to mention the outstanding engineers as Korolyev and technologists-people uncreative. Apparently, Lee Smolin never saw the best Soviet ballet in the world, such poets as

Tvardovsky, Simonov, Rubtsov, Vampilov, Zhdanov, Kalpidi, etc., such writers as Kataev, Rasputin, Makanin, etc., did not read, such composers as Shostakovich, Prokofiev, Myaskovsky, Sviridov, Schnittke - did not hear. Fourth. Why did Smolin assume that the USSR is a Marxist country??

Thus, the creative Smolin thinks in propaganda cliches.

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But then the scientist discards the false principle of falsifiability and turns directly to experimental verification – if there is no such thing, then there is no theory.

Then the physicist discards all the cliches of bourgeois propaganda, he turns not even to science as such, but to society, he begins to see the world as it is. Lee Smolin begins to denounce bourgeois society "from a phenomenological point of view."

"Over the past thirty years, - writes Lee Smolin, - theorists have proposed at least a dozen new approaches. Each approach has been motivated by compelling hypotheses, but none has been successful to date. In the field of particle physics, these approaches included technicolor, preon models, and supersymmetry. In the space-time domain, these approaches included twistor theory, causal series, supergravity, dynamic triangulations, and loop quantum gravity. String theory... does not make new predictions that are testable by today's - or even conceivable today-experiments. Even if we restrict ourselves to theories that agree with some basic observable facts about our universe, such as its enormous size and the existence of dark energy, we are left with about 10 to the power of 500 different string theories — which means one with 500 zeros after it, more than the number of all the atoms in the known universe. With such a monstrous number of theories, there is almost no hope that we will be able to identify the result of an experiment that would not be performed by one of them. Thus, no matter what the experiment shows, string theory cannot be disproved. But the opposite is also the case: no experiments will ever be made to verify its correctness. The string theories that we know how to study are known to be flawed. Those that we cannot study are thought to exist in such gigantic quantities that no conceivable experiment can ever disprove them all...»

Lee Smolin quotes David Gross, a Nobel laureate in particle physics: "We don't know what we're talking about... The state of physics today is similar to what it was when we were puzzled by radioactivity... They have lost something absolutely fundamental. We may have lost something as solid as they did back then" [1].

The scientist gives the formula of the polemic: "How can you not see the beauty of the theory? How could a theory do all this and not be true?" say string theorists. This provokes an equally heated response from skeptics: "Have you lost your mind? How can you believe so strongly in any theory in the complete absence of experimental verification? Have you forgotten how science allows for results? How can you be sure that you are right when you don't even know what the theory is?.."

And then-quite frankly: "... in the United States, a theorist who deals with approaches to fundamental physics other than string theory has almost no career opportunities... This harms science, because it forces us to abandon research in alternative directions, some of which are very promising. How is it possible that string theory, which has been studied by more than a thousand brilliant and well-educated scientists, working in the best conditions, is in danger of failure? This has surprised me for a long time, but now I think I know the answer. What, I am sure, has failed is not only a single theory, but a style of science that was well suited to the problems we faced in the mid-twentieth century, but has ceased to be suitable for the kinds of fundamental problems we face now. The standard model of particle physics was a triumph of the particular way of doing science that had come to dominate physics since the 1940s.

This style is pragmatic and realistic, and encourages virtuosity in calculations when pondering difficult conceptual problems. This is very different from the way that Albert Einstein, Niels Bohr, Werner Heisenberg, Erwin Schrodinger, and other revolutionaries of the early twentieth century who did science. Their work arose from deep reflection on the most basic questions of surrounding space, time and matter, and they saw that they were part of the broad philosophical tradition in which they were at home. ... I am extremely concerned about a trend in which only one line of research is fully supported, while other promising approaches are starving to death. ... This is a trend with tragic consequences if, as I will argue, the truth lies in a direction that requires a radical rethinking of our basic ideas about space, time, and the quantum world".

This is a torn consciousness - between the surrounding world and outdated idealistic cliches. Smolin sees a way out of this situation in the search for a new IDEA.

## **Idealism**

In 1974, in a conversation with Yuri Nepomnyashchiy, an associate professor of the Perm University, a specialist in liquid helium, I noticed that in the future, both physicists and all scientists, in order to be professionals, to make scientific discoveries, will need to thoroughly know philosophy. Nepomnyashchiy haughtily replied that physicists only need to take philosophy into account.

In 2007, Lee Smolin proposed to include philosophical propositions in the system of axioms in the plan of returning to Einstein's philosophy. However, these propositions are taken by him exclusively from bourgeois, idealistic philosophy.

Quantum mechanics and the theory of relativity were discovered not in line with the idealistic philosophical tradition, but in spite of it.

The great scientific discoveries of the sixteenth and eighteenth centuries were due to the collapse of feudalism, and the growing capitalism required science, not religion. The greatest discoveries of the early twentieth century were made because the October Revolution took place, it is called the Russian revolution, it did not become a world revolution, but it was prepared by the course of social development of the whole world.

Lee Smolin understands revolutions only like revolutions in science, that is, he ignores social revolutions, thus he breaks up the connection between the social revolutions and the revolutions in science:

"Physics has always seemed to its leaders almost complete. This complacency is broken only during revolutions, when honest people are forced to admit that they do not know the basics. But even revolutionaries still imagine that the main idea — the one that will unite everything and bring the search for knowledge to an end - lies just around the corner. We have been living in one of these revolutionary periods for a century. The last such period was the Copernican revolution, which arose in the early sixteenth century, during which the Aristotelian theories of space, time, motion, and cosmology were overthrown."

Whether Smolin confuses the concept of a geocentric system and the concept of space-time, Aristotle, meanwhile, correctly pointed out the controversy of motion in space-time, Copernicus did not change the concepts of space, time and motion, instead of the geocentric concept of the world, he proposed a heliocentric one.

Completely different concepts of space-time were overthrown: the subjective-idealistic view of St. Augustine, mechanistic views etc.

Lee Smolin clarifies: "In the universe of Ptolemy and Aristotle, there is a great difference between the concepts of being in motion and being at rest. Ptolemy suggested that certain bodies in the sky - the Sun, the Moon, and the five planets known to him-move in circles, which themselves move in circles. These so-called epicycles made it possible to predict eclipses and planetary movements-predictions that had an accuracy of 1 part per 1000, thus showing the fruitfulness of combining the Sun, Moon, and planets. Aristotle gave a natural explanation for finding the Earth at the center of the universe: it consists of terrestrial matter, whose nature is not to move in circles, but to strive for the center ... the planets should be considered one with the Earth, but not with the Sun, in an image that should be extremely unsettling. If the Earth is a planet, then it and everything on it is in continuous motion. How can this be? This violated Aristotle's law that everything that is not in the heavenly circles must come to rest..."

This is a misinterpretation of Aristotle's theory. Aristotle believed that the nature of all bodies, not just the Earth, is to strive towards the center, since the Earth is stationary, it is already in the center. The astronomer Claudius Ptolemy was of the same opinion. Ptolemy proved the absence of an axial rotation of the Earth as follows: if the Earth were rotating, then "...all objects that do not rest on the Earth must seem to make the same movement in the opposite direction." Of course, there was no accuracy in 1/1000, Ptolemy's theory satisfied only observations with the naked eye.

To make ends meet, the system was constantly complicated, and although its criticism was severely suppressed by the Christian Church, by the beginning of the XVI century, the Ptolemaic system was so complex that it could not meet the requirements of practice, including navigation.

Let us emphasize: in the absence of the possibility of experiment, Ptolemy turns to geometry, not to physics.

A distorted view of ancient philosophy and science does not go unpunished.

Smolin appeals to subjective idealism in the question of the incompleteness of quantum mechanics (QM): "The core of our inability to complete the current scientific revolution consists of 5 problems... These problems ... remain unresolved... it is worth taking a brief look at each. The first is that the combination of GRT and QM... QM does not tell the full story... It cannot be that reality depends on our existence. The problem of the absence of observers cannot be solved by addressing the possibility of the existence of alien civilizations, because there was a time when the world existed, but it was too hot and dense for organized intelligence to exist. Philosophers call this view realism... the world must exist independently of us. It follows that the terms in which science describes reality cannot include in any significant way the fact that we choose to measure or not to measure. QM... is not easily adjusted to realism... because the theory assumes the division of nature into two parts... there is an observable system. We, the observers, are on the other side. We have the tools that we use to conduct experiments and make measurements, and the clocks that we use to record when certain things happened. QM can be described, if we use a new kind of language, in a dialogue between us and the system that we are exploring with our tools. This quantum language contains verbs that denote our preparations and measurements, and nouns that denote what is then observed. It doesn't tell us anything about what the world will look like in our absence. Many of the founders of QM, including Einstein, Schrodinger, and de Broglie, found this approach to physics repugnant. They were realists. For them, KM, no matter how well it worked, was an incomplete theory, since it did not provide a picture of reality in the absence of our interaction with it. On the other side were Bohr, Heisenberg... they were taking such a new way of approaching science. What you see as a dimension, I see as 2 physical systems interacting with each other... if you agree that it is good to have an observer's influence as part of the theory, the theory as such is not sufficient. The QM should be expanded to take into account many other descriptions depending on who the observer is ... realism as a philosophy is simply extinct... I must admit that I am a realist. I am on the side of Einstein and others who believed that QM is an incomplete description of reality ... The mechanists had a great idea that would unite physics: everything that exists is matter..."

Lee Smolin is wrong, the atom is a quantum system, it functions as a quantum system even in our absence, without any observers.

Realism in England at the beginning of the XX century and in the philosophy of science of the second half of the XX century – asserts the correspondence of theoretical objects to objects existing in nature. Scholastic realism postulates the existence of general concepts in nature, like things. Lee Smolin substitutes the wrong term for the category of materialism. The position about the materiality of the world is not given by the mechanists, among the mechanists were the idealists Descartes, Kant, Laplace, and even in some matters the dialectician Hegel, who attributed randomness to the external.

The next substitution is in the replacement of the "material measuring device" system with the "observer" system. This makes it possible to declare QM subjective, that is, not a science, but the quantum world-dependent on the subject, with which Lee Smolin cannot agree, but declares the question is open.

The process of measuring quantum quantities is specific, it does not cover the entire QM. But in the theory of probability, the picture is the same: the conditions that the experimenter prepares for a probabilistic event to occur must necessarily be rough.

However, Einstein insisted on something else: QM is incomplete because it does not give the same picture as classical mechanics, whose philosophy is based on mechanismism. QM shows that mechanistic ideas about the world are limited. But QM by no means rejects dialectical materialism, so the problem of the incompleteness of QM is far-fetched.

Gross is right: physicists have indeed "lost something absolutely fundamental".

## **Degradation**

Lee Smolin complains that the works of Soviet scientists were not known.

This is not true, in the 80s Zeldovich, Ivanenko, Ginzburg, Frolov, Linde and many other Soviet scientists, even provincial Permian hydrodynamicists had extensive contacts with foreign scientists and were published in foreign scientific journals.

"...almost everything about Newton is unique and incomprehensible " - Lee Smolin is sure.

No, not unique: Newton could not have done anything without the laws of Kepler, who, in turn, derived them from the data of Tycho Brahe, which he stole. Leibniz discovered differential calculus before Newton, and Hooke discovered the law of universal gravitation. But Newton went to any lengths to prove his priority.

In the history of the creation of SRT, Smolin does without Michelson and Morley (establishing the independence of the speed of light from the speed of the light source), without Lorentz, Minkowski and Poincare, in the history of the creation of GRT – without Urbain Leverrier (the displacement of the perihelion of Mercury), Arthur Eddington (the deflection of a ray of light near the Sun), Gilbert and Friedman.

"By the 1930s, we also knew that the universe contained gigantic numbers of galaxies like our own, and we learned that they were moving away from each other. The implications were not yet clear, but we learned that we live in an expanding universe".

Lee Smolin forgot about the discovery of the Slipher in 1914 of the scattering of galaxies and the approach of the Andromeda nebula.

"By 1780, when Antoine Lavoisier's quantitative chemical experiments showed that matter is conserved, Isaac Newton's laws of motion and gravity had already been in place for almost a hundred years".

The law of conservation of mass was theoretically described in 1748 and experimentally confirmed in 1756 by the Russian scientist M. V. Lomonosov, 33 years before Lavoisier.

"...the standard model, - writes Lee Smolin, - told us exactly how protons and neutrons are assembled from quarks that are held together by gluons, carriers of the strong nuclear interaction. For the first time in the history of fundamental physics, a theory coincided with an experiment. Since that moment, not a single experiment has been made that does not correspond to this model or GRT".

Lee Smolin understands fundamental physics exclusively as the physics of elementary particles.

"By 1980, Stephen Hawking had already made a fantastic prediction about what black holes emit".

In fact, it was Hawking who for a long time resisted the idea of black hole radiation, but Zeldovich, Gribov and Starobinsky managed to convince him.

"In 1981, cosmologist Alan Guth proposed a scenario for the very early history of the universe called inflation. Roughly speaking, this theory states that the universe went through a giant growth spurt at a very early point in its life, and this explains why the universe looks almost exactly the same in every direction. The theory of inflation made predictions that seemed dubious until a decade ago, when the evidence began to arrive. As it is written, a few mysteries remain, but the entire body of evidence supports the predictions of inflation".

Smolin does not link the names of Linde and Starobinsky to the theory of inflation.

"Another example is the erroneous proof of the impossibility of hidden variables in quantum theory, published by John von Neumann in 1932 and widely cited for thirty years, until the quantum theorist David Bohm found the theory of hidden variables."

That is: is Smolin familiar with Bell's inequalities, but does not link them in any way to Bohm's theory? With a high degree of accuracy, the experiment shows that Bell's inequality does not hold, that is, no hidden parameters exist.

"In 1986, Abey Ashtekar, who worked at Syracuse University, reported on "a reformulation of GRT that makes its equations much simpler. Interestingly enough, he did this by expressing Einstein's theory in a form very close to that of gauge theories - the theories underlying the standard model of particle physics".

Lee Smolin calls this theory amazing, revolutionary, but its author is not Ashtekar. The idea of gauge gravity was proposed by the Soviet physicist E. Gapon and Werner Heisenberg, and then, in the early 80's, it was developed by D. Gapon, Ivanenko, G. Sardanashvili and the author of this text.

There are two gauge symmetries for the gravitational field. The first one is given by general covariant transformations of tensor quantities. The field of gauge general covariant symmetry can be easily identified with the connectivity of the gravitational field (Christoffel symbols). Indeed, the expressions for the covariant derivative and gauge connectivity transformations resemble similar expressions for the Yang-Mills field.

However, it is obvious that deviations from the Minkowski metric cannot be identified with Goldstone components, and an infinite continuous manifold cannot be isomorphic to a finite discrete one. There is no similar expression for the metric tensor. The attempt to reduce an arbitrary metric to the Higgs scheme, i.e. to equate form with content dualistically, leads only to a transition to the tetrad formalism.

The mathematician Ludwig Faddeev, without whose work string theory would not have taken place, is a reductionist and knows this, he seriously believes that chemistry is "the ultimate science, it supposedly fully explains the Schrodinger equation, although this equation does not even describe the light from a light bulb. Moreover, Faddeev seriously believes that there will come a time when theory will explain everything.

Even Lenin, in his book *Materialism and Empirio-criticism*, warned that even the most brilliant scientists should not be trusted when it comes to society. Today, as we can see from Lee Smolin's book, things are much worse: physicists can no longer be trusted in physics.

Even de Broglie claimed the completely wrong position that there is no pressure inside the gas, it is only on the walls of the vessel, Hawking claimed that thermodynamics supposedly allocates the arrow of time.

Now in Russia, many physicists study torsion fields that do not exist in nature, leading theoretical physicists talk about the effect of consciousness on the experiment, employees of the Kurchatov Institute measure the intensity of Favor light, etc.

Publicist Michio Kaku, a specialist in string theory, adheres to the interpretation of quantum mechanics formulated by von Neumann, that is, frankly subjectively idealistic, clearly inconsistent with the experiment. These examples once again show that in physics one can not know everything, the last universal physicists in the field of theoretical physics were Feynman, Holdan, Landau, their era is over. But the point is different – the problem is in the structural gap of physics.

Lee Smolin analyzes theoretical physics based on the historiosophy of theoretical physics itself. Let's expand its scope.

## **Sociology**

Not only the humanitarian intelligentsia feels above the classes, but also the scientific and technical intelligentsia. Although scientists are extremely dependent on both the bourgeois and the working class, they prefer to choose the bourgeois mentality. Lee Smolin explicitly states that his passion was not the study, not the comprehension of nature, not the use of the acquired knowledge in life, but the construction of theoretical schemes. Isn't that what ideologists and political strategists of all parties, from the ultra-right to the ultra-left, are doing now?

"... we must prove that science is more than sociology, more than academic politics, we must have the notion that science is what it consists of, but more than the idea of a self-governing community of human beings. To prove that a particular form of organization, a particular behavior, is good or bad for science, we must have a basis for making value judgments that go beyond what is popular. We should have a reason to disagree with the majority without being labeled as eccentric originals", - the scientist writes.

Lee Smolin contrasts the unconscious domination of the bourgeoisie with the domination (dictatorship) of the intelligentsia: "We must give the advantage to the Einsteins - people who think for themselves and ignore the established ideas of powerful higher scientists".

But he immediately writes: "... in order for the community to continue to exist, there must be mechanisms for correction: elders... "And he links this caste with the "democratic process"!

Democracy in translation – the power of demos, of course, such did not exist in ancient Greece, in the twentieth century this concept was equated with freedom for the bourgeois. We read how Lee Smolin understands democracy: "The most basic idea of democracy is that society will function better when disputes are resolved peacefully". It is strange, but the whole history of the United States contradicts this understanding: in Cuba, in El Salvador, in China, in Yugoslavia, in Iraq, in Afghanistan, in Libya, in Syria, and even in the USSR during the intervention after the October Revolution.

Thus, Lee Smolin separates physicists from society and places them above society as a special caste with privileges. This is exactly what Stalin reasoned: the party should be made up of special people, a kind of swordsmen. This is exactly what Stalin reasoned when he contrasted Lysenko, whom he had enrolled in the Einstein caste, with the powerful higher-level "bourgeois" genetics.

The question of who (and what) will determine whether an individual is Einstein, whether Smolin is not asked. Nor is he interested in the question whether the workers, by virtue of their depersonalizing labor, are capable of independent thinking, and in this connection whether scientists who are completely dependent on the depersonalizing labor of the workers and the dictates of capital, are capable of independent, unbiased thinking.

Therefore, like the humanitarian intelligentsia, the thinking of scientists is broken, it either ignores practice, or subconsciously feels the theory (i.e., itself) dominant, primary.

Lee Smolin mentions the importance of the experiment, but reports: "We can say that science progresses when scientists reach a consensus on the issue".

The practice was left out of the brackets. Marx explained: "There is nothing in science but its practical application".

Of course, science is not utilitarian, it does not live in the present day. Otherwise, it would be reduced to a set of technical techniques. Stars are not money, you can't put them in your pocket. However, the absolutization of non-utilitarianism leads to idealism and, sooner or later, to a crisis.

Lee Smolin demonstrates his lack of understanding of dialectical materialism by his lack of understanding of multi-faceted positivism: "In the 1920s and 1930s, a philosophical movement called logical positivism grew up in Vienna. Logical positivists assumed that statements become knowledge when they are verified by observations of the world... Their motive was to rid philosophy of metaphysics, which filled huge volumes with statements that did not make contact with reality".

The Positivists did not rebel against metaphysics, they rebelled against the philosophy of Marxism. Soviet physicists also wanted to rid science of ersatz Marxism, which indicates how and where it should develop.

Attributing to the positivists the Marxist position that it is necessary to test the theory by practice, the scientist, without any hesitation, asserts that "verificationism" has failed. That is, the principle of testing the theory by practice allegedly failed.

Smolin is not familiar with the works of Vizgin, Gemmer, Karpovich, A. S. Davydov, Gutner, Kazyutinsky, Yuri Molchanov, Idlis, Koblov, Treder, Meskov, and many others who thoroughly investigated the philosophical problems of physics.

Relying on the philosophy of K. Popper, R. Carnap, P. Feyerabend, I. Lakatos, Lee Smolin categorically declares: "... philosophers have not been able to discover a general strategy that would explain how science works".

It is argued that Lakatos gave new content to the principle of falsificationism as the methodological basis of the theory of scientific rationality. According to this principle, the rationality of scientific activity is confirmed by the willingness of the scientist to recognize refuted any scientific hypothesis when it is faced with a contradictory experience (not only to recognize, but also to strive for possible refutations of their own hypotheses).

Any scientist first checks whether the experiment is set correctly. But imagine a scientist who, despite experience, persists and does not want to admit a hypothesis that contradicts experience! Moreover, as soon as a scientist puts forward a hypothesis, he is immediately obliged to refute it. Then why put it forward? But a good scientist is one who puts forward a hypothesis without seeing any objections in advance. Thus, the Lakatos principle is meaningless.

But the scientific community asserts that "the Lakatos methodology is the most important tool for the rational analysis of science, one of the most significant achievements of the methodology of science in the twentieth century" [2].

On the contrary, Lakatos presented science as a competitive struggle of "research programs" consisting of a "hard core" of a priori accepted fundamental assumptions that cannot be refuted within the program, and a



"safety belt" of ad hoc auxiliary hypotheses that are modified and adapted to the program's counterexamples. The evolution of a particular program occurs due to the modification and refinement of the "safety belt", while the destruction of the "hard core" means the cancellation of the program and its replacement with another, competing one. There is no shadow of experience or practice here. This is how Wikipedia puts it.

In 1968, in the 4th issue of the journal "Questions of Philosophy", a review was published by G. P. Shchedrovitsky on the book published in the USSR by Lakatos "Proofs and refutations. How theorems are proved." The Soviet philosopher Shchedrovitsky admired the book. It is extremely difficult to say that Shchedrovitsky, who taught a lot of Soviet students from his textbooks, is a major philosopher.

The depth of Lakatos' creative vision can be easily assessed by his program for the development of mathematical theory: 1) the operation of the method of "naive" trial and error until a plausible hypothesis is found, 2) the introduction of the method of proof and refutation, which is an attempt to prove an assumption and improve it by counterexamples, 3) the application of the method of research programs, when the hypothesis is no longer in doubt. That is all.

The progress of science for Lakatos is when theory outstrips practice. If a theory explains facts only by hypotheses, it regresses. A theory can be eliminated by a better one, "which has more empirical content than its predecessor, and some of this content is subsequently confirmed". The abyss of thought!

Although Lakatos was familiar with dialectics through Marx, Lenin, and Lukacs, of course, there was no question of any practical verification. The method of ascending from the abstract to the concrete and back to the concrete universal is also forgotten. Although the researchers are sure-in this book, Lakatos applied a Marxist methodology.

The point is that the degeneration of Marxism took place not only in the USSR, but also in Hungary.

Lee Smolin wants to appeal to philosophy, but turns to philosophers who somehow deny it – to the neo-positivists [3].

## Ideologization

Lee Smolin states: "My hypothesis is that the mistake with string theory is the fact that it developed using a style of particle physics research that is hardly applicable to the discovery of new theoretical schemes. The style that led to the success of the standard model is also difficult to maintain when the connection with the experiment is broken... Why did a style less suited to solving the problems at hand become dominant in physics, both in the United States and in Europe? This is a sociological question... Universities stopped growing in the early 1970s.; despite this, the professors hired in the previous era continued to train graduate students at a steady pace, which meant a significant overproduction of new PhDs in physics and other sciences. As a result, there is fierce competition for places in research universities and colleges at all levels of the academic hierarchy. There is also a much greater emphasis on paid professorships, which are funded by research agencies. This is a great narrowing of alternatives for people who would like to run their own research programs, but instead follow programs initiated by higher-level scientists. So there are fewer and fewer corners in which a creative person can hide, protected by some kind of academic work, and develop risky and original ideas... The pace of innovation in course planning and teaching methods is positively medieval... the number of American students graduating with a degree in physics has decreased over the decades"ю

The education system in the United States followed the path of simplifying knowledge, a test system was introduced, a system of ridiculous presentations (all this is now accepted in the Russian Federation). In physics, there is a gap between "applied" physics and mathematized (not mathematical!) physics. Physicists in the field of high energy or quantum field theory are illiterate in traditional physics. But what are the reasons?

Ott and Einstein obtained two expressions for the relativistic temperature transformation with a direct and inverse dependence on the Lorentz factor, and both were wrong, but Tolman believes that both expressions are valid. I have already written about the elementary mistakes of de Broglie and Hawking above.

However, today the situation is much more painful.

In Perm, the doctor of the Polytechnic University believes that radiation and X-rays are "almost the same thing", that the temperature of the liquid increases due to the friction of the molecules against each other. At the

same time, the journals of the HAC list give articles on theoretical physics to doctors of technical sciences who are unable to understand theoretical physics, and worse—the editors give articles for review to their children, who, after searching for information on the Internet, write illiterate refusals.

In Perm, a theoretical physicist, a professor at the classical university, does not know that a mathematical pendulum does not have a set of natural frequencies, an associate professor of the university, who is engaged in cosmology, does not know that bodies expand when heated, that the orbital and spin moments of an electron are of the same order of magnitude, and believes that 10 billion years ago, there were no stars, and his hand, which he moves up and down, considers a precision instrument for measuring temperature (I showed him that the gravitational field violates the 1st law of thermodynamics). Another associate professor, also a cosmologist, lectures on the topology of the Universe, but can not solve a school problem on topology, another associate professor seriously believes that physics began with Galileo. Not to mention the faculties of the humanities, where the faculty was so thoroughly reorganized that the dean of one of them believes that in ancient Greece society was devoid of class conflicts, that the slave, that is not a slave, did not matter, the slaves were free – because of democracy.

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If there was only one ideological subject per year in the humanities faculties (or the history of the CPSU, or philosophy, or political economy, or scientific communism) in the USSR, today ALL subjects are permeated with ideology, completely subordinated to liberal-democratic propaganda.

Lee Smolin quotes particle physicist Jo Ann Hewitt at the Stanford Linear Accelerator Center: "I find the arrogance of some string theorists astounding, even by the standards of physicists. Some sincerely believe that all non-string theorists are second-class scientists... young string theorists are usually poorly educated in particle physics. Some literally found it difficult to name the fundamental particles of nature."

The scientist is surprised by the fact that a caste mentality has emerged among physicists in bourgeois society!

"When discussing the current state of affairs with young string theorists, you often hear them say things like: "I'm confident in theory, but I hate sociology"... More than one friend has announced to me that "the community has decided that string theory is correct, and there is nothing you can do about it. You can't fight sociology"... I became convinced that we should talk about the sociology of theoretical physics, since the phenomenon to which we collectively refer as "sociology" has a significant negative impact on its progress".

But the sociology of theoretical physics does not exist separately from the sociology of the entire bourgeois society.

"There is good evidence that the progress of string theory itself has been slowed down by sociology, which restricts the set of questions to be explored, and excludes as the kind of imaginative and independent-minded scientists that progress requires".

But why limit yourself so much? Due to the fact that industry annually requires millions of factory workers, office workers, engaged in monotonous depersonalizing work, every year tens of millions of the most talented children are eliminated, do not receive a university education and access to creative work.

However, Lee Smolin ignores the sociology of classes, he turns to the sociology of abstract groups.

"It turns out that sociologists have no problems in understanding this phenomenon... this phenomenon is described in the literature under the name groupthink. Yale University psychologist Irwin Janis, who coined the term in the 1970s, defines groupthink as "a way of thinking that people engage in when they are deeply

contained in a close-knit, self-contained group, where the members' desire for unanimity dominates the motivation for realistic alternative modes of action." According to this definition, groupthink occurs only when there is great cohesion. This requires that the group members share a strong "shared sense" of solidarity and are very willing to maintain the relationship within the group at all costs. When colleagues act in groupthink mode, they automatically apply the "maintaining group harmony" test to every decision that comes before them. Janis has studied the failures of decisions made by expert groups, such as the Bay of Pigs. The term has since been applied to many other examples, including the failure of NASA to prevent the Challenger disaster, the failure of the West to anticipate the collapse of the Soviet Union, the failure of American automobile companies to anticipate the demand for small cars, and most recently — perhaps most perniciously — the Bush administration's pursuit of war on the basis of the false belief that Iraq had weapons of mass destruction. Here is a description of groupthink extracted from the University of Oregon's communication website: groupthink participants see themselves as part of a closed group working against an outside group opposing their goals. You can tell if a group is susceptible to groupthink if it: 1. overestimates its invulnerability or high moral standards, 2. collectively provides a rationalistic explanation for the decisions it makes, 3. demonizes or stereotypically views external groups and their leaders, 4. has a culture of homogeneity, where the individual censors himself and others so that the facade of group unanimity is maintained, and 5. contains members who commit themselves to protecting the group leader by withholding information from the leader from them or from other members of the group. It doesn't match up one-on-one with my characteristics of string theory culture, but it's close enough to worry about".

The collapse of the USSR, we repeat, was predicted by Trotsky, and in the 50s-by the Soviet political economists-Marxists, who, of course, did not report their views to the country's leadership. Imagine – the whole world knows that Bush had no false belief that Iraq had weapons of mass destruction. Only average Americans had it, but the US leadership itself was well aware that Iraq had no weapons of mass destruction. The whole world knows why Bush needed this deception. Only the world's leading physicists still can't understand it!

Psychology is absolutely irrelevant here, the class interest of the American bourgeoisie is at work here. Similarly, psychology has nothing to do with the situation with "string" theorists. As Lenin said, anyone who explains the actions of a particular politician by the psychological characteristics of his character is a fraud. In the case of the group social infantilism of physicists, this is also a manifestation of the class instinct, which Lenin described very clearly in his famous letter to Gorky, assessing the essence of the intelligentsia.

Lee Smolin is amazed by what is happening, he has spent his entire life "behind glass", isolated from life, and wants to isolate himself from life with psychology, but it unceremoniously invades the world of theoretical physics. The scientist only quotes the opinion of an honest bourgeois in a footnote:

"John Kenneth Galbraith, an influential economist, called it "traditional wisdom". He meant by this "beliefs that, although not well founded, are so widely accepted among the rich and powerful that only the rash and reckless will jeopardize their careers by disagreeing with them" [4].

The word "rich" is pronounced, Galbraith only forgot to mention that any group "delusions" of the upper classes always serve the group interests of the bourgeoisie.

"I was shocked," the scientist writes", when Laughlin told me that he was under pressure from his department and funding agency to pursue normal science in the field in which he worked, instead of spending time on his new ideas about space, time, and gravity. If such a person, after all his achievements, including the Nobel Prize, cannot be trusted to hunt for his deepest ideas, then what does academic freedom mean?"

"Funding bodies and foundations, - Lee Smolin demands, - should enable scientists at every level of research and development of viable assumptions to solve deep and difficult problems".

But the fact is that the main goal of the funding bodies and funds is profit. This is a law that is not violated by any scientist, and many simply do not see it. Lee Smolin does not even know that the Nobel Prize has long been an instrument of politics and is devalued.

The naivety of Lee Smolin extends to philosophy, for him the authority is Paul Feyerabend. "The book of Feyerabend told me this: Listen, child, stop dreaming! Science is not a gathering of philosophers in the clouds. This is a human activity, as complex and problematic as any other."

Feyerabend, alas, did not inform the scientist that science is part of capitalist production. At a personal meeting, the master gave him, as Lee Smolin writes, "invaluable advice": "Yes, the academic world has deteriorated, and

there is nothing you can do about it". Hegel, Plekhanov, Ilyenkov, Kant, Gramsci, Lukacs (Lakatos' teacher), Batishchev, Cassidy, and two dozen other world-class thinkers smoke nervously on the sidelines. Scientist reports that Feyerabend "considered the question of why science works as having no answer". He might as well have continued to introduce Lee Smolin to the heights of philosophy by offering to run for a beer.

Feyerabend also argued that "even in cases where there is a widely accepted theory that is consistent with all the facts, it is still necessary to invent competing theories in order to ensure the progress of science". The ideologeme "competition" dominates the consciousness of Feyerabend and Lee Smolin. That is: it is necessary to act out of meanness. Not to study nature and thus achieve progress, but to try to harm the competitor. If the husband says "shaved", the wife is obliged to prove that "cut".

But Feyerabend, unlike Lee Smolin, calls a spade a spade: intolerance and dogmatism rule in science, anti-scientific works are recognized as scientific and strictly protected, the authority of scientists stifles everything new, technical achievements are usurped by scientific clans. Feyerabend does not shy away from the concept of "capitalism", he sees that in bourgeois society, science is a means of exploitation and, like any other state institution, is used by the authorities to manipulate the mass consciousness.

And... how does science work? "...science works because we live in a world of regularities ... " I.e., Lee Smolin has no idea about the relationship of the particular, the special and the general, the object and the subject, about the dialectic of necessity and randomness, about the transition of quantity to quality, etc. The whole struggle in philosophy has passed him by, and indeed the whole history of mankind. Li Smolin does not want to understand that the materiality of the world and the dialectical laws of the development of matter are the basis of repeatability, regularity. Lee Smolin forgets that repeatability doesn't mean anything – although this is what neo-positivism is based on.

Finally, the scientist's verdict follows: "... science succeeds because scientists make up a community that is defined and maintained by strict adherence to a common ethic. It is precisely a commitment to ethics, not a commitment to any particular fact or theory, that I believe persists as a fundamental regulator within the scientific community".

Has the world gone mad?

If, in speaking of the string theory community, Lee Smolin, as a physicist, is rebelling against the tenets accepted by the community, in this paragraph he welcomes his enemy and asserts it as an indicator of progress.

"There are two principles of this ethics," says the scientist: 1. if a problem can be solved by conscientious people by applying a rational argument to publicly available evidence, then we need to consider how to solve it in this way; 2. if, on the other hand, a rational argument derived from publicly available data has failed to bring conscientious people to an agreement on the problem, then society should allow and even encourage people to draw different conclusions from the data. I am sure that science succeeds because scientists adhere to these two principles...»

No more, no less. This childish statement essentially means that science works solely because scientists are well-mannered.

But scientists are ill-mannered, they strangle each other.

## **Conclusion**

Imagine what mental attempts are made by opponents of Lee Smolin, Polchinsky, etc., if in his criticism of string theorists Lee Smolin is absolutely right?

Science is indeed in a crisis, since theoretical physicists turn out to be intellectually impotent.

Linde and many other physicists have long included the anti-scientific philosophical anthropic principle in the axiomatics of physics [5].

Lee Smolin suggests including the principle of causality in the axiom system: "... many of us, working on quantum gravity, believe that causality itself is fundamental - and thus makes sense even at a level where the concepts of space and time disappear. Ambjorn, Lall, and others have shown that if the causality constraint is not established, then classical space-time geometry does not arise. (Hawking believed that the causal structure

is immaterial, and that calculations in quantum gravity can be made while ignoring the difference between time and space, time is imaginary). One such formulation, called causal series theory, chose fundamental units of space-time in the form of bare events whose only attributes were lists of other events that could be their cause and of which they could be the cause... it seems to have solved the problem of the cosmological constant. By simply assuming that the classical world arises from causal series theory, Syracuse University physicist Raphael D. Sorkin and his collaborators predicted that the cosmological constant should be about as small as observations subsequently showed".

In fact, causality is only a particular thing, Lenin pointed out that "causality, which we usually understand, is only a part of the universal connection" [6]. Zeldovich, long before Lee Smolin, proposed to introduce an axiom: to reject solutions of Einstein's equations that do not satisfy the principle of causality. But this is not true, physically these solutions correspond to decaying processes.

"...all the triumphant theories, - writes Lee Smolin, - had experimental implications that were easy to develop and could be tested within a few years... physical insight immediately leads to the prediction of a new physical effect ... string theory, loop quantum gravity did not achieve what was promised on this front. The standard excuse is that experiments on these scales cannot be done... there is something fundamental that we are missing, some erroneous assumption that we are all making... then we need to isolate the erroneous assumption and replace it with a new idea. Why, despite such great efforts by thousands of the most talented and well-trained scientists, has so little progress been made in fundamental physics in the last 25 years?.. The TC community style is an extension of the elementary particle theory culture. This has always been a more brash, aggressive, and competitive atmosphere, in which theorists vie to respond quickly to new developments (until 1980 they were usually experimental), and are suspicious of philosophical problems. This style replaced the more reflective, philosophical style that characterized Einstein and the inventors of QM....»

Physicists' suspicion of philosophical problems in the United States is exactly the same as in the USSR, that is, in both countries, instead of philosophy, ideological demagoguery prevailed (and still prevails).

The difference between the scientific eras is that QM, SRT, and GR arose not from the internal inconveniences of theories, but from experiment.

For TS, quantum gravity, there are no experiments that would be paradoxical, would violate the previous ideas. Secondly, the creation of the TS did not follow from the problems of the development of even the theoretical part of physics, which went parallel to the formation of the TS.

In principle, there are a number of objections to string theory [7].

The situation in string theory resembles a well-known joke: a billionaire decided to develop a method to find out who will win the race. I called a zoologist, a mathematician, and a physicist, and gave them a task, a million dollars each, and a year of time. A year later, a zoologist comes: "Knowing the exact pedigree of each horse, the success of its parents, what it was fed, how it was treated, I can accurately name the result." Mathematician: "Having accurate statistics of the previous races of these horses, I can name approximate results." Physicist: "I need another 10 years, \$ 50 million, a few assistants and a laboratory, but I have already built a model of the movement of an absolutely elastic spherical horse in a vacuum."

String theory is logical and beautiful, but it is similar to the geometric constructions of Gersonides, Al Bitruji, or Ptolemy.

It is not necessary to change an idea for an idea, but to change the whole way of thinking. This task is impossible inside the office. Its solution involves at least the realization that the point of reference of the regression in science was the collapse of the USSR. We must immediately reject all bourgeois philosophical schemes, all subjective idealism.

Let us repeat: the era of Newton-Darwin did not arise from scratch, it was caused by the transition from feudalism to capitalism.

The great era of social revolutions of the early twentieth century gave rise not only to great discoveries in physics, but also to great literature, poetry, music, and painting.

The collapse of the USSR intensified competition between the US and the EU and pushed capital to reduce wages for labor, to increase the army of the unemployed, etc., and caused a reduction in educational programs around the world.

President Kennedy said: "Soviet education is the best in the world. We have to take a lot out of it. The USSR won the space race for the school desk." Since then, the average length of study in the United States has reached 16 years, while in the USSR – 11 years.

After 1991, the situation changed dramatically. Professor Arnold, returning from the United States in 1997, spoke about the discouragingly low level of education in America.

High school students were given a test: "You had \$ 100. After some operations, it became 80% of the initial amount. Do you have a) more, b) less, c) the same amount of dollars?" Only a third of the students answered correctly. In the theory of probability, this means that no one knew the correct answer. American 3rd year students can't compare  $\frac{2}{5}$  and  $\frac{3}{7}$  without a calculator. A Russian girl who studied at an American school says: "We were given the task to build a straight line on 10 points. I built two points in a second and was surprised to see that American schoolchildren diligently put all 10 points on the drawing!»

But if general education has regressed, theoretical physics will inevitably regress.

As long as scientists do not begin to understand Marxism-Leninism, first of all, authentic, as long as they do not realize that Marxism-Leninism is part of the world culture, as long as they will be fruitless.

Half a century ago, the last statement was true. Today, only an idealist who puts the idea first can say this. The materialist understands that society has entered a period of regression, social degradation, and science follows the times. You cannot live in society and be free from society, even in thought. For social consciousness is determined by social being.

One way or another, the historical-political-economic approach must be supplemented with Marxist philosophy, and two propositions of dialectical materialism must be included in the basis of physics.

1) Along with the concept of cycle (cyclicity of processes) and the concept of irreversible qualitative changes, regression as a moment of development (minimum action, dissipation, increase in entropy), make the concept of development as an ascent from the lowest to the highest, from simple to complex, and not only in the form of increasing the number of elements of systems, but complicating their structure, the transformation of potential qualities into actual, dominant.

2) Include with the system of axioms the ideology of contradiction as a source of movement and as an indicator of the development of science [8].

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