ROLE OF THE METHOD IN SCIENCE

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Many scientists believed that the correct method of research plays the main role in the development of science - some general principles that make it possible to adequately establish the relationship of natural phenomena, to find their fundamental principles, in other words, to discover the laws of the world, the truth. There are dozens of people who have made important discoveries and lived in different countries at different times. The only thing that united them was their thinking style. The discoverer was invariably the one who found the correct method of research. Therefore, scientists who understood the system, having made one important discovery, as a rule, continued to make discoveries, often in different, independent areas. Such universal scientists as Leonardo Da Vinci, Galileo, Newton, Lomonosov, Tsiolkovsky were called geniuses, versatile gifted people. However, the secret of their success was not so much in personal properties, but in a method equally well applicable in various branches of science (astronomy, physics, chemistry, biology), in invention and even in art. After all, science and art are essentially engaged in the same thing: the search for the relationship of phenomena (in science), sounds (in music), colors and forms (in painting) - the search for harmony, truth. And the proper method was the sure compass in this quest.

When this method spreads, a scientific revolution takes place - discoveries go on in a continuous sequence, they are independently made by dissimilar people in different countries. This is how the most important discoveries were made in a short time by Copernicus, Galileo, Kepler and Newton. On the other hand, in the dark Middle Ages, over a millennium, when talented, intelligent people were also born, no important discoveries were made. The fact is that in that era, an erroneous method of research reigned. It was the time of the dominance of the scientific doctrine of Aristotle, scholasticism, religion. Probably, the modern stagnation in science is associated with the spread of developed in the XX century. erroneous method, reminiscent of Aristotle. For many decades, new fundamental laws of nature have not been discovered, which prevents a breakthrough in technology. The quantum-relativistic picture of the world and the corresponding formal research methods are slowing down progress. So the right methods play a major role in science. Let's try to identify them based on the analysis of the history of science.

The most important method is the principle of "Occam's razor", designed to cut off all unnecessary: concepts that are irreducible to intuitive and experimental knowledge should be removed from science. Occam's principle, formulated back in the XIV century, says: "You should not multiply entities beyond what is necessary."

That is, one should reduce to a minimum the number of introduced objects and hypotheses, prefer simple explanations to complex ones, and natural ones - to supernatural ones. This is how, in the heliocentric system, Copernicus reduced the number of celestial spheres to a minimum, explained more phenomena with a smaller number of hypotheses. Crisis of XX century science. is largely due to the oblivion of Occam's principle. Thus, wave-particle dualism calls for considering each object as a wave and a particle at the same time. The presence of two contradictory ways of describing means that one of them is wrong. This leads to paradoxes and, as is clear from Occam's principle, does not provide an adequate description of the phenomenon. Occam's razor is also applicable in art. Michelangelo, when asked how he sculpts his beautiful statues, replied that he takes a piece of marble and simply cuts off everything unnecessary. In art, as in science, only natural, simple, laconic things that reflect reality live forever, and everything complex, cumbersome, pretentious, abstract dies off over time. In simplicity, cost savings, their versatility and naturalness lies the beauty of art and science.

Another important method is the method of elimination, as formulated by Sherlock Holmes: "Eliminate everything that is impossible, then what remains will be the truth." This method was also forgotten. Instead of consistently rejecting the erroneous, scientists at the beginning of the 20th century, when inconsistencies began to arise, preferred to invent supernatural explanations through conditional agreement. So, Michelson's experiment rejected the ether and Maxwell's electrodynamics based on it. But physicists did not exclude his electrodynamics, but decided to fit the facts to the theory (against which Sherlock Holmes also rebelled), inventing the Lorentzian contraction with the theory of relativity. Therefore, one more important principle: do not formally fit the facts to the theory, but honestly seek a solution. From the notes about Sherlock Holmes, although this is a fictional character, you can learn a lot about the method of research (essentially the same investigations). He considered the main thing not his abilities, but the deductive method developed by him, according to which he organized his brain. This is how the detective solved complicated cases and found natural explanations for the strangest riddles. One person, even a layman, having mastered the method, can make in science more than a dozen institutes and hundreds of academicians, representatives of official science, just like Sherlock Holmes, who was considered an amateur, unraveled dozens of complex cases beyond the control of ministerial, police departments and all representatives of the official police.

Another important principle of research is the ability to approach all phenomena with an open mind, critically perceiving accepted theories, and to study the problem from different points of view. As the history of science shows, very often the generally accepted explanation is wrong, no matter how convincing it may seem. And often you can find an alternative, simpler interpretation. Therefore, in order to

make discoveries, you need to carefully critically analyze explanations, look for inconsistencies, vague places, clarify them, pay attention to mysterious facts poorly understood by science. Scientists, however, having discovered a discrepancy between the experience of the theory, often try to bypass it in silence, to disguise it, to hide it. But it is in such small details, inconsistencies, as the same Sherlock Holmes noted, that the key to solving the riddle lies. You cannot blindly believe any theory, just as you cannot believe the refutation of some scientific doctrine. A false theory can work for a long time, giving correct results, like Ptolemy's geocentric system, and a correct theory can seem erroneous due to the incompleteness of our knowledge. So, many criticized the Copernican theory, since the parallax of the stars was not observed, and on Earth nothing betrayed its motion. In addition to objectivity, criticality, it is important to search for non-obvious, unexpected facts and solutions. It is necessary to search not where everyone is looking, but where no one was looking or they were looking little. Therefore, craving for fashionable trends in science is vicious. On crowded paths, the probability of finding a treasure is small. As a rule, important discoveries arose from small, generally not interesting facts, for example, microbiology.

An important feature of the scientific method is the desire to find the fundamental principles of phenomena, to get to the bottom of what is happening. This goal was set by Newton, Lomonosov, Mendeleev. This is how they achieved outstanding success. L. Poinsot said "In no case can one consider that science is finished if it was possible to reduce it to analytical formulas. Nothing frees us from studying the phenomena in ourselves (in their essence)". In modern science, a formal, analytical way of describing phenomena reigns, and the essence of phenomena is not clarified by formulas (as, say, in mechanics), but is obscured - this is again about non-classical science. Mathematics and formulas are not an end in themselves, but only crutches of science, its tools. Mathematical formalism, the conditional acceptance of new unfounded hypotheses, such as Bohr's quantization rules or the second postulate of SRT, is an unscientific method.

The essence of the scientific method is to reduce everything to mechanics, to visual movement, combination and disintegration of bodies and particles. In the world, as Democritus understood, there is nothing but matter - particles that are floating around in empty space. Only an atomistic, mechanical model of the world will be truly materialistic, scientific. It was not for nothing that Tsiolkovsky said "I am the purest materialist. I do not recognize anything except matter. In physics, chemistry and biology, I see one mechanics. The entire cosmos is just an infinite and complex mechanism." The study of nature should be approached with an engineering method, considering its objects and laws as mechanical structures, arranged in the most simple, beautiful, harmonious, rational way, considering nature to be a brilliant

engineer. The idea of one engineer can only be understood by another engineer. Therefore, in order to analyze the creations of nature, one must think creatively, engineering, constructively, applying geometry, mechanics, and spatial imagination. As Newton said, "The world is simple and not luxurious with unnecessary reasons." Nature is extremely simple and economical, and its laws are quite comprehensible - there is no supernatural in them. There is nothing beautiful about the jumble of tangled and abstract formulas, like crutches. They do not correspond to the real structure of the world, unlike simple mechanical models.

When science moved away from visual mechanical analogies, it came to a dead end: in antiquity and the Middle Ages, when they ridiculed the atomistic ideas of Democritus and extolled the speculative fantasies of Aristotle; in modern times, when abstract fluids flourished along with the atomism of Newton and Lomonosov - caloric, phlogiston, ether; or now, when classical particle mechanics is in disgrace, and uncertainty and relativism are extolled.

It should be remembered Occam's principle - not to introduce supernatural, abstract objects: fluids, strings, space curvatures - these complex speculative hypotheses, until the possibilities of simple and classical ones are exhausted. It was the classical mechanical picture of the world that gave science the most important laws of conservation of mass, energy, momentum, charge, etc. The rejection of mechanical models leads to oblivion of the laws inherited by such labor. In everything, one should rely on facts and build a theory only on their basis, as taught by the same Sherlock Holmes, otherwise we risk surrendering to the power of empty fantasy, abstract formalism that has nothing to do with reality. Thus, Einstein admitted that he built his theory not on the basis of experimental facts, but purely speculatively. But facts are the air of a scientist. It is only necessary to interpret them correctly, as taught by Sherlock Holmes, to select the undoubted ones from them, freeing the inhabitants from speculation. However, a pile of facts is not science, just as a pile of bricks is not a building. To understand, systematize, link together facts, correctly, without adjustments, build them into the building of a scientific theory, one must possess the correct method of cognition. Without it, scientific research is like a blind wandering. Perhaps that is why now, from the corruption of the mind by abstract, non-materialistic, unscientific theories and oblivion of the correct methods of cognition, discoveries were crushed and became not the fruit of a systematic search, but the lot of rare scientists who accidentally stumble upon a discovery.

The opposite situation is also possible, if the correct method spreads, discoveries will be within the reach of anyone. After all, the true engine of science, as prominent scientists admitted, consisted not in some rare abilities, not in the creation of unique devices (these are only auxiliary means), but in the general idea, method, curiosity, inquisitiveness of the mind, the ability to be surprised at simple things,

passion for one's own deed, immeasurable enthusiasm. To awaken the mind, you just need to think about the important things, as in Hansovsky's story "Awakening", to throw off the shackles from thought. As Newton noted, to make discoveries, it is enough just to think about them, ask the necessary questions, pay attention to interesting facts. According to the opinions of scientists, the same Newton, scientific search was an exciting game for them, but not an empty game of the mind, with abstract reasoning, but a competition with the Universe in an attempt to solve its riddles, to reveal interconnections. Just like children learn about the world through play, scientists learn about nature. Game and wakes up the mind, fantasy. The prize in the game is huge - the truth and progress of mankind, but the stake is also high, often it is the life and health of a scientist. By constantly reflecting on the problem, going through the options for solutions and having a method to find and filter them, you can solve even the most difficult problem.

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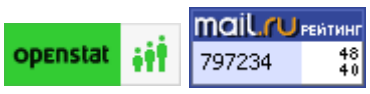

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