

# Physics and science

[Science](#)



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To be understood correctly, I should note that the question "To be or not to be" as applied to humanity and not the individual, though considerable, was first raised by physicists precisely and on the achievements of physics. It's not by chance that for about three centuries were marked by the science. People involved in it, opened and opened the fundamental laws of nature that determine the structure and movement of material objects in a large range of distances, time and mass. Ranges of these great - from the small, atomic and subatomic to the cosmic and universal.

Of course, this is not physics said "Let there be light," but they found its nature and properties, set contrast to the darkness, and have learned to manage them. In its work, physics, crucially the largest of them, have developed a certain way of thinking, the main elements of which is the willingness to rely on well-tested, fundamental laws and the ability of a complex nature, and the public, a phenomenon highlight the main element, as simple as possible, that allows us to understand the very complex phenomenon under consideration.

These features allow physicists approach very successfully deal with problems often lie far beyond their specialization. Confidence in the unity of

the laws of nature, based on extensive experimental material, confidence in their fairness, coupled with a clear understanding of the limitations of the applicability of existing laws physics pushes forward, abroad unknown today. Physics - the science is complicated. It requires a lot of intellectual effort from the people who do it. It is incompatible with the amateurish.

I remember how, at the end of the University and the Shipbuilding Institute in 1958, I was standing at the crossroads - where to go next. And my father, very far from science, asked me if I could go back to engineering after a dozen years of studying physics. My answer was an unqualified " yes. " " In physics, after ten years of engineering? ", - He said. My " no" and identified a further choice, which is not sorry and I do not regret a second. The complexity of physics and the importance of its results that create a picture of the world and encourage the spread of its ideas far beyond most of this science in the public interest to her.

I will give some of these ideas, in the order received. This is a scientific (not speculative! ) Atomism, the opening of the electromagnetic field, the mechanical theory of heat, the establishment of the relativity of space and time, the concept of an expanding universe, and quantum leaps in principle, not because of the error, the probabilistic nature of the physical processes in the first place, the micro- level, the grand unification of all interactions, establishing the existence of not directly observable subatomic particles - quarks.

Here then there are popular books that are designed not to teach physics beginners, and explain her interest. There is another purpose of popular books, including the very well-known to people of my generation is "

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Entertaining Physics" Yakov Perelman, not relative ME Perelman. I am referring to a demonstration of how much things in everyday life, familiar to us technique and technology, one can understand qualitatively, based only on the well-known fundamental laws of physics in the first place - the law of conservation of energy and momentum, and the confidence that they are universally applicable.

Objects of the laws of physics are vast. Why not pour water into the boiling oil, why stars twinkle in the sky, why is twisted water, emerging from the bathroom, why crack the whip and why the driver spins it over his head, to enhance the sound of the click, why ever would try to jump off the rail locomotives, but never make it electric? Why roars menacingly approaching plane and moving away, he moves to a falsetto, and why dancers or figure skaters begin to spin, throwing open wide " arms," ?? but then quickly pressed his hands to the body?

Of the " why" of each in everyday encounters, not to mention not everyday life in abundance. They may be useful to learn to see, train yourself to find incomprehensible. Books by E. Perelman contain a record number of such questions " why? " (Five hundred), give them the answers, in most cases - definitely right, sometimes - beckoning to the discussion, occasionally - probably incorrect, provoking disagreement. There are questions that science has to date simple and generally accepted answer. Hence, the reader is room for an intense intellectual work. Along the way, the author explains the ell-known professionals to but less severe confusion among outsiders. That is, the author emphasizes the operational nature of many of the definitions in such a universally recognized exact science like physics.

Professionals know that even the most fundamental of concepts, which operates physics, such as time and energy, space and momentum adjusted as further development of science itself. Even the vacuum, once the analogue of absolute emptiness, lack of anything was self-evident in the "empty" space in time "overgrown" means non-trivial features of the primitive raises complex object of study.

Versatility physical approach dictates a similar attitude to the definitions of non-trivial concepts and other areas that are very far from physics. Read books mentioned ME Perelman interesting and professionals - to argue, to find other, allowing a simple, sometimes graphic, explaining the issue. But a layman can expand your horizons, not necessarily rushing to their own, different from the author, explanation. It is worth remembering that the writing - verbal impression, often greatly simplified, with sometimes very complex physical concepts, based on a far from trivial in the everyday sense of the physical theory.

No need to follow the example of the real character, the director of one of the Moscow Research Institute who denied particular theory of relativity (general he chityval! ) Because the formula is the speed of light! "What would happen if the light off?" - Wrote in the science department of the Central Committee of the CPSU venerable gunmaker. Studying physics, beginning to understand its laws, shall be attached to the special beauty, there is actually an extra dimension to the perception of the surrounding world.

This was written when - the great physicist Richard Feynman, noting that understanding the nature of the glow of stars, the mechanism of their birth

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and death makes the picture night sky even more beautiful and romantic. I wish, in conclusion, to mention one, a few unexpected side benefit of knowledge of physics, though by no means superficial. About him once told Academician Migdal. It lights up in the mountains and attractions nearby couple. The young man explained his pleasant companion, why daytime sky is blue.

He told her about the scattering of light, referred to Lord - theoretical Rayleigh. The girl was sitting with his mouth open, looking admiringly at the scholar. But of the bore, and he, showing carelessness and inattention to a senior, said that the probability of scattering of radiation is proportional to the cube of the frequency. Migdal but was already on the alert. Remembering a classic, it is appropriate only in a very weakened form, say, perhaps, academic" in thought, under the night darkness, mouth kiss the bride. " Young man, the probability of scattering can not be proportional to the cube of the frequency - it would clearly be contrary to the invariance of the theory with respect to time reversal. The relay, as it should be, the probability is not proportional to the cube, and the fourth power of the frequency! " - In his usual tone, dogmatic said Migdal. Needless to say, that triangle changes shape, and the fat was cathetus hypotenuse, reaching the top. In short, read about physics and who is not too late - learn it. It will pay off. Physics in Medicine

Medical physics - the science of the system, which consists of the physical devices and radiation, medical diagnostic equipment and technology. The purpose of medical physics - the study of these systems for prevention and diagnosis, and treatment of patients using the methods and tools of physics,

mathematics and engineering. Nature of the disease and the mechanism of recovery in many cases have biophysical explanation. Medical physicists are directly involved in clinical processes, combining physical and medical knowledge, sharing with the doctor responsible for the patient.

The development of medicine and physics have always been closely intertwined. Even in ancient times medicine used for medicinal purposes physical factors such as heat, cold, sound, light, and various mechanical actions (Hippocrates, Avicenna and others). First medical physicist, Leonardo da Vinci (five hundred years ago), who conducted the study of mechanics of movement of the human body. The most prolific medicine and physics were to interact with the end of the XVIII - XIX centuries. , When they were discovered electricity and electromagnetic waves, that is, with the advent of electricity.

To name a few names of great scientists who have made important discoveries in different epochs. End of XIX - the middle of the twentieth century. connected with the discovery of X-rays, radioactivity, theories of atomic structure, electromagnetic radiation. These discoveries are associated with the names of C. Roentgen, Becquerel, M. Sklodowska-Curie, D. Thomson, Planck, Bohr, Einstein, Rutherford. Medical physics has truly establish itself as an independent science and profession only in the second half of the twentieth century. - With the advent of the atomic age.

In medicine, have been widely used radiodiagnostic gamma apparatus, electronic and proton accelerators radiodiagnostic gamma camera, CT scanners, and others, hyperthermia and magnetic therapy, laser, ultrasound, and other medical and physical techniques and instruments. Medical physics

has many sections and titles: medical radiation physics, clinical physics, physics oncology, therapeutic and diagnostic physics. The most important event in the field of medical examination may be the creation of CT scanners, which have broadened the study of almost all organs and systems of the human body.

OCT have been installed in hospitals around the world, and a large number of physicists, engineers and doctors worked on improving techniques and methods of bringing it almost to the limits of the possible. The development of nuclear medicine is a combination of methods and physical methods radiofarmatsevtiki registration of ionizing radiation. Positron-emission tomography imaging was invented in 1951 and published in the paper of Rennes. Physics and literature In life, sometimes without realizing it, physics and literature are closely intertwined.

Ever since ancient times, people in order to convey to posterity literary word, used the invention, based on knowledge of physics. On the life of the German inventor Johannes Gutenberg is little. However, the great inventor, to convey to us the literary masterpieces studied the laws of physics and mechanics. Organized them in printing, he published the first book in Europe, which has played an important role in human development. The first Russian printer - Ivan Fedorov, was known to contemporaries as a scientist and inventor.

For example, he was able to cast cannon invented multilateral mortar. A first remarkable images of the literary and art of printing - " The Apostle" (1564) and " Chasovnikov" (1565) will remain forever in people's memory. The name of Mikhail Lomonosov we call one of the first in the series of the most  
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remarkable representatives of the national science and culture. The great physicist, he left a number of works that are important for the industrial development of Russia. A large part of his scientific work took optics. He manufactured optical instruments and original mirror telescopes.

Exploring the sky with their instruments, inspired by the infinite universe, Lomonosov wrote beautiful poetry: Opened an abyss full of stars. The stars of not, the abyss - the bottom ... Without such a science as physics would not be a literary genre as science - fiction. One of the founders of the genre was the French writer Jules Verne (1828 - 1905 gg. ) Inspired by the great discoveries of the XIX century, the famous writer surrounded physics glamor. All of his book " From the Earth to the Moon" (1865), " The Children of Captain Grant" (1867-68 gg. ), " 20, 000 Leagues Under the Sea" (1869-70 gg. , " The Mysterious Island" (1875 . ) are imbued with the romance of this science. In turn, many inventors and designers inspired the incredible adventures of heroes of Jules Verne. For example, the Swiss scientist - physicist Auguste Piccard, like repeating the path of fantastic characters he invented climbed into the stratosphere stratosphere, making the first step towards uncovering the mysteries of cosmic rays. The next fad A. Piccard was the idea of ?? the conquest of the sea depths. The inventor himself sinking to the sea floor and to build them bathyscaphe (1948).

For about 160 years ago in " Notes of the Fatherland" published " Letters on the Study of Nature" (1844 - 1845). Herzen - one of the most important and original works in the history of philosophy as well as natural science, Russian thought. Revolutionary, philosopher, author of one of the masterpieces of classical Russian literature works " My Past and Thoughts" - Herzen,

however, was keenly interested in the natural sciences, including physics, he has repeatedly stressed in his writings. Now you need to turn to the literary heritage of Tolstoy.

First, because the great writer was a teacher- the practice, and second, that his works relate to the natural sciences. Best known for the comedy "The Fruits of Enlightenment." The writer is extremely negative attitude "to all kinds of superstitions," he believed that they "hamper and hinder the true teaching it to penetrate into the soul of the people." Tolstoy understand the role of science in society: first, he was a supporter of the organization of society on sound science, and second, it makes a powerful emphasis on the moral - ethical standards, and because of this science in the treatment of Tolstoy are secondary science .

That is why Tolstoy ridiculed in "Fruits of Enlightenment" Moscow gentry in the heads of which are mixed science and Antiscience. I must say that at the time of Tolstoy on the one hand that time, physics is in deep crisis due to the experimental verification of the main tenets of the theory of the electromagnetic field, which disproved the hypothesis of the existence of Maxwell's world ether, that is, the physical environment, which transmits electromagnetic interactions

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