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PHYSICS AND ECOLOGICAL PROBLEMS

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Abstract

Physics is the science underlying scientific and technological progress. Among the global, vital problems facing mankind, the problem of ecology has acquired paramount importance in our days.

Interest in environmental problems among physicists has become clearly noticeable since the late 80s of the twentieth century, primarily in connection with the tragic events at the nuclear power plants Three Mile Island (USA, 1979), Chernobyl in 1986, and Fukushima (2011). The tragedy of the Aral Sea, when the whole sea dries up before the eyes of one generation.

At first glance, ecology and physics seem to be simply incompatible concepts. The fact is that the results of physics research and its introduction into industrial production are one of the most important sources of environmental pollution. The nuclear industry and energy, other industries that make extensive use of the achievements of physics, give many examples of the negative impact on the environment.

The name "ecology" was proposed by the German biologist E. Haeckel in 1866. This is an independent science, which belongs to the biological field of studying the surrounding world. One of the interpretations of the term "ecology" in modern society is the level of technogenic pollution of the biosphere, soil and water resources. This understanding of science is maximally "physical". Even at the beginning of the 20th century. in the works of such researchers as V.I. Vernadsky and A.A. Bogdanov, the idea was expressed that the laws of organization exist not only in living nature, they also exist in inanimate nature.

The presence of structures, organization - these are the most important features of nature. Vernadsky, developing the doctrine of the biosphere and noosphere, used the concept of organization as the most important property of the material and energy parts of the biosphere. And he believed that anthropogenic impact could become a more powerful geological and geochemical factor than all natural processes combined.

I.R.Prigozhin, Nobel Prize winner in chemistry, called the ordered formations that arise in the course of non-equilibrium processes dissipative structures. Dissipative structures arise as a result of the development of the system's own internal processes. In this case, the system exchanges energy and matter with the environment, which ensures a state of dynamic equilibrium (balance of flows), despite internal losses in the system. This is their difference from ordered structures, the emergence of which is due to external influences.

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In the early 30 s of the last century, the physics developed by Newton was replaced by its quantum direction. And in those years, V.I. Vernadsky wrote that man is a miniature cosmos or a quantum system.

At the current stage of the development of society, researchers are building a scientific picture of the world based on the physical laws of nature, which necessarily reflect and take into account all the growing environmental problems. Human activity has such a profound impact on our planet that such an intrusion must be contained within certain limits and regulated in a certain way. Otherwise, the world may face the fact of an ecological catastrophe.

To solve the problems that exist in the natural environment around us, it is important to properly organize environmental education and education of the younger generation. Students should be well versed in the laws of nature and in the relationship of the phenomena existing in it, as well as be able to evaluate and foresee the consequences of human intervention in the living world of planet Earth.

Ecology and physics are also closely related. Among the global, vital problems facing humanity, environmental problems have become of paramount importance. It became obvious that it was no longer possible to overcome the ecological crisis by technical means alone. Mankind has to create a new culture - both in relationships between people and in relationships with nature. This new culture must be based on environmental education.

Nature - this giant physical laboratory - clearly demonstrates the relativity in the subject of "physics", the conditionality of dividing physics into separate independent sections, the unity of the physical picture of the world, the interconnection of physical phenomena.

A deep study of the physics of natural phenomena has become possible, mainly, only in our time - thanks to the successes of modern physics (as well as chemistry and biology). It is also important to remember that the study of the physics of natural phenomena makes it possible to successfully solve various technical problems. Suffice it to recall such a scientific and technical direction as bionics. Man has long learned from nature.

The result of a new awareness of the role of physics was the introduction of environmental physics or environmental physics into the educational process of leading universities.

As you know, the stability of human life is determined by a very narrow range of fluctuations in the average temperature of the atmosphere, about 4 degrees, and going beyond it can lead to the disappearance of modern civilization. This, on the one hand, cooled the "delight" of physicists from the role of the founders of the scientific and technological revolution and conquerors of the forces of nature. On the other hand, the formation of a sense of responsibility for the costs of "conquest" and an understanding of the need to introduce a new component into the educational technologized physics of universities - environmental physics or ecological physics - began to form.

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The formation of ecological consciousness in the student does not tolerate delay. The generation of people entering into life should be guided in their actions by the need to protect nature, appreciate and rationally use its resources.

It is physics that plays an important role in understanding many environmental problems that arise as a side effect of scientific and technological progress. Ecology is the science of relationships in nature. The connection of these two sciences proves the unity of the material world and shows that the time has come to use physics as a tool for preserving the environment.

The course "Physics and Environmental Problems" forms ideas about the physical aspects of the occurrence of environmental problems and finding modern means of solving them, the application of physical laws in everyday life, deepening knowledge about the surrounding material world and methods of scientific knowledge of nature; development of cognitive interests of students, their intellectual and creative abilities in the process of practical application of knowledge in physics and ecology; the formation of physical and environmental thinking: the ability to put forward hypotheses, to simulate situations, to draw conclusions to explain them; the formation of an understanding that a person is a part of nature, and by changing it, a person changes himself; development of independent work skills using information sources; formation of research skills.

The course should reflect the following: human influence on the flow of thermal, electromagnetic and light phenomena in nature. Ecological aspects of physics. The role of physics in the study of environmental factors, in predicting the course of natural processes, in improving existing technologies and in creating new ones based on the rational use of natural resources and respect for the environment.

Temperature conditions as a necessary factor for the existence of life. Influence of ambient temperature on wildlife. Adaptation of living organisms to temperature conditions. Various types of heat transfer in nature and technology. Influence of solar radiation on climatic conditions. Properties of thermal radiation and features of energy transfer by means of radiation. Convection in the atmosphere - winds, breezes, hurricanes. Violation of convection in the event of an atomic war. The formation of a "mushroom" in a nuclear explosion and the impact of radioactive emissions on the earth's ecosystem. Greenhouse effect. Respect for energy resources. Thermal pollution of the biosphere, atmosphere, rivers. Pollution of the hydrosphere by fuel discharges, discharges from wastewater treatment plants. The sun is the source of energy and life on Earth. geothermal springs. biological sources. Artificial energy sources - the history of fire in human life. Converting solar energy into heat. Types of fuel: organic, mineral, nuclear. Comparison of fuel efficiency and environmental safety. Atmospheric pollution by fuel combustion products. The scale of modern consumption of various types of fuel and forecasting the depletion of fuel reserves. Energy transformations in thermal processes. Application of mechanical energy of water and wind. Transformations of internal energy in thermal and nuclear processes, and in chemical reactions. Light energy and energy conversion during photosynthesis. Energy transformations in living

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organisms. Evaporation and boiling of water at various atmospheric pressures. Evaporation in plant life. Human influence on the water cycle in nature. Scaffolding as an osmotic pump. Aggregate transformations in nature and technology. liquid crystals. Cooling systems at nuclear power plants, in the chemical industry, on spacecraft. The fourth state of matter is plasma. The importance of plasma for life on earth. Modern applications of plasma. Thermal machines. The history of the development of steam technology: causes, incentives, results of development. Steam engines - the STP engine. Thermal machines for generating electricity. Ecological safety of thermal power plants, emissions and pollution. Heat engines: diesel engines, jet and turbojet engines. efficiency of modern engines. Electricity and life. The impact of electric fields on living organisms. Features of the impact of low-frequency electromagnetic fields on a person in everyday life and technology. The impact of UV radiation on the molecules of living organisms. The importance of the ozone layer for the preservation of life on earth. Destruction of the ozone layer and the need to preserve it. Currents in nature and technology. atmospheric electricity. Distribution of charges on the ground. Natural electrical currents: nerve impulses, electrical animals, lightning discharges. Research and mysteries of ball lightning. Current sources. Mechanical sources of electricity. Current sources in living organisms. Thermal and chemical effects of current and their application. Safety and environmental implications of the industrial use of electrolysis. Electric current in metals, electrolytes and semiconductors. Semiconductor devices. resistance of various materials. The use of conductors, dielectrics and semiconductors in technology, science and life. Electrical properties of human organs. Safety precautions when working with electricity. The influence of electric currents on living organisms: therapeutic currents and electric shock. The energy of electric current and its use. Hydropower. Tidal power plants. Solar energy. NPP problems. Transmission of electricity over long distances. Magnetism in nature and technology. The magnetic field of the earth and other planets. Magnetic fields of the Sun and stars. Magnetic fields of living organisms. Biofield. Anthropogenic magnetic phenomena. Superconducting Magnets, High Temperature Superconductors and Their Applications. Optical phenomena in nature.

Natural light sources: thermal, fluorescent. The sun and stars are natural sources of light. Color perception. Optical instruments: from microscope to telescope. fiber optics. Laser light. Modern heat engines and their efficiency Ecological problems of using heat engines. The meaning of light and color in human life. Optical instruments are assistants in the study of nature. Videoecology is the science of human interaction with the visible environment. Problems of control of thermonuclear fusion, the solution of which will be able to satisfy the energy needs of mankind for millions of years. In the future, fusion power plants could contribute to climate change mitigation.

Considering that all over the world special attention is now being paid to solving global environmental problems, and based on the above judgments, we propose to introduce the course "Physics and environmental problems" into the curricula of universities.

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Literature

1. Tarasov L.V. Physics in nature. Moscow, "Enlightenment", 1988.
2. Ryzhenkov A.P. Environmental Physics, Ed. "Prometheus", 2018.
3. Trukhin V.I., Pokazeev K.V., Shreider A.A. Physics and ecology, a number of articles 2023.
4. Kuklev Yu.I. Physical ecology: Moscow, 2011.
5. Physics and ecology. Materials for conducting educational and extracurricular work on environmental education.Comp. G.A. Fadeeva, V.A. Popova - Volgograd: Teacher, 2014. - 74 p.
6. Lubinskaya T.N. Physics and ecology. "Physics at school". 2012. No. 3.
7. Gordienko V.A. Physical fields and life safety: Moscow. 2010
8. Darenskaya M.V. The program of the elective course "Physics and Ecology, Krasnodar 2015.
9. Materials from the site http://www.ecolife.ru.

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