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THE PLACE OF NANOTECHNOLOGY IN THE PRESENT TIME

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Abstract. *Experts of the Global Industry Analysis company reported that Japan, the USA and the European Union are leaders in the world of nanotechnology. The reason is that these countries plan to invest the largest amount in the development of nanotechnology.*

Key words*: Manipulator, computer programs, radio receiver, spacecraft, development of nanotechnology, nanomechanical structures, nano-factory, nano-sized objects, nanomanipulators, nanorobots.*

МЕСТО НАНОТЕХНОЛОГИЙ В НАШЕ ВРЕМЯ

Аннотация. *Эксперты компании Global Industry Analysis сообщили, что Япония, США и Евросоюз являются лидерами в мире нанотехнологий. Причина в том, что именно эти страны планируют инвестировать наибольшие суммы в развитие нанотехнологий.*

Ключевые слова: *Манипулятор, компьютерные программы, радиоприемник, космический аппарат, развитие нанотехнологий, наномеханические конструкции, нанофабрики, наноразмерные объекты, наноманипуляторы, нанороботы.*

The experts of the Global Industry Analysis company reported that the countries of Japan, the USA and the European Union are leaders in the world of nanotechnology. The reason is that these countries plan to invest the largest amount in the development of nanotechnology. In particular, for research and production in the field of nanotechnology, the Japanese government plans to invest more than 6 billion dollars, the United States 5.6 billion dollars, and the European Union countries 4.5 billion dollars in 2006-2010. There are reports that Russia plans to allocate 8 billion dollars for the development of nanotechnology by 2011.

I think that it is necessary to publish the magazine "Nanotechnology" in our country and provide detailed information about the achievements in this field. Returning to the topic, according to science historian Richard Booker, the history of nanotechnology lighting is very complicated for two reasons. First of all, this concept itself is vague, for example, the concept of nanotechnology often does not fit into the scope of the usual technology term. Secondly, since ancient times, mankind has unknowingly tried to experiment with nanotechnology. Charles Poole, author of the book "Introduction to Nanotechnology", gives an example of this idea: in the British Museum there is a "Lycurgus Cup" made by ancient Roman craftsmen (the cup depicts scenes from the life of the great Spartan law creator), which contains microscopic particles of gold and silver added to the glass.

When the cup is illuminated in different ways, its color changes from dark-red to pure gold. Similar technologies were used in the Middle Ages in European churches to make stained-glass windows. There are views that the Greek philosopher Democritus is the "father" of nanotechnology. He first used the Greek word "atom" ("indivisible") 400 years ago to describe the smallest particle of matter. In 1661, the Irish chemist Robert Boyle in his article criticizes Aristotle's view that everything on Earth is composed of four elements - water, earth, fire and air (the philosophical basis of alchemy, chemistry and physics of that time). According to Boyle, all

things are made up of "corpuscles" of very small parts, the various combinations of which form various substances and objects. put forward the view that Later, the ideas of Democritus and Boyle were recognized by scientists. Perhaps the first breakthrough in nanotechnology of the current world occurred when the American inventor George Isman invented photographic film in 1883. The following events also have an important place in the world of nanotechnology.

- In 1905, the Swiss physicist Albert Einstein published his article based on the fact that the size of a sugar molecule is about 1 nanometer:

- 1931 year. German physicists Max Knoll and Ernst Ruska invented the electron microscope, which made it possible to study the nanoworld for the first time;

- 1968. Employees of the scientific department of the American "Bell" company, Alfred Cho and John Arthur, created the theoretical foundations of nanotechnology in surface treatment;

- 1974. In fact, 10 levels of atoms and molecules have 9 dimensions. The suffix "nano" means 9 to the 10th degree, thus the term "nanotechnology" appeared. The Japanese physicist Norio Taniguchi introduced the word "nanotechnology" into science as a scientific term and proposed to name the mechanisms smaller than one micron. ;

- 1981. German physicists Gerd Binnig and Heinrich Rohrer made a microscope that could show individual atoms;

- 1985. American physicists Robert Kerl, Harold Crowe and Richard Smiley have a diameter of one nanometer

they created a technology that can accurately measure the objects;

- 1986. Nanotechnology became known to the general public. American Futurologist Eric Drexler's book is out of print and it predicts the rapid development of nanotechnology in the near future

was done; - 1989. IBM employee Donald Eigler typed the name of his company on a platinum plate with Xenon atoms. When the drawing was shown in scientific and other magazines, scientists were shocked;

- 1993 year. The Feyman Prize began to be awarded in the United States;

- 1998. Dutch Physicist Seez Dekker made a transistor based on nanotechnology;

- 1999. American physicists James Tur and Mark Read discovered that individual molecules can move as molecular systems;

- 2000 year. The US government has approved the National Nanotechnology Initiative.

Nanotechnological research was funded by the state. 500 million dollars were allocated from the state budget;

- 2001 year. Mark Ratner's "Nanotechnology: An Introduction to the New Big Idea" book states that nanotechnology became a part of human life in 2001, in that year two important events: the prestigious science magazine "Science" named nanotechnology "New of the Year", the famous business magazine "Forbes" and it was noted that it was called "New multi-covenant idea". He put forward his opinion that at present, the term "new industrial revolution" is used periodically in relation to nanotechnology. Currently, nanotechnology is used in the following directions:

1. Creation of nanomaterials (items with nano-sized elements) using traditional chemical methods (so-called "nanoscale technology").

2. Seeking to create active nanostructures using oxygen, DNA and other organic molecules.

3. Making electronic drawings whose elements consist of several atoms.

4. Creation of nano-sized devices, including nano-machines (that is, mechanisms and robots the size of molecules) within the nanomechanical approach known as "molecular industry"; directly manipulating atoms and molecules and making them into anything you want.

If the fourth problem was solved, the solution of the remaining three would be found by itself. Nanotechnology used to mean only this fourth issue. This view clearly illuminates the concept of nanotechnology in general. But due to financial complications and problems, the first three directions above were also recognized as nanotechnology research. At the same time, the concept of nanotechnology has become somewhat confusing. The goal of the development of the first three areas is primarily aimed at solving the fourth issue.

Richard Feyman, in his speech at the annual meeting of the American Physical Society held on December 25, 1959, predicted that many of the problems facing mankind would be solved after people learn to separate atoms. was awarded the Nobel Prize for his work in the field of quantum electrodynamics. Quantum electrodynamics has now become one of the fields of nanoscience. However, it was not until 1981-83 that physicists Heinrich Rohrer and Gerd Binnig of the Swiss IBM company created a scanning tunneling microscope that could show individual atoms and move them from one place to another. Five years later, in 1986, they were awarded the Nobel Prize for this unparalleled achievement in the field of nanotechnology. In 1989, another scientist of 1BM, Donald Eigler, placed 35 atoms of inert xenon gas as he wanted on a platinum plate and drew the logo (emblem) of his company. Currently, nanotechnology is used in the following directions:

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