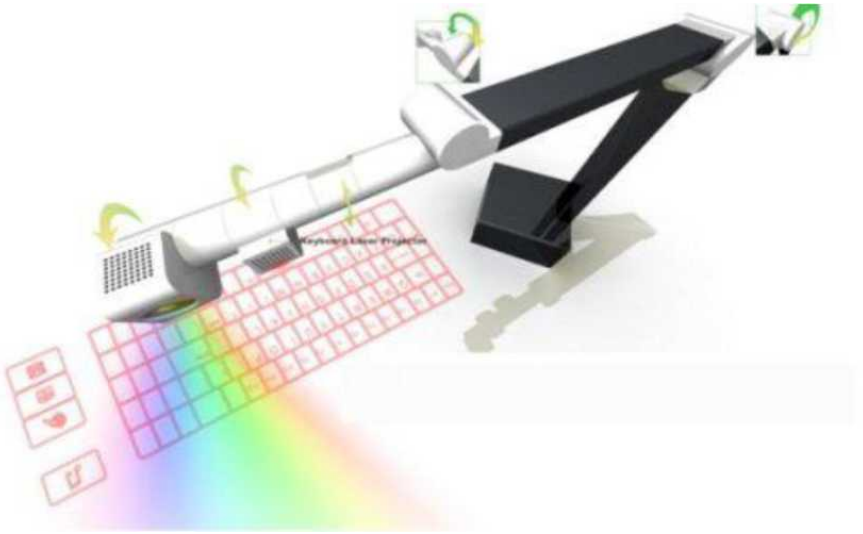
"Green" computer of the future Soul PC - saving energy and materials.



The Soul PC computer uses two new modern technologies: image projection technology and remote "cloud" computing technology to reduce energy costs for system operation. In appearance, the Soul PC doesn't look like a traditional computer at all, it looks more like a table lamp standing on a massive stand. With the help of a laser projector, the keyboard and other controls are projected onto any surface, and the other projector is the display of this computer. Thus, by installing Soul PC anywhere, you will get a ready-to-use computer.

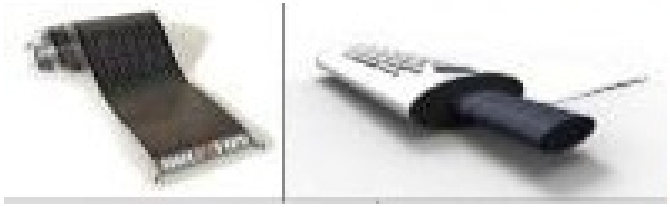
The computing stuffing of the computer cannot boast of great performance and power. In the Soul PC system, all attention is paid to "cloud" and remote computing, which are performed on powerful computers, servers located in special data centers, which allows you to achieve maximum productivity even with a large number of users due to the flexible distribution of processor time between users.

The mobile computer of the future does not need a keyboard, display and other peripherals.

To activate the new computer, it is enough to put it on the appropriate surface and, using the only control element - the power button, turn on the device. With the help of a projector and a camera, the computer will scan the available space and calculate the image correction, which will take into account the irregularities and features of the surface. After that, the user will be able to get to work and do all the things that a regular computer can do.

Roll Me is a computer that can be rolled up like a newspaper.

The Roll Me computer display, which extends from the roll-shaped case, is made using color electronic ink (Color E-Ink) technology and, thanks to the use of nanotechnology, provides excellent image quality. The internal stuffing of the Roll Me computer pays tribute to minimalism, but due to this, the computer turned out to be quite light, ergonomic and portable.



All the controls of the Roll Me computer are made in the tradition of the controls of modern ordinary mobile computers, so users do not experience any inconvenience. by purchasing such a computer. The Roll Me computer is powered by a small-sized battery hidden in an unusual case, and the battery is charged using the flexible SolarRoll solar battery, which folds up and is stored inside the computer case.

Let's consider several examples of existing eco-technologies. which, if developed, could really solve some of the most pressing global problems.

Eco-technologies of organic batteries.

Prototype of organic flow-type storage battery.

Eco-technologies in transport - electric cars.

During operation, the internal combustion engine emits exhaust gases, which are products of complete and incomplete combustion of fuel, excess air, aerosols and various micro impurities. Exhaust gases contain about 300 substances, most of which are toxic. Electric cars are an ecological alternative to cars with internal combustion engines, they create less pollution. A trend of significant increase in sales has emerged on the world market. In addition, an electric car can not only be purchased, but also manufactured independently, for example, using documentation for the open source OS Vehicle automotive platform.

Eco-technologies in atomic energy.

Traditional nuclear energy is far from the principles of environmental sustainability. However, currently the total net electric power of nuclear power plants in the world is 372,022 MW and the reactors simply cannot be taken and turned off. There are problems of disposal of nuclear waste. Therefore, instead of building traditional technologies, why not mobilize technologies that are focused on solving current problems?

The company Transatomic Power is engaged in the creation of a nuclear reactor Waste-Annihilating Molten Salt Reactor or WAMSR, which can be translated as a waste-and-powder reactor. This reactor can use radioactive waste as fuel. This reactor is safer than conventional reactors because it is fully automatic and does not depend on the human factor. It has a mobile modular design and the modules can be transported by rail to the installation site. If this technology can be developed, it will be possible to use radioactive waste, turning it into clean energy.

A plane powered by solar batteries is making a round-the-world trip for the first time.

Solar Impulse 2 is equipped with more than 17,000 solar panels made of silicon crystals, covering an area of about 270 square meters and capable of accumulating up to 340 kilowatt-hours of solar energy per day. Solar panels cover the wings, horizontal tail and fuselage of the aircraft, providing a compromise between the lightness of the aircraft, its maneuverability and the energy efficiency of the solar panels (which reaches 23%).

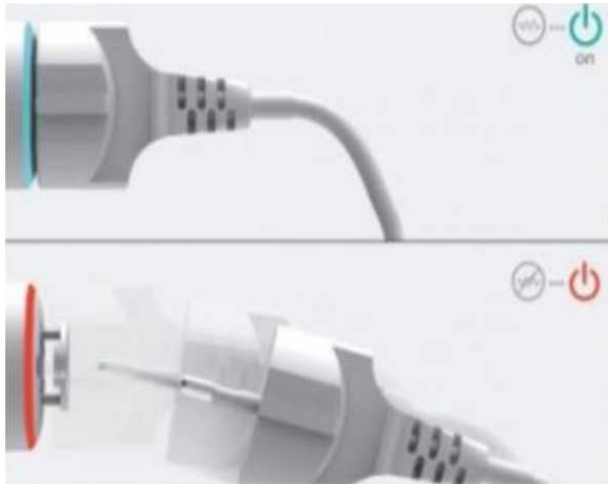
Green Ethernet technology.

Energy-efficient Ethernet (IEEE 802.3 az) can reduce the power consumption of network equipment. In 2005, all network interface controllers in the United States (in computers, switches, and routers) consumed approximately 5.3 terawatt-hours of electricity

Energy-efficient Ethernet conserves power by allowing network links to either enter a low-power sleep mode or operate at a slower speed when no data is present. It also specifies low power signaling for use with higher quality cables.

Pumping Tap.

Hi, it's no secret that many household devices waste a small amount of energy, even when they are turned off. Of course, if there are enough such devices in the home, not the amount of energy can play a significant role in the monthly electricity bills. And the only way to avoid unnecessary energy consumption is to physically disconnect the power supply cables of unused devices from the network, unfortunately, few people confuse themselves with such actions. To solve this problem, a group of designers developed the concept of the PumPing Tar device, a device that could detect the presence of an unused power cord in an outlet and be able to physically disconnect it from the network.



The construction of the PumPing Tar device is incredibly simple. Current sensors allow you to detect whether the plug is actively using electricity from the network. Ten minutes after detecting an unused cord in the outlet, a special spring mechanism is activated, which pushes the plug of the cord out of the outlet. Thanks to its simplicity, as the PumPing Tar device became one of the winners of the Red Dot Design Concept competition.

The most promising directions in IT from the point of view of engineers from Microsoft

1. Machine learning: machine learning, data science, data mining, big data.

If you follow the news from the world of high information technologies, you certainly noticed that almost every second piece of news is devoted to what scientists have once again come up with using artificial intelligence and machine learning algorithms.

The global labor market today confirms the prospects of these areas and the increased demand for relevant experts.

Big data analysis is increasingly in demand in finance, marketing and even HR. In addition, there are more and more applications that work with huge amounts of data that need to be processed, so the demand for such specialists will grow.

2. Mobile development.

Already three years ago, the number of mobile Internet users exceeded the number of wired Internet users. Not only that, there are more mobile devices today. than the people themselves. And in general, there are many fashionable IT trends in the field of mobile applications - the Internet of Things, virtual reality, corporate programs, etc.

Against this background, it is not at all surprising that the developer of mobile applications is very popular in the labor market, and this job is one of the most well-paid, the salary is constantly increasing.

Mobile applications have long been a new reality for business and business processes. This is a very promising direction in the IT industry.

3. Cloud technologies.

Analysts of the IDC company conducted research and came to the conclusion that already in the 20s of this century, every third position in the field of information technology will be associated with clouds. Data analysis specialists are the first in this queue, as today it is difficult to imagine the processes of storing and processing large data without cloud services.

The market of cloud services is divided into 3 categories: SaaS, laaS and PaaS (the most popular SaaS - today its share accounts for more than half of the entire market of cloud technologies).

Technologies that will define our future.

Blockchain.

This technology can change almost any industry — finance, trucking, and even agriculture. Blockchain is a kind of decentralized database from which it is impossible to delete or falsify information. This is a promising technology, but it has not yet been widely distributed. One of the reasons is that government structures prefer to deal with data protection on their own, which somewhat limits the scope of application of blockchains.

Cloud platforms/DaaS/PaaS.

Services Data as a Service (DaaS) and Platform as a Service (PaaS) are currently available only to large companies, but in the future even small businesses will be able to optimize processes.

"Smart" houses.

Google Nest, Amazon Alexa can already adjust the parameters of some objects according to the specified parameters. Modern "smart" houses not only understand the human voice, but also save energy, ensure safety and monitor the health of residents.

5G networks.

This technology increases the speed of data transmission and the quality of the Internet connection. In the future, this will allow unmanned cars and aircraft to be connected to the Internet, as well as expand the capabilities of the Internet of Things.

Unmanned transport.

There are five levels of autonomous driving from "no automation" to "full automation." Tesla cars are currently at level 3 and 4. Maybe we can reach level 5 by 2025.

Quantum computing.

Theoretically, quantum computers are much faster and more efficient than conventional ones, but they can allow the loss of information. The technology can lead to breakthroughs in drug development and will be beneficial for pharmaceutical companies.

Bionic technologies.

Some problems can be solved with the help of robotics. More and more advanced tools for human empowerment are emerging, often in the form of bionic limbs. In the future, not only prostheses await us, but also vision devices.

Graphene.

Graphene is a byproduct of graphite: a thinner, stronger, flexible material that conducts electricity. It can be used in portable electronics and space travel, where resistance and weight are key components. It has been talked about for a long time, but it will take a long time for us to start using graphene widely. Right now, most of our technology is based on silicon, and it has yet to be supplanted.

Peripheral computing.

The vast majority of data for connected devices is now processed in the cloud. But sometimes it can take too much time. There are more and more smart things, and their productivity is increasing.

Microchips and biochips.

Currently, microchips are mainly planned to be used for medical purposes. In the future, they can save us from having to carry a wallet. There is speculation that the chips will send music directly to the brain and allow us to compete with artificial intelligence.

Nanobots.

Tiny sensors with limited computing power can be used to identify and destroy cancer cells, deliver drugs, detect toxic chemicals, and measure their concentrations in the environment.

"Green" technologies.

This category includes a wide variety of technologies — from artificial photosynthesis to carbon capture. Startups that meet the goals of sustainable development attract business interest.

Green nanotechnologies are nanotechnologies used to increase the environmental sustainability of processes that have negative external effects. The term also refers to the use of nanotechnology products to support environmental sustainability. It includes the creation of "green" nanoproducts and the use of nanoproducts to increase environmental sustainability.

Green nanotechnology has been characterized as the development of clean technologies: "in order to minimize the possible risks to the environment and human health associated with the production and use of nanotechnology products, as well as to encourage the replacement of existing products with new nano products, more environmentally friendly throughout their life cycle.

Green nanotechnology has two goals: the production of nanomaterials and nanoproducts without harm to the environment or human health, and the production of nanoproducts that provide solutions to environmental problems. It uses existing principles of "green" chemistry and "green" engineering to create nanomaterials and nanoproducts without toxic ingredients, at low temperatures, using less energy and renewable resources whenever possible.

In addition to creating nanomaterials and products with less environmental impact, green nanotechnology also means using nanotechnology to make current manufacturing processes for non-nanomaterials and products more environmentally friendly. For example, nanoscale membranes can help separate desired products of a chemical reaction from waste.

Nanoscale catalysts can make chemical reactions more efficient and economical. Nanoscale sensors can be parts of automated technological process control systems that work with information systems created on the basis of nanotechnology. The use of alternative energy systems has become possible thanks to nanotechnology, this is another way to make production processes

"green".

A second goal of green nanotechnology involves the development of products that directly or indirectly benefit the environment. Nanomaterials or nanoproducts can directly clean

hazardous waste sites, desalinate water, neutralize harmful substances, or detect and control substances that pollute the environment. Indirectly, lightweight nanocomposites for cars and other vehicles could save fuel and reduce the amount of materials needed for production; fuel cells and light-emitting diodes (LEDs) based on nanotechnology can reduce pollution from energy production and help conserve fossil fuels; self-cleaning non-dimensional surface coatings can reduce or eliminate the use of many cleaning chemicals used in routine maintenance procedures: longer battery life can result in reduced material use and less waste. Green nanotechnology encompasses many nanomaterials and nanoproducts, ensuring that unintended consequences are minimized and that any impacts are predictable throughout the life cycle.

According to the US National Nanotechnology Initiative, nanotechnology is "the science, engineering, and technology conducted at the nanoscale, which is roughly between 1 and 100 nanometers." By comparison, a sheet of newspaper is about 100,000 nanometers thick.

It is also a rapidly expanding industry. Scientists and engineers are making great strides in exploring what nanotechnology can do and creating nanoscale materials to take advantage of advanced properties such as greater strength, lighter weight, increased electrical conductivity, and chemical reactivity compared to their bulk counterparts.

Ways of impact of nanotechnology on our life.

1. Faster, smaller and more powerful computers that use much less power, with batteries that last longer. Circuits made of carbon nanotubes could be vital in supporting the growth of computer power.

2. Faster, more functional and more accurate medical diagnostic equipment. Lab-on-a-cliip technology allows testing in real time, which speeds up the delivery of medical care. Nanomaterial surfaces on implants improve wear and resist infection.

3. Improving vehicle fuel efficiency and corrosion resistance by creating vehicle parts with nanocomposite materials that are lighter, stronger, and more chemically resistant than metal. Nanofilters remove almost all airborne particles from the air before it enters the combustion chamber - further improving gas mileage.

4. Nanoparticles or nanofibers in fabrics can increase stain resistance, water resistance, and fire resistance without significantly increasing the fabric's weight, thickness, or stiffness.

5. Water filters only 15-20 nanometers wide can remove nanoparticles, including virtually all viruses and bacteria. These cost-effective portable water purification systems are ideal for improving the quality of drinking water in developing countries.

6. Carbon nanotubes have a variety of commercial uses, including making sports equipment stronger and lighter. For example, a tennis racket made of carbon nanotubes bends less during impact and increases the power and accuracy of the serve. Nanoparticles treated with tennis balls can help them bounce twice as far as standard tennis balls.

7. Thanks to nanotechnology, a vast number of different chemical sensors can be programmed to detect a particular chemical at incredibly low levels, such as one molecule in billions.

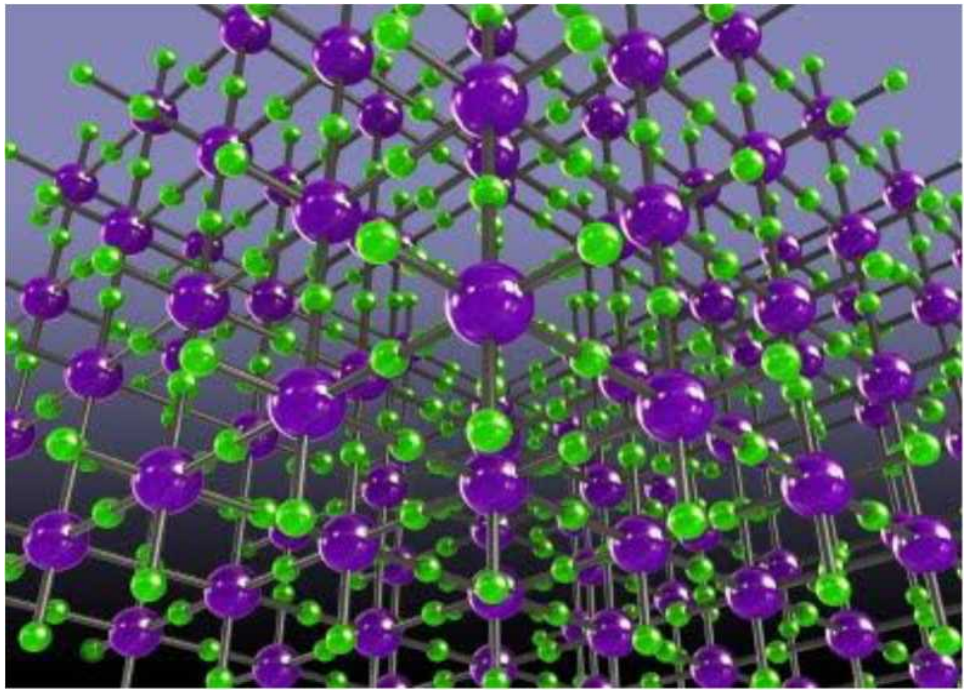
This capability is ideal for surveillance and security systems in laboratories, industrial sites and airports. At the medical level, nano sensors can also be used to accurately identify certain cells or substances in the body.

Nanotechnology can lead the world to a new technological revolution and completely change not only the economy, but also the environment.

Nanomaterials are materials containing structural elements (crystallites, fibers, layers, pores), the geometric dimensions of which in at least one direction do not exceed the nanotechnological border - 100 nm (from 1 to 100 nm), which have qualitatively different properties compared to traditional materials with physical, chemical, mechanical and biological properties, functional and operational characteristics. A number of nanotechnologies are used in practice — for example, in the production of digital video discs (DVD). In the field of medicine, it is possible to create robot doctors capable of "living" inside the human body, eliminating all emerging injuries, or preventing them from occurring. Theoretically, nanotechnology can provide a person with physical immortality, due to the fact that nanomedicine will be able to endlessly regenerate dying cells. According to forecasts of Scientific American magazine, medical devices the size of postage stamps will appear in the near future. it will be enough to put them on the wound and this device will independently conduct a blood test, determine which medicines need to be used and inject them into the blood.

It is expected that the first works created on the basis of nanotechnology will appear in 2025. It is theoretically possible that they will be able to construct any object from ready-made atoms. New technologies are capable of revolutionizing agriculture. Molecular robots will be able to cook food. replacing agricultural plants and animals. For example, it is theoretically possible to produce milk directly from grass, bypassing the intermediate link - the cow. Nanotechnology can also stabilize the ecology of the planet. New types of industry will function without waste that poisons the planet, and nanorobots will be able to destroy the effects of old pollution. Incredible prospects also open up in the field of information technologies. Nanorobots are able to realize the dream of science fiction about the colonization of other planets - the devices will be able to create an environment suitable for human life on them.

Specialists in the field of electronics and information technologies place special hopes on nanotechnology. In 1965, it was possible to fit only 30 transistors on one line. In 1971 - 2 thousand.



In 1965, Gordon Moore, a specialist in physical chemistry, made a famous prediction that was called "Moore's Law". Moore's Law states that the number of transistors on a chip will double every 18 months. Over the course of several decades, this forecast proved its accuracy. Currently, manufacturers of computer chips are faced with the difficulties of miniaturization: in order to actually confirm "Moore's Law", it is necessary for the transistor to be no more than 9 nanometers in size (2015-2017), in 2021 it was announced to develop a 2 nm chip.

To appreciate the scale, imagine a globe and a penny coin - this is roughly how a meter and a nanometer relate to each other.

Viruses are measured in hundreds of nanometers, large protein molecules in tens, and recently transistors in computer processors.

History of nanotechnology development.

The first assumptions about the possibility of studying objects at the atomic level can be found in the book "Optics" by Isaac Newton. which came out in 1704.

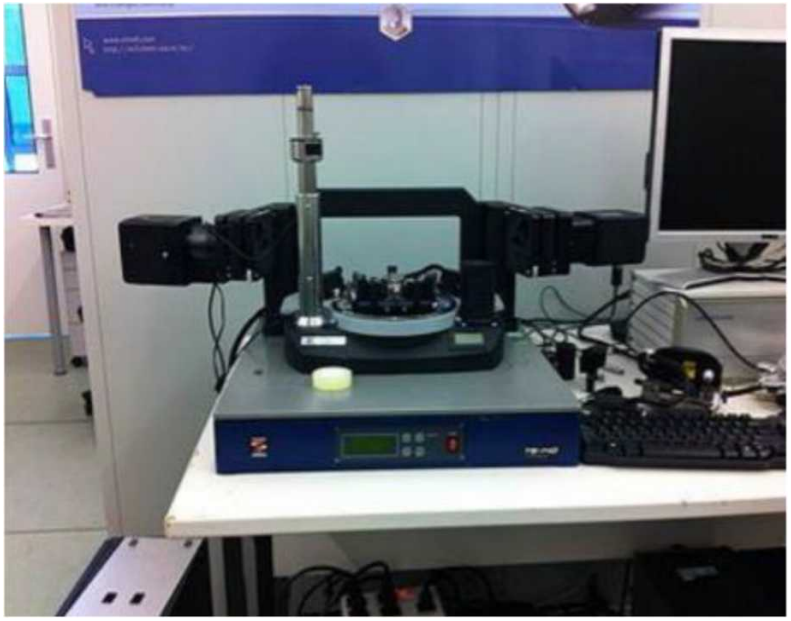
In the book, Newton expresses the hope that the microscopes of the future will one day be able to explore the "mysteries of corpuscles"

The term "nanotechnology" was first used by Norio Taniguti in 1974. He called this term the production of products with a size of several nanometers

It is impossible to view objects with a size of tens, let alone a unit of nanometers, in a light microscope. Therefore, the first step to the nanoworld was an electron microscope.

By its principle, it resembles an ordinary microscope, but instead of light, electrons work here, and they are focused by magnetic lenses. A beam of electrons, passing through a thin sample, interacts with it, and then falls on a luminescent screen, which makes the picture visible to the human eye.

An electron microscope gives a magnification of millions of times.



In the second half and at the end of the 20th century more sophisticated methods of observing nano-objects were created:
Scanning tunneling microscope (allows viewing individual atoms);
Magnetic resonance imaging (made a revolution in medicine);
Atomic force microscope (allows not only to "examine" individual atoms and molecules, but also to manipulate them).

Nanorobots are in the research stage of creation.
In 2010, DNA-based nanorobots capable of mixing in space were demonstrated for the first time
It is assumed that the development of the theory and practice of designing and using nanorobots will allow to create a new molecular production, to make a leap in the field of biotechnology. Which will lead to a new technological and scientific and informational revolution.

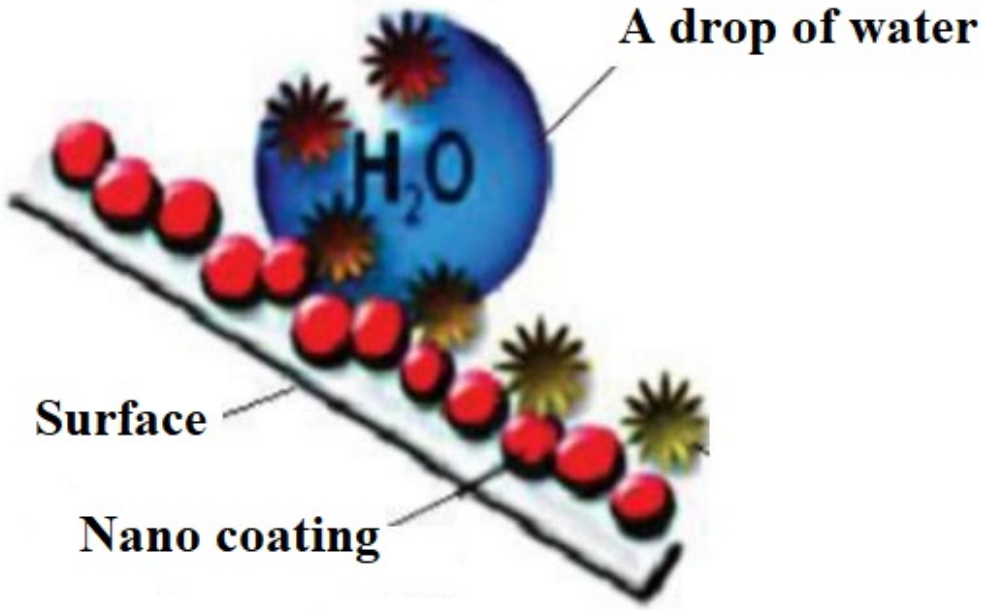
Technological singularity is a hypothetical moment after which, according to supporters of this concept, technical progress will become so fast and complex that it will be beyond comprehension. Futurists predict the onset of the singularity after the creation of artificial intelligence and the appearance of self-replicating machines, the integration of humans with computing machines, or a significant leap-like increase in the capabilities of the human brain due to biotechnology.

Cells of living organisms grow and divide due to the fact that interrelated processes at the nanoscale are continuously taking place in them.

The lotus plant is remarkable in that its leaves always remain clean, in some countries of the East this plant is considered a symbol of purity. Lotus leaves have a unique surface structure, containing numerous nanohairs in the form of sharp peaks, which provide superhydrophobic properties. It is this structure that explains the self-cleaning of the sheet and its water-repellent ability. Drops of water roll off the lotus leaves, taking foreign particles with them. This property was called the "lotus effect".

Since the lotus effect is based exclusively on physicochemical phenomena and properties and is not tied only to a living system, similar surfaces can be technically reproduced.

Currently, technologies based on the practical implementation of the "lotus effect" are widely used in the construction industry, in particular, technologies of decorative and protective self-cleaning coatings for ceramic tiles, facade paints.



Implementation scheme of the "lotus effect".

Main fields of use of nanomaterials and nanotechnologies.

The qualitative characteristic of nanotechnologies consists in the practical use of a new level of knowledge about the physical and chemical properties of matter.

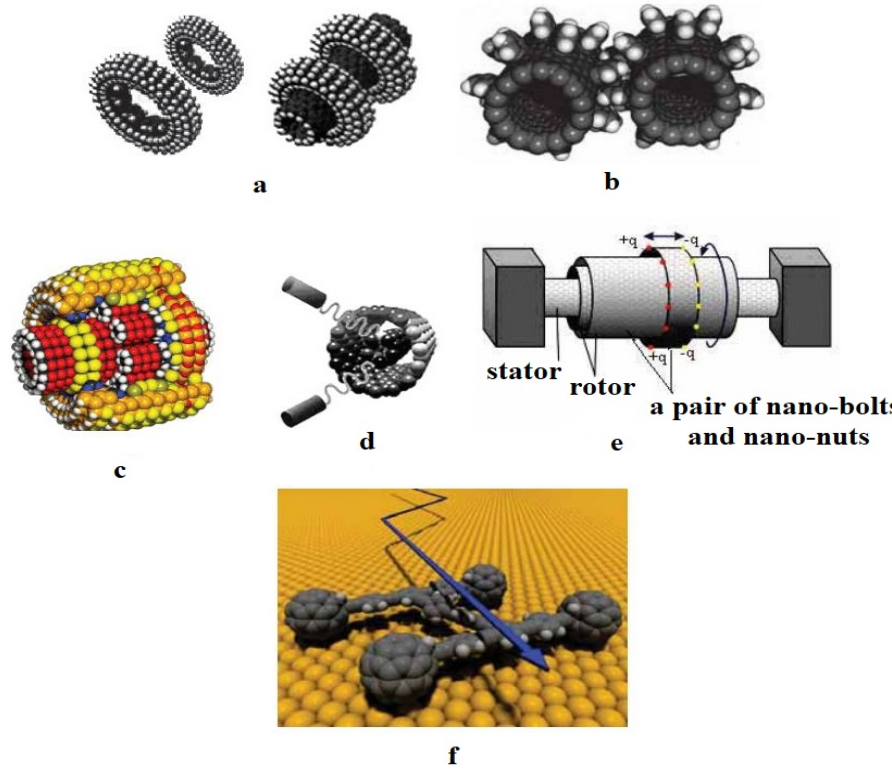
New possibilities in increasing the power of temperature and radiation resistance, expanding the frequency range, improving the ergonomic characteristics of electronic devices opens the direction in which the ideas of vacuum and solid-state electronics are synthesized - nanoelectronics. It is in this area that the most revolutionary achievements are expected, approaching the quantum limits, when one electron, one spin, quantum of magnetic flux, energy, etc. "works". The reduction to the limit values of electronic elements contributes to the miniaturization of electronic devices based on them, including the creation of superminiature computers.

The next stage of the development of nanoelectronics and nanotechnology in general is the creation of quantum computers, which allow to increase the speed, amount of memory and other characteristics. The idea of creating quantum computers is based on the application of quantum calculations using the quantum properties of particles as logical constants, in particular, the spin - the electron's own moment of rotation.

Quantum computers will be able to solve the problem of modeling nanoobjects, which has not only theoretical, but also practical significance, since, as is known, computer modeling allows you to significantly reduce time and costs at the stage of developing a new product, which is important for nanotechnological production.

Nanoelectromechanical systems (NEMS) are a set of electronic and mechanical elements made in nanoscale based on integrated technologies. These objects develop "nanoforce" under the action of an electric field or light. NEMS devices, as a rule, include a nanosensitive element, a signal conversion circuit, control systems, information storage and transmission systems. The integration of electronics and sensitive nanoelements in one MEMS device (microelectromechanical system) has given birth to a huge variety of scientific projects, many of which are already being implemented.

Some examples of NEMS based on nanomaterials: a - nanobearings; b - nanogears based on carbon nanotubes; c - a molecular reducer: d - a nanomotor driven by light: e - a schematic diagram of a nanomotor (charges on the edges of the layers can be obtained by chemical adsorption and serve to control the nanomotor using an electric field); f - a "nanocar" of 300 atoms with wheels made of fullerene molecules connected by chemical bonds to the "framework", the width of the car is ~ 4 nm



It is on the basis of MEMS and NEMS that it is planned to create nanomanipulators and nanorobots, nanocomputers, entire nanolaboratories for use in computing, telecommunications, aerospace engineering and automotive engineering, for the creation of means of ensuring safety, in medicine, and in household appliances.

Miniature sensors (in fact, chemical laboratories, placed on a 1 cm 2 plate) have been developed, capable of working autonomously in any conditions and using radio waves to connect to local networks to transmit collected information to a central computer - self-organized sensor networks.

Sensors can be used to monitor the state of the environment, monitor transport and communication systems (including space), search for oil and gas deposits, obtain information about the condition of buildings and structures, roads, water pollution, for medical and military purposes, etc.

Work on the implementation of such sensors has already begun, in the coming years the process of their production will take on a mass character.

The growth of technical progress is inevitably associated with environmental pollution, therefore environmental issues are becoming more and more relevant in the modern world.

There is hope that many environmental problems, the task of creating a society "harmony with nature" can be solved with the help of nanotechnology.

The main directions of development in this regard are as follows:

- control of the environmental situation with the help of various multifunctional sensors that provide registration of changes in climatic and environmental parameters;

- water purification from harmful and dangerous substances;

- use of ecologically clean, renewable energy sources:

- fight against the greenhouse effect:

- preservation of the ozone layer;

- development of environmentally friendly materials;

- fight against environmental pollution with dioxin;

- fight against the so-called "acid" rains, etc.

Conclusions.

1. The special role and practical importance of nanotechnology lies in the potential for the development of new conceptual changes in almost all areas of human activity - in industry, health care and medicine, information technology, environmental protection and national security, education and etc.

2. One of the most important areas of application of nanotechnologies and nanomaterials is the creation of a fundamentally new class of structural materials - with extremely high strength, significantly exceeding the strength of traditional structural materials, combining high strength and plasticity, possessing high specific strength, capable of changing their structure and properties depending on external influences.

3. The magnetic properties of nanostructures have a wide variety and are significantly different from traditional materials, which promises the creation of a whole range of magnetic materials with fundamentally new qualities for use in electrical engineering and electronics, in the technique of magnetic recording and information display, in fundamentally new approaches to the formation of the structure of hard disks, in mechanical engineering, aircraft construction and space engineering, in metallurgy and energy, in medicine, etc.

4. Thanks to nanotechnology, progress in the creation of "intelligent" materials is possible. In nanotechnology, the "intelligence" of the material, that is, the built-in ability to respond to certain external influences and change its properties depending on this, is projected at the atomic and molecular level.

5. In the field of microelectronics. the development of which is directly related to the reduction of the size of functional elements, the use of nanotechnology allows to improve the speed, memory capacity and functionality of electronic devices by thousands and millions of times and to reduce their weight, energy consumption, and heat generation to the same extent. In addition, nanotechnology provides the creation of a wide range of electronic devices, the production of which is impossible by other means.

6. The problems of miniaturization, increasing the efficiency of photonic devices, including fiber-optic communication systems, which are the most important element of communication and information technologies in various fields, can be largely solved thanks to the use of nanoeffects and nanomaterials.