

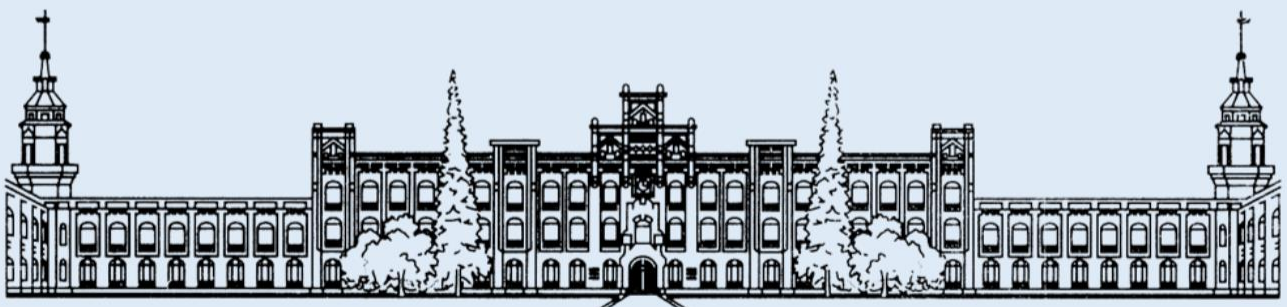
**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
THE NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE"
FACULTY OF LINGUISTICS**

**IX INTERNATIONAL STUDENTS' RESEARCH AND
DEVELOPMENT CONFERENCE**

**Ukrainian and Foreign Science:
Yesterday, Today, Tomorrow**

CONFERENCE PROCEEDINGS

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ENGINEERING SCIENCES

THE USE OF INFORMATION TECHNOLOGIES CUSTODIANS

Egor Morskyi

Politechnika Rzeszowska im. Ignacego Łukasiewicza, Poland

The on-line processing of information from a remote terminal is needed due to the increasing multiplicity of information systems and growing requirements for the speed of information processing. A general requirement for all remote access technologies is the protection of information from unauthorized access (2020). The largest custodians in the world are developing their remote access systems, with the help of which the client can initiate an order from his computer.

The experts are seriously interested in the problem solving of the stock information system integrating with banking and accounting systems. So, they do not ignore the issues of data protection, access, and maintaining their integrity. These tasks require new approaches and make scientists pay attention to modern solutions that are already available on the information technology market. The basis of the modern approach to building an information system is the "client-server" technology.

One of the most important conditions for the development of a civilized securities market in Poland is the creation of information systems that allow paperless office (storage and circulation of documents in electronic form). Due to the fact that the secondary securities market in the country has been underdeveloped, special attention of the developers is drawn to the constantly increasing demand for systems operating with securities of private enterprises, the main of which is the depository system. It is the development of electronic depository systems that can have a significant impact on the widespread transition to electronic technologies in the securities market, an increase in their turnover and, as a result, to the formation of a network of participants with remote access, which, taking into account the size of the country.

The introduction of new information technologies should contribute to solving the problem of improving the information support of custodians. The most knowledge-intensive and objectively necessary elements of such new information technologies are methods of simulation and forecasting depository activities. One of the topical directions for improving custodians' activities is the use of the mathematical apparatus. It implies the need for research in this area and, first of all, a critical assessment of approaches and mathematical apparatus, the choice of a class of mathematical models and methods, the use of which is advisable for considering the subject area.

To sum up, only the correct choice of technology for creating a system allows experts to extend its life cycle, carrying out continuous development and expansion without radical alteration of the main basic components of the system.

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BITCOIN REASONS FOR ITS GROWTH AND A BRIEF HISTORY

Danylo Antolyk

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Bitcoin, created in January 2009 after the housing market crash, is a cryptocurrency. The creator is an anonymous user under the pseudonym Satoshi Nakamoto. His identity is a mystery. It is run by a decentralized body, so it is not the official currency. (Jake Frankenfield 2020)

Also, Bitcoin is not physical, it is absolutely virtual cash. We use it wherever they are supported. For example: from 2018 in Kyiv on the Bessarabian market it is possible to buy food for bitcoins. But in some eastern countries, they are completely prohibited.

Basically, bitcoin is a computer file that is entered in an application on a PC or smartphone. Folk can easily exchange bitcoins for each other and all deals are listed in a publicly available catalog designating a blockchain. This allows you to track Bitcoins history so that people do not spend coins that do not belong to them, copy or cancel transactions. (BBC 2018)

People can receive bitcoins in three ways: from other people, by selling certain things, or by creating them with a PC. For this system to work, people have to make persistent transactions on their PC. Computers are capable of calculating surprisingly complex amounts. Sometimes their owners receive bitcoins as a reward. For it, you need a more powerful computer. It is - mining. However, now it's getting harder and harder to end creating too many Bitcoins. At the moment it is almost useless to start mining because you can spend more on electric power than you earn

This system is highly commendable, because you can exchange not a physical object for real things, but even for real money. People like it because it is not guided by the state. It is used by both ordinary lovers of anonymity and criminals.

This is safe since every deal is open. This means that it is hard to duplicate bitcoins, create unreal ones, or use some you don't have. All risks are: you can lose access to your "storage", accidentally remove it, or someone can steal it from an untrusted website which one allows you to keep your currency. (BBC 2018)

Throughout history, Bitcoin has managed to rise, fall, and rise again. The first take-off - new technologies, limited edition, potential digital currency. The collapse is the refusal of the digital community to accept it due to the rules of using fiat currencies, competition in the form of huge financial investments, and their unwillingness to support the transition, which led to a drop in demand. The second take-off is the transfer of almost most of the same financial assets to their blockchain platform (which has led to a reputation for being a secure system), increased use of the network in connection with the coronavirus, and an increase in the number of electronic payments.

To conclude, cryptocurrencies are not a solution for everyone. It has its pros and cons, and the defect of entry is extremely low. So, making the decision to switch to cryptocurrency is not easy. However, it is definitely a very interesting currency to look out for.

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CYBER CRIMES

Kateryna Artemenko

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Cybercrimes are claimed to be a great threat to our society, personal confidentiality, and capitalism, on its own. Offenses such as hacking or identity theft are becoming more and more common.

It is unarguable that an enormous part of humanity has experienced some sorts of cyber attacks, for example in 2019 over 60% of businesses, worldwide, experienced phishing and social engineering attacks, 70% of which were actually small businesses. The goal is obvious — to take over some kind of confidential data (Vuleta, 2020).

Needless to say, almost half of all property crimes are done via the Internet (The Guardian, 2019), where it is harder to defend yourself from violations. The question is: “are we doing enough to secure ourselves and data online?”

First and foremost, cybersecurity departments are lacking employees, right now there are 300,000 unfilled jobs and the number will continue to increase, it is supposed that by 2021 this number will be up to 3.5 million (InfoSec Newsflash, 2019). Whilst everyone doing their work online, owing to quarantine, the cybersecurity specialist will be one of the most wanted positions.

We cannot but mention that despite security online is highly important, there will be a lack of finances, to further support my argument the President of the United States in 2019 allocated 15 billion on cyber security needs (The White House, 2018,

p 1), but it is still the bare minimum since the cases of cyber-attacks won't be leaning back. The current COVID-19 crisis and the need for investments in medicine will not let any government the opportunity to spend this much on cybersecurity.

All things considered, the problem of the Internet not being a "safe place" for anyone, it is terrifying to see that even a teenager could wreck up the justice system of the whole country (Daniel Kelley's case) (BBC, 2019), so you have to be aware of risks not just as an everyday user, but as businessmen or a public figure. Therefore, we should attract investments to the cybersecurity companies or maybe to become this type of specialist. It is up to you to decide, but do not take too long, the criminals are still on their way.

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HOW AI CAN ENHANCE OUR MEMORY, WORK AND SOCIAL LIVES

Oleksandra Denysenko

Faculty of Applied Mathematics

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

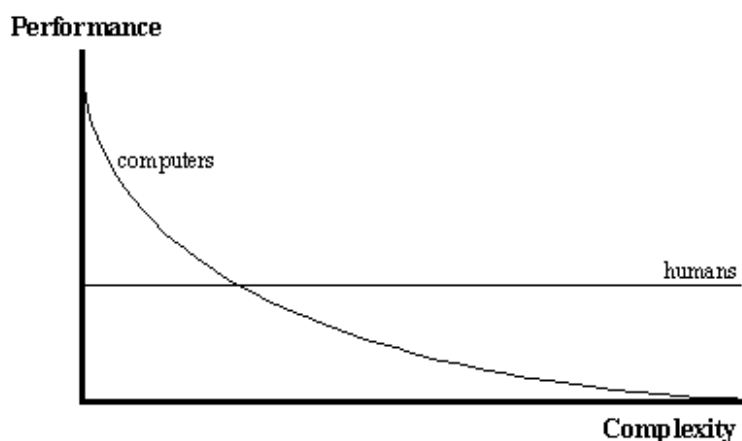
Tom Gruber, the co-founder of Siri, has recently presented his speech on the topic of Artificial Intelligence and its impact on humanity. As he claimed, the purpose of Artificial Intelligence (AI) is to help people with boosting their lives to a higher level.

The system, where AI and humans are cooperating, is called "humanistic AI". For the majority of people, this technology exists for the purpose of easier lifestyles. However, for some disabled humans, humanistic AI can be a vital necessity.

As an example of the implementation of artificial intelligence, Tom Gruber gives a personal story about his friend, a young disabled man who cannot talk or move without somebody's help. Siri helps him to maintain an ordinary human life:

communicate with friends and girlfriend using social media, study, develop, and entertain himself.

Another example of how AI can enhance our lives is medicine. According to the newest research, artificial intelligence has learned to define if a person has cancer. 10 years ago, only human specialists could deal with it and diagnose cancer after the special test. The appearance of the classifier with an integrated AI greatly simplified their lives. The technology is innovative and still, it makes many mistakes. However, as it was discovered, the combination of human specialists and machines increased the accuracy of diagnosis to 99.5%.



Artificial Intelligence has totally changed the vision of design. One human can create one model or draft, having spent hours or days on that. While the machine can create hundreds of models and designs without spending many sources. The designer can just choose the suitable option.

Improving memory is the point where skepticism dominates most. Most people would say, that the development of AI makes machines smarter. But what if to think about AI as a way to enhance our memory?

Human memory is the basis of his mind. It is finite, and most people remember only 60% of the information. People can retell the story, but they forget the details. We can remember a person's face, but sometimes we cannot remember his name. The memory of the machines is more perfect. If a person can establish a connection between memory and artificial intelligence, then he will be able to memorize all the information which comes to the brain. Artificial intelligence will read all the same books as its owner, will get to know people, and remember every detail about them. There will be no more problems forgetting important dates.

This hypothesis has been scientifically confirmed. A team of researchers led by University of Pennsylvania professor Michael Kahana has proven that machine learning algorithms can help unravel and improve human memory mechanisms.

The study involved 25 patients with epilepsy, each of whom had 100 to 200 electrodes placed in the cerebral cortex to monitor seizures. During the experiment, machine learning algorithms learned to associate the signals from the electrodes with memorization of the given word. But the electrodes do not just read neural activity: they can also stimulate it. Therefore, the researchers also tried to "wiggle" the brain and fix the perceived information in it. Every few seconds, the subject was shown a new word, and the newly trained algorithm determined whether the brain was ready to remember it, which increased the number of words that patients remembered by an average of 15 percent.

Humanistic AI can make a breakthrough in the fight against disease and allergies. If to catch signals after every meal or medication taken, a person can live a

long life, as it eliminates the risk of illness or sudden death. This is possible when interacting with chips and other devices with built-in AI.

AI can warn of the spread of viruses: Canada's BlueDot bot alerted the coronavirus threat nine days earlier than WHO. AI is widely used in the fight against COVID-19: from forecasting and screening to automatic drug delivery and laboratory research of drugs.

International companies are using AI to create a coronavirus vaccine. Global practice includes face recognition technologies for tracking coronavirus cases and contact alerts.

Artificial intelligence is playing a big role in the fight against epidemics and opens up new opportunities in the health sector, from virtual assistants for basic self-diagnosis to disease control.

Humanistic AI is about increasing productivity and improving performance. It's no secret that computers were created to help humans compute. Now machines are significantly different from the first computers, but they still continue to play the role of assistants in work. Artificial intelligence is able to calculate, come up with a solution, and select options in a split second.

Businesses are starting to actively use artificial intelligence for marketing research. Previously, all indicators about buyers, their interests, preferences, and the process of choosing a product or service were collected manually by marketers. Experts compiled statistics based on available data, spent a lot of time on it and had many errors. Now machines can collect all the data faster and more accurately. Thanks to this, the business can improve its strategy and increase its market position.

Artificial intelligence is used not only in work or medicine. Humanistic AI is most clearly manifested in direct interaction with a person in his or her social life.

When we think of AI in real life, we immediately imagine smart machines that are controlled by artificial intelligence. But this is just one example. Already at many airports, some robotic assistants help passengers get to the desired point. In addition, all over the world, there are more and more smart homes in which robots make human life easier. The machine helps keep your home clean, maintains optimal indoor temperatures, monitors the quality of food in the refrigerator, and tries to reduce utility bills by regulating water, heat, and electricity.

Everyone cares about protecting his or her home and family, and here artificial intelligence can play a big role as well. Detectors were developed to distinguish the faces of frequent visitors to your home and can warn about dangerous people in the house. Such a security system can also record the time when the child leaves for school and returns. Artificial intelligence is even able to keep track of your pets while you are not at home. All these benefits significantly reduce the level of stress and anxiety, because you no longer need to worry about the safety of your own and those of your family.

Thus, artificial intelligence can and should go hand in hand with humans, helping them to cope with life's difficulties, improving their work and social performance. AI has already become an integral part of medicine and will only strengthen its position in the next 5-10 years.

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PARALLEL COMPUTING WITH BOOST.COMPUTE

Mikhailo Didur

Faculty of Informatics and Computer Technology

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Parallel computing is named after one not so popular but very useful library for C++ programming language. It is one of the packages of “boost” that is called boost.compute. This library provides a simple high-level interface for computing on multi-core devices (CPU and GPU). You can use this library from boost version 1.61.0 (Lutz, 2014). As boost.compute is based on another low-level library, some problems can be met during including. For correct using boost compute, OpenCL should be found for your GPU(Nvidia or AMD) and CPU(Intel or AMD).

The library includes three auxiliary classes, which are enough to start with calculations on a video card and/or processor:

1. compute::device (defines device that will be used for computing)
2. compute::context (the instance of this class contains resources of OpenCL, including buffers of memory and other low-level things)
3. compute::command_queue (it is a queue of commands that is used by the chosen device)

All of the objects of these classes can be initialized in this way:

```
auto device = compute::system::default_device();
auto context = compute::context(device);
auto queue = compute::command_queue(context, device);
```

Boost.compute has got its own container called compute::vector. It is very important because std::vector from STL(standard template library) cannot be used in functions from the “compute” namespace.

```
std::vector<unsigned long long> host_vector = {1, 2, 3, 4, 5};
compute::vector<unsigned long long> device_vector(host_vector.begin(),
    host_vector.end(), queue);
```


In the example above, defined the default vector that is placed in RAM first and then copied it into another vector that is placed in GPU memory. You can also use the function “copy” and do it asynchronously to do it faster.

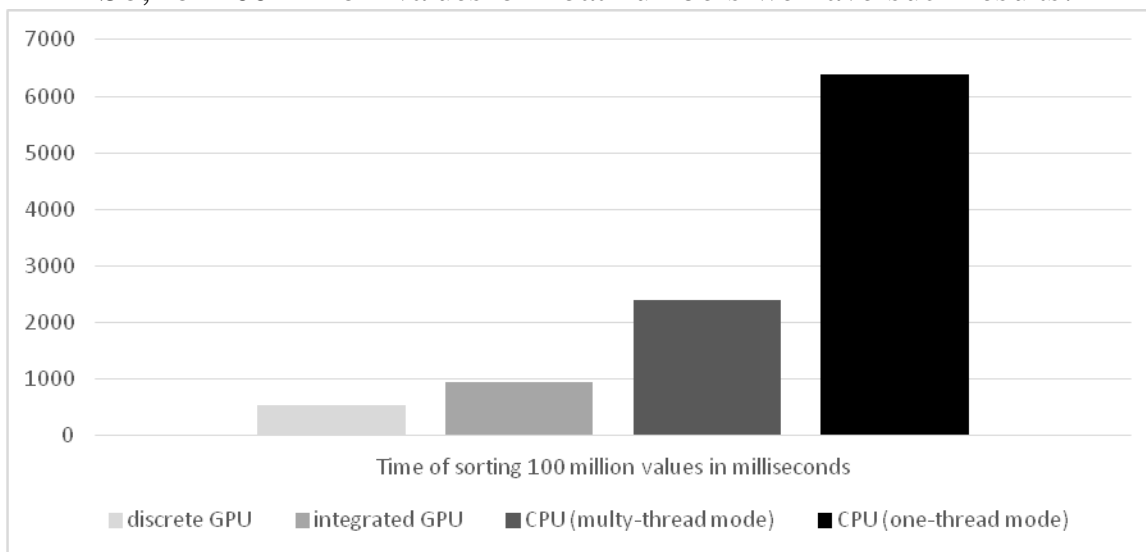
The library has got default functions to do simple calculating or sorting data (even with data dependencies). One of these functions is “transforming”, it can be used if it is needed to do something with every element of the array apart. For instance, multiply every number by two, by the next number in an array, or take the square root.

```
compute::transform(A.begin(), A.end(), C.begin(), compute::_1 * 2, queue);
```

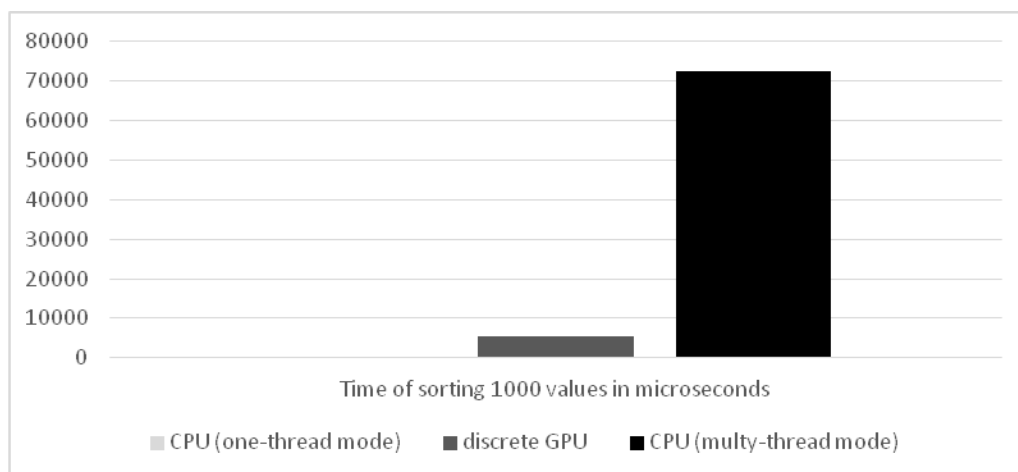
In the example above it is taking data from array “A”, in the fourth argument given an expression using lambda expression framework of “boost”. The third argument is the pointer to the beginning of array “C” where we will write result data.

There are a few simple tests to show when this library is really needed. The experiment will be carried out as follows: first, it will be made two arrays with sizes: 10^3 and 10^8 , the second sort them by parallel method on different devices by boost.compute and by “std::sort” in the one-thread node. Third, all of these ways will be timed and the result will be shown.

So, for 100 million values of float numbers we have such results:



Discrete graphics cards did the work the fastest (537 ms), integrated GPU did the work a little slower but it still fast. In comparison to one-thread mode sorting on CPU, it is tangible acceleration, but to make some conclusion the next test of sorting of one thousand float numbers should be seen.



This test was timed in microseconds because sorting of one thousand values is too fast to time it in milliseconds. So, here we see that one-thread mode is the fastest (43 microseconds). Why is it happening? It is because there is time spent on preparing data for computing on a special device. For example, a lot of time takes compiling and loading code that runs on GPU, also the data loaded from “host” to the main container.

It is believed it is much better to use this library to compute really big datasets. For instance, processing datasets for neural networks, machine learning, etc.

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RENEWABLES

Alexander Dudchenko, Maryna Tsukanova

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Nowadays humanity is dealing with the problem of overusing natural deposits that are used for energy generation and people are persistently looking for new ways of energy creation that can be affordable and eco-friendly. In such a way the scientists drew their attention to renewables.

Alternative (renewable) energy sources are the ones that are repeatedly available and have a minimal influence on the environment. Solar, wind, geothermal, hydro, and nuclear sources are considered to be green, which means that they are unaffectedly replenished. It is the safest way to produce energy without having detrimental consequences on the environment.

Even though green sources of energy are allocated worldwide, location plays a vital role in deciding what resources should be used in a specific area. One of the latest trends in this field is using the energy of photon flux to create clean non-polluting power. In the 21st century, it is a prepossessing opportunity and expected to be increased in usage. The main problems of that type are dependence on weather and

periods of a day and big area occupation. So, not every nation can afford it due to these circumstances.

Another powerful resource of green energy is wind power. Turbines are increasingly used internationally to convert the kinetic energy of the rotation into electricity. It is a totally safe solution, according to the fact that it does not hurt our environment. Countries that use this type of power plant are less dependent on natural resources, like oil. By the way, building and supplying that creates new workplaces and makes the professional circle wider. Like solar plants, wind farms are also a high-priced solution (Renewable energy, 2020).

In 2008 they invested \$51.8 billion in air alternative resources and \$17 billion in biofuel in the world. European countries invested about \$50 billion in renewables, countries of America put in 30 and China did about 15. The next few years were more approximate. As we can see, developed countries, especially G-20, are interested in this kind of technology depending on their territory conditions and circumstances (Energylopedia, 2020).

As a conclusion, we can state that every area can find that class of renewable energy resource that is accessible at that location. Two important things that should be taken into account are the cost of energy production and the choosing of the sources. The price of the chosen energy resources should be reasonable and accessible in the area where it is used. The source or their combination should be determined depending on the weather conditions and time.

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**BEYOND THE LIMIT OF 50 THOUSAND WORDS OR
HOW TO IMPROVE AN ORDINARY PEN**

Artem Girman

Institute of Printing and Publishing

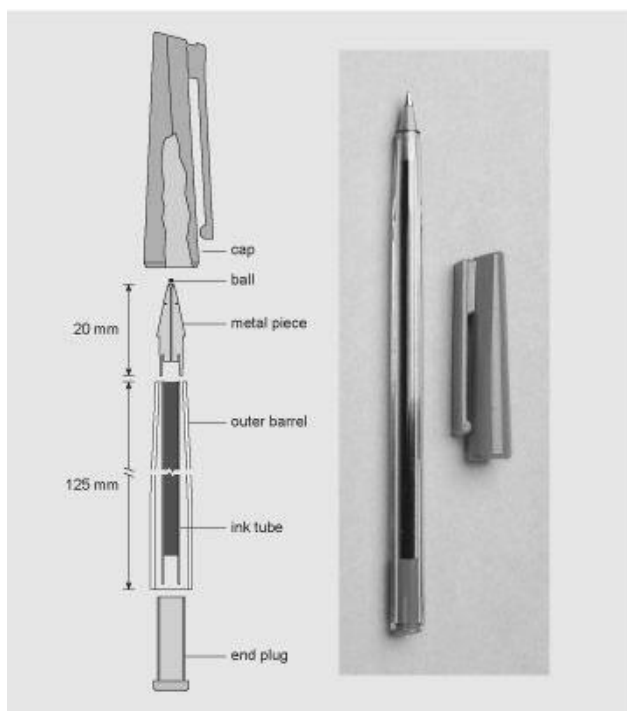
National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The most frequently used writing device is, by far, a pen. Thus it is hard to beat the importance of a stable workflow, be it a creation of a report or jotting down a quick note. What makes a pen write is the presence of a certain writing material (usually paste or liquid). Generally speaking, the construction of a pen can be broken down into several parts: a chamber (refill, ink stick, etc.) filled with a limited quantity of ink, a barrel covering the chamber, and some other additional details (grip for a better touch, cap, blind cap, etc.) depending on a type of a pen. A key implement is a stick whose purpose is to produce a demanded quantity of ink. Then this ink is ground against the paper so that a writer or drawer can create a sample of text or draw an image.

But as was mentioned above, the ink is strictly limited due to a rather small space inside of a chamber. It results in a runout of a writing substance and a pen does not work anymore. It can be fixed either by buying a new identical ink stick, which will act completely the same in the future or by substituting it with some other kind of writing appliance which will last far longer. To achieve this, a writing material should have a specific “drying-resistant” nature or a container itself should be able to release the ink only when a writer needs it instantly to prevent drying. Both goals seem to be hard to fulfill so that construction is not extremely complicated and an initial price is not too high. The problem is, how to provide such conditions enabling a pen to write without any refills for a long-term period of time.

Regardless of the pen’s construction ink is usually stored in a cartridge of stretched shape. To apply the ink to paper a ballpoint is being used, which is designed to be a perfect sphere that can literally grip most any writing surface. This small sphere is made out of brass, which is an alloy of copper and zinc. Its surface is actually composed of over 50,000 polished surfaces and pits. The pits are connected by a series of channels that are continuous throughout the entire sphere. This design allows the ink to be present on both the surface and interior of the ball.

Therefore, ink is being released from the cartridge onto the surface of the ball so that a writer can use it. One of the key ideas is that ink should dry rapidly after applying to paper in order to produce a certain sort of information. To make this possible, ink undergoes penetrating into the paper; due to the contact with air, some quantity of ink evaporates. That is why a pen’s cap should be put on when a customer does not use it – to prevent almost immediate drying.



The ink itself is made to be thick, clean of particles, not to dry too quickly in the reservoir, and yet to dry sufficiently fast on the paper. Inks vary by their main component – there are oil-based (used in ballpoint pens) and water-based (used in rollerball pens) types of ink.

All these pens have something in common – they run out of their writing pigment rather fast and make their owners purchase either a new refill filled with ink or a completely new pen. It occurs mostly due to the construction of a pen, in particular, an ink cartridge; but there is also a commercial reason for this. To deal with such an issue it is possible to act in two different ways: either invent and introduce a completely new writing essence with special capabilities (for example, an ability to produce the demanded quantity of ink by reacting with the environment e.g. air surrounding the ink) or limit and control the release of writing substance so that it is impossible to waste a great deal of it at once. In fact, the second approach has already been used in the mass-production of pens,

but mostly by separate physical details which simply prevent ink from contact with air. The idea stated above pursues a bit different concept though: to regulate the production and release of ink at the place of the cartridge where ink is stored, but not at the level of physical objects comprising a pen.

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SMARTWATCHES AS A WAY TO SAVE YOUR LIFE

Artem Hrechok

Faculty of Informatics and Computer Technologies

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

In today's fast-moving world people tend to draw more and more of their attention to health problems. Latest information technologies have drastically changed the whole sphere of health-caring by implementing the newest developments and increasing the amount and quality of researches. Even though plenty of inventions have been made, most of them are still not affordable for a significant part of the population.

The main task is to find a suitable for the majority of people technology, which can combine both health-caring application and the ability to use it, daily on a regular basis.

Even though smartphones are undoubtedly the most popular devices among the crowd at the moment, there is a quite captivating tendency of smartwatches becoming an indispensable addition to the phone and therefore being even more widespread. So why are they smart and what does it all have to do with our health?

Smartwatch is a multifunctional electronic device worn on a wrist just like a regular watch having, however, many more functions due to its ability to interact with a smartphone. Users can make calls, send messages, receive notifications, and even take photos. Apart from the features listed above smartwatches have the ability to measure the heart rate and make an ECG becoming consequently extremely important for the diagnosis of cardiovascular system pathologies. Of course, it should be understood that users would not receive the most accurate data from such an ECG; however, it will help to determine the signs of atrial fibrillation and thereby inform them of the need to consult a doctor. According to the World Health Organization,

cardiovascular system diseases are one of the main causes of death in the world. Unfortunately, despite the high development of medicine, these diseases have a steady upward trend. Therefore, early diagnosis of possible heart complications is extremely important in clinical medicine and smartwatches to have been already making a great difference. In addition to this, there is also a considerable feature available when the watch understands that the user has fallen thanks to smart algorithms and can automatically call emergency services. Moreover, the device measures noise which prevents users from staying in particularly loud places for a long time. There are plenty of smartwatches that can work as fitness trackers: count the number of steps, distance traveled, running speed, determine the number of calories burned which is certainly important for people who want to lose weight.

All things considered, smartwatches are affordable gadgets that you can undoubtedly benefit from. Provided you still prefer using your smartphone to text and make calls, think about your health as these little wearable devices may even save your life one day.

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ROBOTIC ANIMALS

Artem Karimov

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

A robotic animal is an artificial intelligence machine made in the image of an animal. These unusual machines are created using tiny details of the animal body structure but most importantly they are able to repeat some major features of the animals and it can be extremely useful for nature and society purposes. Some of these unbelievable robots, their appearances, characteristics, and uses will be considered in this work.

The first robotic animal that will be presented is the RoboBee. The main purpose of creating this machine was the development of a small robot capable of flying and landing effectively. The size of RoboBee is not more than an inch and it weighs less than 80 milligrams. This artificial intelligence machine has tiny wings attached to components that react to the voltage being applied to them (Breuer, 2019). Currently, these robots must be connected to a power source in order to work. However, developers are working on giving them their own contained power sources. The researchers on the project believe that the implication of the RoboBees could be

great in agriculture or search and rescue. These bees are able to cross-pollinate plants just like the real ones.

The second artificial intelligence machine that resembles an animal is CRAM Roach. CRAM stands for Compressible Robot with Articulated Mechanisms. This robot fits in the palm of a hand so it is not as small as an actual cockroach. But they have a special feature that the real cockroaches have. These animals seem to fit into any space, no matter how small it is. They are able to squeeze into tight spaces by repositioning their legs further out to their sides which allows them to flatten down to a fraction of their original height (Sanders, 2016). The researchers are planning to make these machines smaller and outfit them with cameras, sensors, and microphones so that in the event of an earthquake or other disaster they can be used to effectively search the debris for survivors. Also, the developers of CRAM Roach hope that their machines can be used to determine which piles of rubble are stable enough so that rescuers are able to safely find survivors.

The next robotic animals that will be presented are Fish and Shark. Fishes are the environmental controllers. The artificial machines in a form of fish float on the water and check its purity. They can determine the degree of water pollution and help to recognize the main sources of pollution. Shark robots are much bigger than Fish robots. In fact, they can weigh up to 45 kilograms. Like the real fishes, these machines use their tails to move and control their movements. Shark robots move in a fishway so that it is hard to distinguish them from the real ones. They can both swim above and dive to depth. These artificial intelligence machines can be used to repair ships and even spy on them as they can reach the enemy ships unnoticed (Sutton, 2019).

The ultimate robotic animal presented in this work is the robot dog called SpotMini. The main aim of its developers was to design the software, the hardware, and the behavior all at one time and all these parts need to cooperate with each other. In their opinion, this combination can create a perfect machine (Raibert, 2017). Using the 3-D printers the parts of this robot were made. All moves of SpotMini are programmed and then are managed by controllers. This machine has already been tested in delivering packages, opening doors, and climbing stairs. It can also walk on 10 inches of snow and resist if a human tries to stop it. Such robots are soon expected to be at homes becoming robotic pets which also help around the house.

In conclusion, some of the impressive robotic animals have been considered in this work. The designs, special features, and purposes of creating these artificial intelligence machines have been described. It was only a tiny part of all robotic animals that exist nowadays. There are different kinds of robotic birds, insects, reptiles, and mammals that are created and are being developed. Although they are not widely used currently, most researchers are absolutely sure that in the near future these machines and other robots will be a huge part of everybody's life.

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WHAT IS KUBERNETES AND HOW IT SOLVES PROBLEMS OF DEPLOYMENT

Hennadii Kochev

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Kubernetes is an easy-to-use open-source (since 2014) platform that gives the ability to control containerized services and makes manipulation and automation much easier. Kubernetes is a free product and it is accessible for everyone.

Let's find out why Kubernetes is so good and useful.

Deployment problem is very old and it appeared when first IT companies needed to run their products so customers could easily access them. Software analytics distinguish three stages of solving this problem.

The most basic form of deployment was to start the application on the physical machine - server. There was no way to set constraints of processor usage or random-access memory consumption so there were a lot of problems with resources dealing. For example, if there is more than one application on a physical server, they will likely use inefficiently given calculating resources, they can even cause server hangs and there comes the constant need of a person who will observe if our precious server didn't break down. Imagine if we need to have more than one server, so how many servers we need - that many people we need to observe them constantly - it is really expensive and not really effective.

Then computer scientists worked hard and created a new solution on how to deploy effectively - they created virtual machines. A virtual machine is an isolated operating system that uses the number of processors and RAM that you assign to it. This solution gave the ability to big companies to reduce the number of physical servers by creating a bunch of virtual machines that run different applications on a single physical server. Virtualization helps to use the physical resources of servers more effectively and isolates applications from each other. But there is a drawback of virtual machines using – every virtual machine needs a separate operating system installation, then if it breaks down, it needs to be rebooted. All of this takes time, and

time is money for every company, and there is no company that wants to lose its money because of long-time reboots and installations.

So, software engineers went forward and invented the term of containerization where the single unit is a container. The container has something common with a virtual machine concept but they have internal properties of isolation and mutual effective usage of operating systems between the applications. That's why containers are considered lightweight and comfortable. They are not connected to basic computer infrastructure and are at a high level of abstraction so they can be easily transmitted between cloud computing services and operating systems at normal computers.

Containers gained popularity because of many advantages, such as:

- comfortability of development integration and delivery to the endpoint
- easy observation in parameters like resource usage
- absolute portability and run ability wherever you want
- flexibility and ease of control which gives the ability to fast understand and solve any problems you face

As you understood, containers are a very good way to connect and start applications. Surrounded by a production environment, you will need to control a big, sometimes an enormous, amount of containers. So, we need a system which will give such ability to control our containers.

Here is where Kubernetes will help us. It gives us an easy-to-use interface for controlling the containers. It helps us to scale the number of nodes on which we have containers with applications that run more efficiently. Kubernetes is on a level of abstraction that removes the concept of dependency hell when some library or binary used by one application, needs to be at a certain version and is simultaneously used by the second application which needs another version of that binary. Without containers, it is very hard to solve such problems of versioning. Moreover, containers give us the ability to version-control them so we can get back to any state of the container it was some time ago.

Kubernetes gives us also such comfortable services like:

- Keeping secrets and keys to important information like passwords safe (Luksa, 2018, p. 375);
- Automatic restart of broken containers and deleting bad containers that refuse to work correctly (Burns, 2019, p. 5);
- Balancing of system resources used to any container you need.

As for me, this is the real future of application deployment. It is really convenient and easily understandable so new developers and operators will happily use containers and tools for controlling them. Containerization and orchestration topics are highly popular now and are under constant development so maybe soon we will be able to see new possibilities of these technologies.

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ELECTROMAGNETIC RADIATION DETECTOR FOR MONITORING THE USE OF MOBILE COMMUNICATION EQUIPMENT

Andrew Komarov

Faculty of Radio Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

The modern world cannot exist without various means of receiving, transmitting, and processing information. We can say that these devices are the basis of the modern world because they provide communication between people, help in training and production. Also, a variety of technical devices that work with information, help in various fields of medicine. The development of information technology is the basis of technological progress in the world. We are used to benefiting only from this, but there is another side to this technical development.

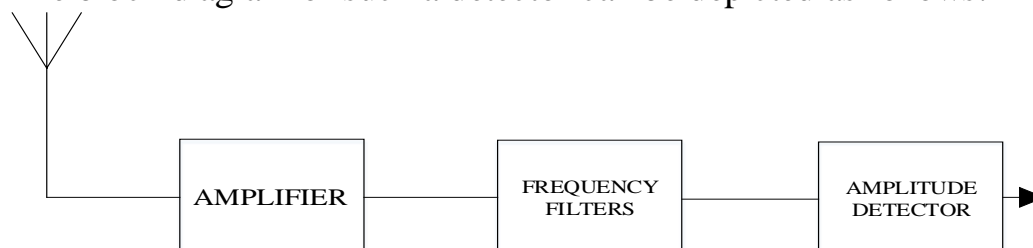
The problem is that in the age of the information society there is a need to control the functioning of mobile means of receiving and transmitting information because their unauthorized use can harm people.

With the development of production technologies aimed at miniaturization of the radio element base of devices, modern means of receiving and transmitting information are constantly being improved and reduced in size. In the future, this trend will not only continue but will grow.

With the current level of development of information technology and the associated positive and negative consequences of their use, it is necessary to design a device to control the use of mobile means of transmission, reception, and processing of information.

Such a device can be called an electromagnetic radiation detector or a radiation detector to monitor the use of mobile communications. The principle of operation of such a detector can be described as follows: at the moment when the communication means enters the active mode, the signal emitted by it is received by the antenna, then amplified. After amplification, the signal goes to special filters, which are tuned to certain frequency bands, then the signal is sent to the amplitude detector, after which a pulse of a certain duration appears and then the already defined signal enters one of the information outputs of the device.

The block diagram of such a detector can be depicted as follows:



Thus, using such a device, you can monitor the use of mobile means of receiving and transmitting information, and in case of unauthorized use of such

means to report it. In the future, there are options to improve such a detector, such as combining it with a metal detector, and so on.

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WIRELESS HEADPHONES

Igor Lishchuk

Faculty of Informatics and Computer Technologies

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays mobile gadgets, as well as accessories for them, are developing with a constant and noticeable progression. Due to modern technologies users have an opportunity to use more practical devices such as wireless charges, wireless keyboards, and mice. However, it has not been a lot of time since wireless headphones showed up on the market. Nevertheless, they immediately became a must-have device and the popularity is only growing each day.

The goal is to figure out if wireless headphones are indeed a better option, what advantages over regular headphones they have, and whether they will be able to become a complete replacement for their wired counterparts.

Since people learned to work with analog and digital signals, it became possible to transmit sound waves without wires. Bluetooth module is used most of the time for these purposes because it is by far the most popular one. It is also available on literally all devices that broadcast sound. The absence of wires makes the headphones not only more convenient to use but also durable since the plug is the most vulnerable point in a wired accessory. There are some other types of wireless earphones as well. Even though infrared headphones are considered to be outdated and inconvenient, they are still suitable for watching TV and are manufactured by companies. An infrared LED source uses high-frequency pulsation to transmit an audio signal which is caught, decoded, and amplified by the receiver in the headphones. The transmitter and the receiver must be in the line of sight from each other in order to work properly. Moreover, the signal reception radius is only a few meters, which is rather disappointing. Ultra High-Frequency headphones, however, provide a significantly larger range of sound compared to their Infrared analogs. UHF headphones are known for their low power consumption and may become a remarkable alternative if your device doesn't come with Bluetooth.

The main advantage of a wireless headset for some users develops into an essential drawback as the sound quality can decrease by several times compared to wired alternatives. In spite of this, drawbacks are definitely overlapped by positive sides. Wireless earbuds help users to feel free to move around untethered from the

phone. There is no need to unwind them and as a result, they can be easily accessed and carried. Furthermore, once your wireless headphones are set up and paired to your device, they will automatically sync the next time they are turned on for use. Some modern devices have a built-in player with a stand-alone battery and its own memory for storing files. This is an excellent option because this system does not require a separate signal source which significantly saves memory and extends the life of the smartphone's battery. While technologies are constantly improving, wireless headphones are becoming better as well. For instance, they are now capable of receiving CD-quality audio and have some relatively new features, such as noise isolation and echo reduction. Active noise cancellation has become a recent trend in this sphere making companies produce earphones equipped with this technology. What is more, the audio quality of wireless headphones does not degrade over time and should stay the same.

To summarize, despite all the disadvantages wireless headphones have, the current tendency suggests that the entire market of audio equipment will be replaced soon by a new splendid technology, which has nothing to do with wires.

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CAN ALIENS CATCH A RADIO SIGNAL FROM EARTH?

Tatiana Lugovets

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institut"

There is a theory that extraterrestrial civilizations can detect our planet if they detect radio waves emanating from it. And they will even be able to listen to songs broadcast on radio stations. Is it really possible, and the question is not whether the aliens will be able to listen to the hits of "Disco 80s", but when it will happen?

The main obstacle on the way of radio waves into space is the earth's atmosphere, or rather its upper part called the ionosphere, which is constantly ionized due to exposure to sunlight. One of the main characteristics of any radio wave is its length. If we could see the radio waves and measure them, we noticed that their length can vary from 1 mm to 100 km. The peculiarity of the ionosphere is that it reflects long waves, but short wavelengths can pass through it (Lukin, 2019).

With the distance traveled, due to the gradual dissipation, their power gradually decreases. Imagine that you have thrown a stone into the quiet surface of the lake: from the stone - the source - circles went in all directions, but the further they diverge, the less noticeable they become. The same happens with radio waves: if you calculate approximately, then two-fold moving away from the source of communication will reduce the power of radio waves by four times (Beskin, 1985). Detecting such radio waves at a distance of several hundred light-years from Earth will be a daunting task for space civilizations. However, even now terrestrial radio telescopes are able to detect the operation of a conventional airfield radar, which is 200 light-years away from us (Gindilis, 2004). It remains to be hoped that the alien technology for receiving radio messages will not be inferior to the terrestrial one.

Theoretically, aliens can record our radio waves created by ordinary cell towers and TV broadcasters, but they are unlikely to be able to extract anything from them other than an incomprehensible "mess" - there is no talk of listening to music and films (Hambartsumyan, 1968). But is there a way to transmit meaningful information over tens of thousands of light years? Perhaps if radio signals were broadcast into space purposefully from powerful radio telescopes, the aliens would have a better chance of catching information from Earth? This is indeed the case, and such one-way communication sessions have already been conducted using long-range space communication antennas (Zaitsev, 2008). These radio messages are united by the METI program, the main idea of which is precisely to send such messages towards "promising" galaxies and stars - that is, those where the existence of life, according to scientists, is theoretically possible.

What do these messages include? Anything you like: information about the Earth and its inhabitants, our society, nature, the animal kingdom, the melodies of the peoples of the world, a description of the coordinates of the solar system in our galaxy, etc. The power of radio signals is really amazing - according to forecasts, one of the already sent radio messages should reach its addressee in 25,000 years. However, most radio messages still have more realistic arrival dates: 2029, 2030 (NASA, 2020). During the entire existence of the METI program, 19 messages were sent into space. In this case, were used optimally for distant space communication lengths of radio waves: from 1 cm to 20 cm.

Humanity entered the radio era only about a hundred years ago and theoretically has already managed to spread radio waves within a radius of 100 light-years. But a distance of 100 light-years on a scale not only of the Universe but even of our galaxy, the Milky Way is nothing. The probability that there are developed civilizations with knowledge of radio engineering in this radius tends to zero. And whether humanity in 100 years will continue to generate radio waves and thereby increase the radius of coverage of space with radio signals to 200 light-years is a big question.

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FACIAL RECOGNITION TECHNOLOGY

Illia Mykhailichenko

Faculty of Informatics and Computer Technology

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

A few decades ago computers were something like big calculators, just an instrument of people. Nowadays it can recognize us just by our faces. We see such technology everywhere: from our phones to security cameras on street. People have a different attitude to it: some say that we can cheat this system using just a photo of a person, others think that this is a way to the digital dictatorship. So, what is facial recognition technology, and what it`s future?

First, people can recognize each other by the shapes of some parts of the face and their mutual arrangement, which vary greatly from person to person. If we can define these parameters, the computer can measure this data and compare it to some others. Analyzing our unique facial structure some software verifies our identity. But we should be sure that the system will not confuse the faces of different people.

So, how does it work? There are various ways, but the main points are similar:

1. Detecting a face on frames from the camera. The simplest way is when a person is looking at the camera and don`t move quickly. It can be problematic in the recognition of people on the street.
2. Marking several dozen key points, located in fixed areas of the face, for example, several points along the edge of the eye. The system counts distance between points, analyzes the shape of the face and its parts.
3. Comparing the relative position of the points with the base. If there is enough close result, the system sets a match between them. Modern databases contain millions of photographs of people with their names.

We can think that such technology is unsafe because someone can print my photo and cheat the system. But this is just a question of incoming parameters. New models can take account of the liveliness of the face tracking facial expression. Others use 3D scanning of the face instead of old 2D systems. It solves most problems with security.

Recently scientists have been using artificial intelligence for acceleration of the process. It can learn to recognize faces and the more it works the better the result. Also, it learns to detect people by part of the face and recognize a person's emotions. That allows using this technology in different spheres, like gaming or applications which change your face on the photo.

Facial recognition is a technology of the future, but we can find it in our smartphones right now. Systems like FaceID on iPhone allow you not to write a password every time you want to unlock the phone or get access to some protected applications like banks and others. It is even more safely because you can forget a password or someone can steal it. Facial recognition can also be used as a payment method or to get access to buildings (homes, offices).

Technological development makes possible using facial recognition on street. Police can monitor the movement of people or look for criminals using cameras. It creates some ethical problems because of giving great power to the government. Also, large data breaches are common nowadays and intruders can steal our personal information. There are some flaws in the security of facial recognition. But our law protects human rights and controls using personal information, so the problem is in trusting the government, not in new technology.

So, facial recognition has great potential in the future, and like most new technologies has some pros and cons of usage. Anyway, it helps to solve a lot of problems and will be used in more and more spheres of our life.

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DATABASE OPTIMIZATION

Valerii Nikitin, Eugene Krylov

Faculty of informatics and computer science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

A database is a special software that provides convenient operations for accessing, managing, storing, and updating data. Databases contain data records or files which contain information about transactions, customer details, or some service data. The amount of these data can be very large and RAM cannot store it. In turn, for the convenience of working with the database using special web applications that allow using the graphical interface to administer the database server, run special commands, as well as work with the content of tables and databases – actions that perform in the absence of a web application using the console.

It is possible to separate databases according to many criteria. All databases are divided into two main types:

- Relational databases;
- NoSQL databases.

Also, databases are:

- Centralised databases;
- Distributed databases;
- Personal databases;
- Operational databases;
- Cloud databases;
- Object-oriented databases;
- Graph databases.

Each type of database has its positive and negative sides. NoSQL databases have great flexibility due to the lack of typing and schema. These databases are best used for small projects or projects that are only at the development stage. For large projects with a well-designed database, it is better to use relational databases because they have high performance. Also, historically, relational databases were the first to emerge, so it's like some kind of unofficial standard. This type of database has a huge community and a number of tutorials.

Why is it necessary to optimize databases? Databases are used in almost all spheres of human activity: from school education to the largest IT companies, from submarines to spaceships. Most of the web resources use databases: to store user information, information about products, and so on. It is hard to imagine various modern technologies such as 5G, the Internet of Things, and cryptocurrencies without databases. The slightest delay in time can lead to undesirable consequences.

So, which ways we have?

1) Proper indexing

The index is a special data structure used to speed up the data searching process. You can create a unique index in separated data columns without overlapping. It gives you a guarantee that two rows with equals keys are absent;

2) Fetching only the needed data

You should avoid queries that take all data from tables. Your queries should be highly detailed and take only needed data. Use the commands * and LIMIT instead of 'SELECT *' for fetching needed data without extra fields. Using this advice you can speed up several times your application;

3) Getting rid of unwanted subqueries

Subqueries are used often, but it is not the best way for solving the problem of data fetching. You should use special database tools. For example, 'JOIN' operator in SQL language for fetching data from different tables;

4) Balanced use of temporary tables

You can improve your database performance using temporary tables. You can store often used data or fetching data. You must be very careful because a lot of temporaries can kill your performance fully. Do it only with performance measurements;

5) Using special tools to find bottlenecks

Special optimizers exist for performance improvement. Such kind of software produces the most optimal execution plan for a SQL statement. Optimizer selects the plan with the lowest cost. Available statistics used to compute cost.

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ARTIFICIAL INTELLIGENCE A PANACEA OR A CURSE?

Yevhenii Orlov

Faculty of Applied Mathematics

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Artificial intelligence, machine learning, NLP? To date, before we know, the sustenance of many industries can't be imagined without its use. Although fiction writers usually represent artificial intelligence as iron, bulky humanoid robots, in reality, artificial intelligence can cover what you want from Web search algorithms to the nearest pharmacy in your home, from service checkout to a stand-alone arm.

Nowadays AI is known under the name specialized, weak AI, because it is programmed to perform a particular isolated assignment (e.g., only face recognition, only browsing the Web, or autonomously control of the vehicle). Although, the main goal for the future is to create a strong artificial intelligence. It is important to note that while a weak AI can surpass people in any particular task, (solving logical puzzles or taking the optimal mathematical solution), a strong one can exceed people in almost all cognitive tasks. Therefore, do we really need it? What are the possible consequences and should it be used? Let's find out today! Despite the pervasive misunderstanding, a vast majority of scientists predict that strong AI is not expected to show human emotions, so that is hardly a reason for it to giving us love or hate. Anyway, AI provides us with a few risqué scenarios, among them:

1. Artificial intelligence is wired for something deteriorating, such as autonomous arms. Unfortunately, it can easily lead to massive genocides. Besides, the AI weapon race could unintentionally cause AI wars, which will also lead to large-scale destruction. To win the war, these AIs would have to be constructed so that it would expect quite difficult just to switch off with one big red button. This can happen even with specialized AI, the higher level of AI intelligence and self-sufficiency – the higher risk, though.

2. Initially programmed for something useful, AI starts developing a crippling pattern of reaching the target. It can be done unless we are able to fully reconcile the AI goals with our own. Whether you ask a completely finished work well AI system to take you to the station ASAP, you might be considered as cargo delivery and moved in roller-coaster way, treated nothing like what you have expected, but rather precisely like what you have asked for. Consequently, AI over developing is not a nuisance, but a competence. Strong "AI" should become an extremely efficient tool at completing the most challenging tasks, though when these goals do not meet ours, we are faced with a challenge...

Advantages of AI: It enhances the bandwidth and efficiency of information by helping people create new possibilities. It means new flows to generate income, savings, and jobs. Artificial intelligence improves users' lifestyle choices with search algorithms that provide targeted information. Health services will be better at diagnosis, as AI carriers can monitor users around the clock. It can help people expand their knowledge in the medical field. Imaging diagnoses of AI can help doctors provide their patients with better treatment. Such technologies could handle any life tasks ranging from data entry and e-mail replies to domestic energy consumption reduction and home security control. Throughout human history, the improvement of technology has led to the rise of the human condition. Think about electricity in homes, in cars. AI has the potential to overshadow them, as machines can help people solve much more tangible and complex social problems. Innovation will prevail and quality of life will improve. All in all, everything depends on the user and his or her point of view. AI and robotics will definitely improve our lifestyle, the way we explore new horizons, whether in space or beneath the ocean surface. According to an age saying, necessity is the basis of all innovation, as in the case of AI. People know what they need and are getting better at identifying their needs, quickly making it a reality. In the nearest future, everything will be even more fast-paced and we will hopefully witness positive changes and astounding innovations. Keep your eye on the ball - the future's now!

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**METHODS OF SOCIAL ENGINEERING AS A POWERFUL WEAPON
AGAINST THE SECURITY OF INFORMATION TECHNOLOGY**

Marharyta Pavliukivska

Institute of Special Communications and Information Protection

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, we cannot imagine information technologies without information security threats. Probably each of us knows the possible types of these threats but we would like to draw your attention to a technology that many people underestimate, namely the technology of human management – social engineering – the science of human behavior and what affects it. In our opinion, this is one of the most dangerous types of fraud. We can protect ourselves from different types of attacks with various security measures; however, no one can be completely protected from threats in which the human factor plays a role. Social engineering is based on human psychology and uses its weaknesses. The scammer's task is to gain the victim's trust and get the information he needs. Thus, while engineers develop technical solutions, social engineers use technologies that influence human behavior, seek out your fears, press on pity, and so on.

Let us talk about some popular types of these attacks. The most commonly used form of social engineering is phishing. This method is not new and well known but nevertheless still effective. In short, this attack is aimed at encouraging people to disclose confidential information. Here are some of the most typical and insidious attacks created by phishing. Some time ago, fraudsters sent e-mails claiming to be letters from the court stating that they should appear in court, and for details on this, click on the attached reinforcement. Those who followed this link were downloading malicious software to obtain passwords and other login information.

There are also simpler methods of social engineering, such as the so-called "road apple". It works more on curious people. The point is that the scammer leaves the media with malicious software (such as a USB-flash drive) in some easily accessible place. There are usually files on the device that the victim will be interested in opening. It is easy to guess what happens after the opening.

After all, how not to fall victim to social engineering. First of all, it must be said that no one can completely avoid it. People are constantly evolving, improving their skills, finding new ideas, and learning from mistakes. We think that in order to improve protection against social engineering, it is necessary to raise awareness about it, share experience and knowledge with your acquaintances and colleagues, and most important not be so naive. The least you can do to protect yourself is DO NOT open emails in the spam folder, suspicious emails, or from unknown people; make regular backups (if the information is damaged, it can be restored), use complex passwords that do not consist of well-known data, etc.

Therefore, social engineering is the best weapon for fraudsters. In the age of information technology, the human factor is still the most vulnerable. In order not to

be misled, we should have an idea of what methods fraudsters use. Hackers are constantly coming up with something new and we need to keep an eye on it.

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RESULTS OF INFORMATION TECHNOLOGY DEVELOPMENT

Victoria Pavlyk

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

The history of Information Technology (IT) began in the early 40s: the first computing machines were built during the second world war. Thereafter, those machines had been developed and improved and, at last, penetrated into all parts of our lives. Nowadays, people cannot imagine managing time, education, entertainment, and communication without computers. Hence, this thesis presents the study of IT influence on humanity and some changes brought by it.

IT and government. The present-day government undergoes digital transformation. It applies top secure methods to protect secret data. This means identifying potential risks early on through bridging any gaps between contracting partners and government agencies and also preventing security liabilities from becoming a problem. Cybersecurity is also improved by moving data and systems to cloud-based platforms which allow retrieving information quickly and easily. Another important process for agencies is giving information to people who need it. It is done without spending workers' time because it is carried out with the help of chatbots and artificial intelligence. It is also appropriate to note that digital transformation is driven by people who need to be qualified in order to provide reliable service. Noting that everything improves really fast, government workers must be the first to receive the latest information and improve their skills.

IT and cybersecurity. Presently, secret data is on the line because of the incredibly high number of mobile devices people use. In response to the growing amount of mobile users, cyberattacks increase every year. In 2005 there were reported 157 data breaches, while in the first half of 2020 – 540 (Clement, 2020). Cybercrime thrives due to attacks that benefit because people use phones for work. These attacks are the reason why big companies lose money.

IT and cloud computing. Cloud computing allows to access information, software, and apps without any installation. The advantages of a cloud server are that it is cheaper than an in-house server; you do not have to worry when the server fails – it will be settled for you; it is guaranteed you will have everything you need; it will always keep you up-to-date. However, the dark side of cloud computing includes not being able to access data on the server over problems with the internet connection or server provider; risking secret information, since it is on the cloud, hackers can steal

it, despite all server's precautions; being forced to continue working with a certain server. Whereas in some cases it is possible to bear damages, it is still a good and really useful tool if used wisely.

IT and cryptocurrency. Nowadays, the best-known cryptocurrency platform is Bitcoin. The most fascinating facts about cryptocurrency are that its creator has vanished and it is the official currency of the micronation between Croatia and Serbia. There are also disappointing facts like a large amount of power is consumed by bitcoin farms and there is a limitation of existing bitcoins – no more than 21 million.

IT and social media. The answer to the question as to why social media are a significant part of people's lives is that they are willing to share precious and entertaining information with others. Social networks impact politics, business, culture, education, careers, etc. It is done by discovering people online with similar interests. These people are powerful together because it does not matter where they are and there are not many things stopping them. Social network users can impact others or be influenced by others. The effect might be both positive and negative. Acknowledging the dependence of social media on the smartphone, it is impossible to overlook this device's value. Many people claim that it frees them and helps save time. But it depends on age: adults aged over 50 save time with the device's help, while adults aged under 30 waste time over smartphones (Silver, & Smith, & Johnson, & Jiang, & Anderson, & Rainie, 2019). Younger people indeed tend to waste time online. The proof of that is activities like online-dating, making friends online, etc.

To sum up, the development of IT has brought positive results and continues pushing humanity towards further progress. However, there are a lot of downsides of progress, which derive from the lack of caution and excess of curiosity. Before introducing a new product, every possible danger must be examined and all actions to prevent failure must be taken.

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RAPID TECHNOLOGY DEVELOPMENT

Arthur Pinchuk

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Technology has changed more in the past 10 years than in the previous 50. Technological progress is becoming faster and faster. Every single day scientists invent something new. Sometimes these inventions are actually quite handy. But there are also pseudo-gadgets, which are only made to scam people.

To my mind, technology has affected the process of my development as a person. My childhood was different from my parents' one. The Internet allowed me to learn English, study much easier, meet people from all around the globe, and let me listen to my favorite music completely free of charge. My smartphone lets me keep in touch with my loved ones even if we are thousands of kilometers apart. In order to know what the weather is like in another country, I don't have to send a post pigeon, I can just check the widget on my laptop screen. My parents could not do that and there are countless reasons why my childhood was much easier than an ordinary childhood 50 years ago. But is that good?

Of course, it is, but it also has many drawbacks. Modern children lack live communication. Computer games and social networks are extremely addictive, thus damage eyesight and still not fully developed posture. Everybody can write off tasks, which are meant to be done at home on one's own and it ruins the concept of homework. These disadvantages make me feel pessimistic for my generation and future ones. I am afraid that in another 50 years people will forget what going out is.

Even though the future is frightening, it is rather important to keep up with the latest technological inventions. If you don't – your grandchildren will struggle to explain something to you, just like we can't explain to our parents and grandparents what the Internet is. In 2020 you can't get a job without having basic computer skills and that is one of the main reasons why most older people are unemployed. Imagine yourself in 50 years reading a paper book and chopping logs of wood to heat your place. You will look like a freak to the people of the future, even though these things are still not that strange to us.

To sum up, technological progress has a lot of advantages and disadvantages. It makes our lives easier, but sometimes it also harms us. Our world can become a paradise or be completely destroyed by us.

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ROBOTICS & CONTROL SAY HELLO TO THE ROBOTS

Andrii Pinchuk

Faculty of Radio Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Robot - a mechanical creature, a product of a combination of automation and conveyor production. They are used in Giga factories, factories, or in our daily lives to perform precise, routine tasks or simply to automate the process. Gradually, they appear in our world and even occupy our jobs. The work can be said to do anything. Unfortunately, we can't do this directly. To do this, we need to use software code and electronic devices to transmit information. Sometimes you have to use their eyes and coordinate system or learn a programming language. Different works usually have different languages, depending on who made them, for what purpose, or just the wishes of the client. The most commonly used are C ++, Python Java, and others. At the moment, you can use USB to transmit information, its variations, or enemies due to a wireless connection, which is quite affordable. You can program from almost any PC, PDA, or another device, you only need to install the appropriate programs. As a result of execution, we get a reliable assistant who is always ready to perform the next task.



Robots on the production line.

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VIRTUAL REALITY

Ihor Ponomarov

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Virtual reality is a technology that puts you in an artificial world through simulation and most often you can interact with objects of the environment via special equipment like controllers, glasses, suits, gloves, rudders.

The development of this technology has reached such a level that game items, phenomena are almost identical to the real ones, as well as added mechanics that remain unrealizable for people like creating items from nothing, invisibility. Also, you can hear sound sources and find their location due to the special system.

The first concept of “virtual reality” appeared in 1987 by the American scientist Lanier. The development of this technology was promoted by the US Government and NASA, it helped to accelerate computer networks, graphics, and modeling for military purposes and scientific.

In 1994 was created the language that helps a lot to make a model of virtual reality without some outdated technologies and to expand application possibilities due to special sensors.

The most common application is video games and 3D movies, you can become a superhero, villain, cowboy, alien while you sitting in a chair, you can feel like you are inside a movie or a cartoon.

There is a wide range for the possible future application and development of virtual technologies. You can plan complex structures and predict their behavior in different conditions. You can visit the Moon without 100 000 dollars. Doctors will be able to travel through the human body looking at problems from the inside.

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RESEARCH OF EXPEDIENCY OF USING OBJECT-RELATIONAL MAPPING DEPENDING ON PROJECT'S SCALE

Vladyslava Rozhkovan

Faculty of informatics and computer science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Object-relational mapping, or ORM for short, is a programming technique, that provides an ability to work with databases at a higher level of abstraction, compared to the structured query language (SQL). ORM allows abstracting from tables, primary and foreign keys, and presents data in the form of object-oriented programming (OOP) structures, operate it as classes, properties, and methods of the classes. It is important to note, that ORM just allows to abstract from working with SQL, not to replace it. That is, that ORM is a layer between the program code and the SQL database. That is not a compulsory part of a program, therefore, determining the appropriateness of its use becomes the task of the developer.

The undeniable advantage of ORM technology is the ability to use the benefits of OOP for working with data. In particular, OOP tools such as inheritance and polymorphism. The creation of subclasses, when it comes to similar entities, which differ only in some fields, and simultaneous accessing to a number of entities significantly reduces the code and provide more convenient support for the program in the future. No less important is the encapsulation, the possibility of using which often becomes a strong argument for the use of ORM technology. By using ORM, we encapsulate a physical storage model. That is, we can use any inheritance pattern and change the structure of the database without changing the code. The transition between database management systems (DBMS) will also require changing only a small part of the code (Microsoft Docs, 2020).

Another well-known advantage of ORM is its safety. ORM libraries use parameterized queries, so they will be screened and secure. Of course, there are exceptions, for example, direct SQL queries that may contain dangerous data. But one exception cannot be compared to the necessity to screen all SQL requests.

Besides, the obvious disadvantage of ORM: loss of productivity, should be mentioned as well. Most ORMs are designed to handle a very wide range of possible data usage scenarios, much wider than is required for most projects. Build-in caching improves the situation. ORM creates a repetitive set of queries and allows to obtain this data by using different sampling technologies. But caching does not always compensate for the resources used by the ORM.

No less important for analyzing the expediency of using ORM is the ability to maintain and update existing code and related databases. As mentioned earlier, ORM technology is quite flexible in relation to different databases. If you need to transfer to another database system, you will not need to use a huge amount of resources. But if we talk about updating the database within one system, the situation becomes radically different. For adding new data, in most cases, you will have to create a new class, rewrite the relationships between the base and derived classes. Instead, using pure SQL, updating data in the database could be done by a few simple commands (M Lorenz, JP Rudolph, G Hesse, M Uflacker, H Plattner, 2017).

Therefore, taking into consideration all the facts above, it is possible to assess the feasibility of using ORM in projects of different scales. Thus, for small and medium-sized projects, and for those, in which high productivity is not the main criterion, the use of ORM technology is most justified. ORM libraries vary, but using any of them will greatly simplify the writing of program code. What could be implemented on your own for more than a month, with the use of ORM can be completed in a week? For large projects, the disadvantages of ORM outweigh its advantages. Here the excessive use of resources is not compensated by the simplicity of code writing. If not writing, then maintaining a huge ORM code is quite a time-consuming process. And, therefore, in such projects, work with databases, by means of the competently written SQL code, will be much more effective.

Of course, these statements are not indisputable true, because there are many aspects, besides the technical ones, that must be considered. For example, using ORM for programs related to the financial sector often can be prohibited, due to the necessity to preserve the integrity of the transmitted data. But this research could be the start point of choosing a further way of data storage and communication with databases.

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OPERATING SYSTEMS IN MODERN TECHNOLOGIES

Maria Rudometova

Institute of Special Communications and Information Protection,

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Everybody has heard about operating systems. However, who knows what are they used in computers for? In my opinion, not many people can answer the question. So, let us get ducks in a row.

The operating system (OS) plays the role of intelligence in a computer. Due to it, all parts of the computer body can interact correctly with each other. Moreover, it also interacts with the environment, in particular, with humans allowing them to communicate effectively with the computer. To make a long story short, the operating system is the next vital thing after computer hardware. Therefore, operating systems look like some interpreters, which translate from machine language to the language familiar to users. The OS consists of a loader, a nucleus, a command processor, Device Drivers, and embedded software.

Thus, the OS of a computer solves such important tasks:

- ensures the functioning of the computer hardware as a whole,
- manages the resources of the processor, RAM, and other system devices;
- interacts with the user, interprets his actions in a language understandable by the computer, and forces it to execute them;
- allows you to adapt your computer to solve a certain range of tasks by installing and managing the operation of appropriate programs.

Microsoft Windows, Apple Mac OS X, and Linux are considered the most popular operating systems for computers. Everyone knows them and uses one of them. For example, I work with Microsoft Windows and Linux. I have never used Mac OS because it is a line of operating systems created by Apple and installed in all new Macintosh or Mac computers. In my opinion, Microsoft Windows is easier than Linux. Though, if look at them from the technical side, Linux is more practical than Microsoft Windows.

In conclusion, we can say that thanks to the operating system now, you can use your computer, and any of your activities is simple and straightforward. Many people do not even know what operating systems do and it is very disappointing because it is one of the most important things on the computer. Everybody can install any operating system on the computer, Microsoft Windows or Linux, and if you use the Apple production technique, Mac OS.

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USAGE OF 3D PRINTING

Oleksandr Rybas

Radio Engineering Faculty

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

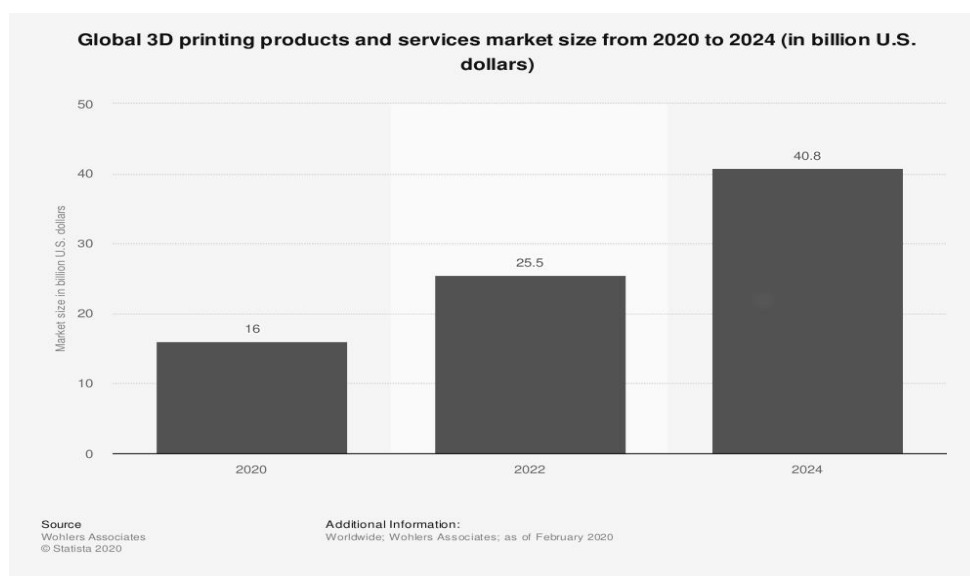
The history of 3D printing began in 1986 with the actual invention of the printer. At that time, it was an innovative device, because no one had ever thought about industrial printing of parts for industry. Despite the first model was pretty big and had a large roughness of the surface on parts, it attracted the interest of many businesses. In the beginning, there were 2 independently developed variants of 3D printing: SLA and SLS technologies.

3D printing, which we use till our days, appeared in 1988 with the introduction of FDM technology, which means applying layer after layer of hot plastic, which made the process of producing printers cheaper, which led to a reduction in prices by more than 30 times. Back then, developers were looking for a self-replicating method of making printers that took much less time and cost.

Over the past few years, 3D technologies have changed the direction of development. Previously, companies wanted to develop the technology itself, but now they are more focused on distributing and optimizing the process of using printers for manufacturing products. According to the developers, this can accelerate the development of 3D printing even more. There is a logic in this: with the widespread use of printers, the number of specialists who will be able to develop this industry will also increase.

Speaking of the future of 3d printing, we can say that this technology has great potential. Nowadays factories produce plastic, metal, glass, and even medical prosthesis. In the future developers planning to create artificial organs, which will be a great jump in medicine. Due to market predictions, this technology has incredible potential in production, and it will spread really fast.

Below is described prognosis of developing power for 3d printing industry:



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THE IMPORTANCE OF TECHNOLOGICAL PROGRESS – VIRTUAL REALITY

Oleksandr Sapozhnyk

Radio Engineering Faculty

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Many of us would like to do some kind of extreme act, but somewhat scary. First of all, we want to test our strength, and thanks to the development of Morton Heilig's we can do it.

But not only this way we can use virtual reality (VR). Also, it serves for:

- Studying: driving test systems, for the case, allow the driver on board the impression of really driving a real vehicle by foreseeing vehicular movement caused by driver input and nourishing back comparing visual, movement, and sound signals to the driver (is simulation-based virtual reality).
- Communication with people: individuals can connect the virtual environment as well as an avatar. One can take part within the three-dimensional emplaced virtual environment in the shape of either a customary avatar. (avatar image-based virtual reality).
- For building: creating a model based on a real environment plays an important role in different virtual reality applications, such as robot route development and construction planes (projector-based virtual reality). And so on (Virtual reality society, 2017). But VR has a number of negative effects on the human.

Virtual reality headsets may be harmful to health with prolonged use and it may abandon this technology. A big part of VR systems has consumer warnings, for example, it may happen: headaches, the problem with the collision of objects, discomfort. Because of these, eyes get tired quickly.

A good example is the well-known popular Japanese company Nintendo, which has received a lot of criticism for the negative physical effects of playing virtual boy (headaches, sickness, vertigo). It happens because the sensation of the body is not synchronized with the vestibular apparatus and perceived information from the eyes.

As 35% of people are facing this problem, companies are looking for certain ways to reduce the likelihood of a virtual disease.

Kline observed in 2005 that virtual reality would be used to create procedures to influence human behavior, interpersonal communication, and cognition (Lawson, 2014).

As a result, we get that the invention of virtual reality brought a solution to many problems and investment in work in many spheres of life. Despite a number of problems, VR continues to develop and seek solutions to negative consequences.

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HYDROGEN ENERGY

Dmytro Shcherbyna

Faculty of Electric Power Engineering and Automatics

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Humanity needs a new energy resource. And perhaps it is water, the most abundant resource on earth, that will help us with this. But how much oil, gas and coal actually remained? According to oil giant British Petroleum’s Statistical Review of World Energy, we should have enough of all of these reserves until around 2070.

What comes next? After all, our generation will already be left without fuel. I believe that we need to use the very resource that is relatively safe and the most common. The total volume of water on the planet is about 1.39 billion cubic kilometers (The needs of 7 billion people, 2020). So, why not turn it into energy?

In fact, electrolysis is a promising technique for obtaining hydrogen from water. This is the process of using electricity to split water into oxygen and hydrogen, the reaction taking place in a device called an electrolyzer.

Electrolyzers are known to range in size from rather small-sized units suitable for small-scale distributed hydrogen production to large central production facilities (Hydrogen Production: Electrolysis).

The concept of “hydrogen energy” appeared in the specialist literature about 60 years ago during the so-called energy crisis. At that time, it became clear what was previously said by specialists about fossil fuel reserves used by the general population in developed countries of the world, namely that the amount of cheap fuels available on Earth is limited (Robinson, 1975), and the rate of their expenditures is so great that it is high time for mankind to think about alternative energy supply systems. In this respect, there are many reasons to speak in favor of using hydrogen as a universal energy carrier, including the following:

1. Water can be a raw material for hydrogen production, and for the production of artificial hydrocarbons we can also use coal, carbon dioxide, or natural carbonates, in other words, the raw material reserves are practically unlimited.

2. When burning hydrogen or hydrogen-based artificial fuels, much less harmful substances are released, and thus significantly lower costs are required for taking environmental protection measures than in the case of the combustion of natural liquid and gaseous fuels, resulting in carbon dioxide and sulfur emissions.

3. The resulting fuels are relatively easy to transport, store, and accumulate.

4. Hydrogen and hydrogen-based artificial fuels, for example, methanol, can be used in existing automobile and aircraft engines with relatively minor alterations.

5. Hydrogen is widely used in modern chemistry, petrochemical industry, and on a smaller scale it also is used in metallurgy, metalworking, food, and other industries, and the demand for it is constantly increasing.

Finally, speaking about hydrogen energy, we should say about how and for what purposes hydrogen is used now and will work in the future. Today, the world production of hydrogen is 40 million tons per year. Of these, 70 percent is used in the chemical industry for the production of ammonia, methanol, caprolactam, and other products, about 25 percent is used in the oil refining and petrochemical processes, and 5-6 percent in metallurgy, food, and other industries.

To sum up, we must not forget that when using such fuel as hydrogen, the world will get rid of the greenhouse effect issues and will reduce the impact of carbon dioxide on humans. This can have a positive influence not only on nature but also on our health. We have to find ways of preventing the emergence of new viruses, weakening of our immunity, and the destruction of life on our planet.

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RECURRENT NEURAL NETWORKS

Mykola Shevchenko, Yuliia Yuzhda

Faculty of informatics and computer technologies

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Recurrent neural networks (RNS) – neural networks (NN) with feedback, thanks to which they have their dynamics, which distinguishes them from static NN, for example, feedforward neural networks. The state of the RNS at the current time is determined not only by the input signals but also by the previous state. Due to this, RNS has infinite memory, which distinguishes them from NN with delays, which remember information about the inputs only for a limited period. Since the RNS is a dynamic system, it is advisable to carry out an analysis of the possibility of attracting the results of the study of dynamical systems in related fields of science, such as physics, the theory of nonlinear dynamical systems, chaos theory, and others, for the synthesis of RNS and solving issues of their training. It should be noted that in this

case the terms "neuron" and "NN" may not be used at all - instead, concepts such as a connected lattice, structure, environment, a finite automaton with memory, cellular automaton. The result of such an analysis will be the identification of promising directions for the development of RNS in terms of their synthesis and training, which is important because of the great potential of RNS noted in many scientific works.

RNS structure is its main characteristic, from which all its properties directly depend. Fully connected RNS and RNS with local connections are distinguished. In a fully connected RNS, each neuron is connected to each. It leads to the subordination of all neurons of the network to someone's global mode. In RNS with local connections, each neuron is connected only with neurons in some neighborhood around it. such links are formed deterministic or random. Local connectivity gives neurons more independence, in different areas RNS can be dominated by different dynamic modes. There are examples of RNN with a changing structure: during the operation of a neural network, it may appear (disappear) neurons and connections. With a small number of elements the RNS structure is a lattice in one-, two- and maximum three-dimensional discrete space. RNS state is characterized by a set of values outputs of her neurons. For math Descriptions of such RNS are used by remote control systems. If the number of elements is large, then from the discrete state space go to continuous, and the RNS structure is a continuously distributed environment. The dynamics of such systems infinite-dimensional in space is described by special wave equations – equations in partial derivatives or integral differential equations.

One of the main properties of RNS as a dynamic system is stability. RNS can be stable (not stable) in small and large. Stability in the large guarantees stability in the entire state space, and stability in the small - only at certain points. Lyapunov's theorems give analytical criteria for the stability of nonlinear systems: for stability in the large, it is necessary to choose a special function that satisfies the conditions of Lyapunov's second theorem; for stability in the small, it is necessary to linearize the system at the equilibrium point and check the stability in it. As a rule, stability in large can be identified only for a small RNS class (for example, Hopfield), and stability in small things testifies only about the behavior of the system at equilibrium points. Therefore, special numerical characteristics allowing to judge the stability of the system by its phase trajectory.

Depending on the stability, there are three main types of RNS dynamics:

- stable dynamics at which in a finite time, RNS converges to a stable state of equilibrium (in mode when the input signal changes possible system transitions from one state to another);
- oscillatory dynamics: state RNS describes a closed cyclic trajectory - limit cycle; with one side, we can assume that the limiting the loop encodes some information and on the other hand, that oscillations occur when this information is transmitted in phase relationships;
- unstable dynamics: trajectories RNS for arbitrarily close initial states diverge over time; if the growth of the state of the system is not limited in any way, then it goes to infinity, otherwise, a chaotic dynamics at which the state of the system spontaneously changes in time within a certain region of the phase space.

It should be noted that there is still, chaotic dynamics, in which changes in the state of the RNS are unpredictable, and from the side of random, the observer's process is stochastic. From the point of view of the physics of the process, the system “withdraws into itself” and reacts poorly to the input signals. In a chaotic mode, the amount of information contained able to RNS, great, but extract this information is difficult. Many laboratories investigate the behavior of dynamic systems in chaotic regimes and options for interpreting these dynamics are proposed. This type of dynamics is unstable in small, but stable in large, and in some cases dynamics can be viewed as oscillatory. Various dynamic modes of RNS can be considered as separate stages of solving a specific problem. For example, a chaotic regime corresponds to the initial search for solutions - the choice between various hypotheses, oscillatory mode reflects switching processes attention from one decision to another, and stable mode corresponds to the found decision.

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THE PROJECT OF FLYING CARS

Yehor Sliusar

Faculty of Electric Power Engineering and Automatics

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

In the XIX-XX century, the first automobile was constructed and since then this area of technology has started to develop rapidly. The first working airplane prototype was completed by the Wright brothers in North Carolina in 1903, and there were a lot of other inventions made over the years. So, what can we expect to see next?

Nowadays, the Japanese technological company SkyDrive made a flight test of a “flying car”, which gives us some hope that in the near future we may not only drive a car or ride through the streets but also we can fly in our own car. On the one hand, I think this is a good idea because you needn’t be afraid of getting stuck in a traffic jam, but on another hand if you are not enough concentrated when you are driving, it may have negative consequences.



Fig. 1. SD-03 model, a flying car developed by SkyDrive.

The machine that completed a flight test is called the SD-03 model, which is an electrical vertical takeoff and landing vehicle (see Fig.1). The total time it was in the air was around four minutes. The SkyDrive company showed its success at the Toyota Test Field, one of the biggest test places in Japan, on August 25, 2020. That was the first flying car shown in Japan at that time (Taylor, 2020).

The pilot can control all of the parameters in the flying car, but the stability of this technology is controlled by the computer.

SkyDrive said: “We position ourselves as an enabler for air mobility, providing location data and building communications infrastructure for flying cars.” They hope to start selling air technology in 2023. The two-seat version of this car will cost about three hundred thousand to five hundred thousand dollars. However, the price is believed to become lower by 2030, because as Prof. Derya Aksaray from the University of Minnesota says each new development costs more in the beginning than later on (Taylor, 2020).

Are autonomous “flying” taxis economically viable at all? That question is not yet fully answered. At first, it will cost a lot of money, but maybe we will have to pay less for fuel because these cars are electrical.

In addition, we can see successful results of flying car tests not only in Japan. The Slovakian KleinVision AirCar was driving on the ground, then took a 7-minute flight into the air, and came back.

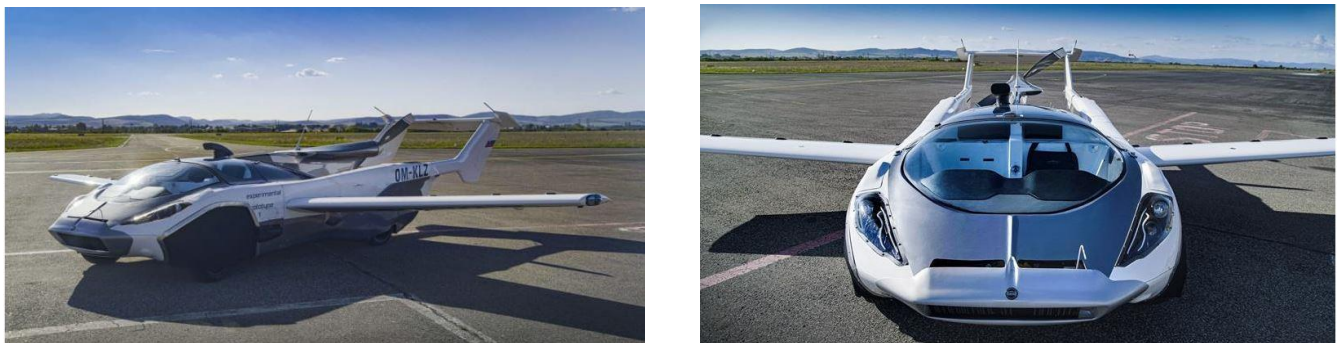


Fig. 2 The front and side view of KleinVision AirCar.

The parameters of this car are as follows: the weight of nearly 1,100 kg, 104 kW 1.6-litre BMW engine, an estimated flying range of 1,000 km, and the maximum cruising speed of around 200 km/h.

It is interesting to note that an extraordinary addition to this aerial technology of the future is a propeller supplied by DM Prop company, and the new feature is the switch that turns the steering wheel into a different type for control when the car is already in the air.

The idea of this construction design had been developed since 2016, and it is really a kind of flying car, while other projects look more like a plane or helicopter (see Fig.2). The AirCar requires a runway of just 300 m to take off, which is less than

that of some other airplanes, and this is a definitely positive quality of this technology. The current maximum payload is 200 kg. The driver and passenger sit side-by-side, and a four-seat version is under development (Morrison, 2020).

The test has been completed successfully and now the 224 kW (300 hp) engine must be patented in the next 6 months or so (Ward, 2020).

Now, we can only wait when all the testing results will be improved and we will be able to drive flying cars by ourselves, but I think we all will need to get practice in air driving schools. This type of school may have been open by the time flying cars become available for everybody. Moreover, if we can help scientists with their tests, it might give us the resulting model of a user-friendly flying car much faster.

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CYBERSECURITY

Denys Sobol

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Security on the Internet is often called “cybersecurity”. What is exactly cybersecurity means?

Cybersecurity refers to the method and continual observation of securing information, networks, and computers from misuse: either by external cyber-attacks or alternative threats. Protected information usually includes contact data, passwords, credit card details (such as account number, date of expiration, CVV code), bank account numbers, passport photos, medical records, and any other non-public data.

Personal information is precious. Hackers and businesses are aware of it. Cybersecurity is quite an intimidating topic, not unlike cryptocurrency and artificial intelligence. It can be quite hard to understand, and, to be honest, it sounds kind of threatening and complicated.

With that being said, there is always remains one big question. How to stay secure on the Internet and do not share your private data with every website that you clicked on? Here I suggest you read and follow some fundamentals of cybersecurity steps.

Install anti-virus software and keep it updated – We have a tendency to call this type of software antivirus, however, it truly protects against all types of malicious software. Ransom software encrypts your data and extorts you to pay for it in order to restore the files. Trojan programs appear to be valid programs, even though behind the scenes they steal your personal information. Bots flip your PC into a soldier in a zombie army, unable to interact in a denial of service attack (also known as DoS), or send spam messages to other people, regardless of the bot's owner commands. An efficient antivirus protects you against these and lots of other forms of malware.

Look into security tools you Install – Many built-in settings and awesome applications help to hide your identity and protect your device, perhaps they only help if you are aware of how to use them properly. Having a clear idea of how the settings that you always skip will protect you can go far beyond really protecting you. For instance, your smartphone definitely has an option to be found in case of loss, and you may didn't even know about it. From another point, did you try to search through those settings and find out how to use it properly, didn't you?

Teach yourself to Two-Factor Authentication - Two-factor authentication (also shortly called "2FA") is really inconvenient, perhaps it completely secures and protects your account. 2FA suggest you passing an extra step of authentication. If personal information in a profile is worthwhile, and the account is allowed to use 2FA, you have to enable it. Gmail, Privat24, and Facebook are some examples of online platforms that provide 2FA. In case you use only a single password for authorization, anyone who obtains it can sign in to your profile. With 2FA turned on, the password alone becomes useless. Most of the password managers' applications allow using 2FA, although such services only ask you to enter a two-factor password when they see you login in from a new gadget or browser. As a consequence, turning on 2FA for your online services and social media is a must-have.

Don't believe the click Bait – the key point of securing your online life is being one step ahead and cautious regarding what you click on. 'Click bait' is not always seen as a miraculous medicine advertisement on a side of a webpage, or a captivating headline on the first pages of a search engine. It may also be messaging notifications, email attachments, and even your friend's stolen Facebook profile. Phishing links are hidden as safe websites, with a goal to trick you, and as a result, stealing your private data. For instance, taking a link that you click to download a file on some new website can source malware that instantly downloads and damage your device. Do not click any links in your emails or SMS, unless they were sent from a person or web resource that you trust or had a chat before. Even after these steps, stay attentive.

A website that you had been to before or a friend's email might be hacked, or a message could be artificially generated and used as a faux.

Create a unique password for every new account – One of the simplest strategies that fraudsters use after they hacked your profile is to apply the combination of your login and password in the most popular social media profiles

and online services. For another example, let's say scammers stole your password from the phishing message that you accidentally clicked. Obviously, they will make an attempt to sign into banking websites or popular e-commerce shop using the same username and password combo they hacked on the first try with the idea that you bought something there and your banking card left attached there. One more powerful technique to prevent such data leaks from the domino effect is to create a distinctive, strong password every time you make a new account.

Briefly to conclude, by following these 5 basics steps of cybersecurity, your privacy level of protection raises by a big percentage. Now, when you might have learned some new information, you became more aware of the ways that hackers use to scam inexperienced users. As long as technology progress grows, the more unique ways and tricks hackers find out to fraud people. Stay safe and be aware of the Web.

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**HIGHLY EFFICIENT WIRELESS ELECTRICITY TRANSMISSION
TECHNOLOGY**

Dmytro Steblyna

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The world is changing. Electronic devices are flooding the market. Now we use wires to charge them. Agree, this is not the most convenient and reliable way. Wireless charging is the solution. A simple concept with incredible market potential. The global wireless charging market exceeded \$ 11 billion in 2019 and is set to grow by 14.5% annually from 2020 to 2026. Existing technologies are capable of transmitting power over a distance of several centimeters, reaching an efficiency of about 80%. But even a slight displacement of a receiver significantly reduces the efficiency. These systems cannot charge devices in motion. Moreover, they use high-frequency electromagnetic radiation. For this reason, there is currently no mass-market solution.

The main task is to develop a technology for highly efficient wireless electricity transmission over a distance of several meters. Also, conduct experiments to measure the effectiveness of the technology, consider possible use cases, analyze the results, and draw conclusions.

After analyzing existing technologies, we



came to the conclusion that magnetic resonance induction is the most perspective. But existing solutions use flat coils, which also have several disadvantages. The main ones are only directional transmission and a few-centimeter transmission distance.

Developing the technology, we took into account all the shortcomings of our competitors. In our technology, we use strongly resonantly coupled hyperbolic coils to transmit power (Fig.1). Such coils and the resonance phenomenon significantly increase the transmission range and efficiency. The use of a different design of antennas and strong resonant coupling made it possible to achieve an energy transfer efficiency rate close to 1 at a distance of several meters. We also calculated that we can use low-frequency electromagnetic waves to transmit power. This will make the technology safer than analogs.

To confirm the effectiveness of the technology, we made antennas with a radius of 10 cm, connected them (Fig.2), and carried out the measurements.

The experiment demonstrates superiority in range, efficiency, and safety over flat and cylindrical coils. Measurements showed that at a distance of 1.84m a frequency generator is loaded equally in the mode of wireless transmission to the load resistance and the mode of operation on the equivalent resistance (Fig.2). On both resistors, we measured a voltage of 100volts. Thus, as

$R(\text{Load})=R(\text{Equivalent})=1000 \text{ Ohm}$, this indicates the equality of currents. The results indicate the equality of power: $P_1 \approx P_2 \approx 10W$. Thus, the efficiency ratio is close to 1.

The use of a different design of antennas and strong resonant coupling made it possible to achieve an energy transfer efficiency rate close to 1 at a distance of about 1.8 meters. And the use of low-frequency electromagnetic waves makes the technology safer than analogs. High amounts of power can be transmitted wirelessly. These factors distinguish the technology from competitors and create new value propositions for the user. In the future, we plan to reduce the thickness of the coils by half, increase the transmission power, and experiment with coils of different sizes, windings, and configurations.

So, the technology will make self-driving electric vehicles and robots completely independent, and automation of production and agricultural industry will increase their productivity. The wireless power potential can be used in medicine, smart homes, and cities as a part of the Internet of Things system. Scenarios of wireless charging technology usage are limited only by the imagination of a manufacturer and the needs of the consumer. The technology can change the way we charge and use any appliance.

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Figure 1. Frequency generator and hyperbolic coils

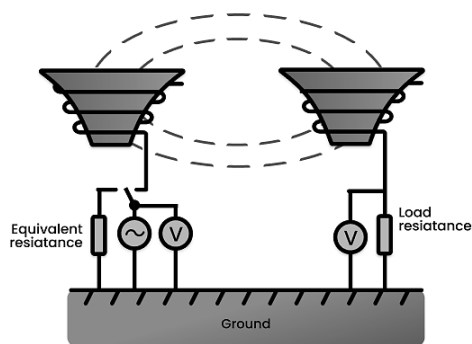


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CONSEQUENCES AND ETHICAL ISSUES OF STRONG AI

Anton Treushchenko

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

With every discussion of AI, there are two problems that always arise: how will it affect humanity, and how should we relate to it? Will enough advanced AI try to eliminate humanity? Or should we give the AI rights and protection in order to avoid manifestations of human cruelty?

In both cases, the main point is that with the creation of real AI, there has to be a technological singularity. Technological singularity is a period of the exponential growth of technologies occurring over a short time interval. The main idea is that AI will be able to improve itself over time or produce more advanced AI. Since this will happen quickly, dramatic changes can happen in one day, and the result will be that an AI is much more advanced than the one that was created by mankind. This could mean that we end up with either a super-intelligent and malicious AI, or an intelligent AI worthy of rights.

Aggressive AI:

- 1) Scientists believe that AI will not destroy humanity because if AI is smart enough to understand and run a scenario that is dangerous to humans, it must be smart enough to know that it is not worth doing.
- 2) Asimov's three laws of robotics can also play a role, although the question remains, will it be possible to implement them in a such way that AI cannot change them? What about the prosperity of the AI itself?

Compassionate AI and its rights:

- 1) If intelligent AI were to emerge, could a human be allowed to simply turn it off? What would be the attitude like towards it? Animal rights are still very controversial, and there is still no agreement on whether animals are conscious, sensible, or intelligent. Apparently, the same controversy will unfold over AI. Would it be slavery to make AI work day and night for the benefit of humanity? Should we pay him for services? What will AI do with its earned salary?
- 2) How can we be sure that an AI comparable to a human, has the same rights as a human? Should this intelligent system be fundamentally different from humans, how can we define the fundamental rights of AI? Also, if we consider AI to be an artificial form of life, do we have the right to take this life away from it (by disabling it)?

In conclusion, as long as AI research continues, these and other ethical issues are sure to be controversial. Apparently, we are still quite far from the moment when they are accepted as appropriate.

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SMART HOUSE – A STEP TO THE FUTURE

Igor Turchaninov

Faculty of Radio Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Would you like your house to clean itself? Or do you sometimes want that coffee machine to make coffee for you without your participation? It is already possible today and is available to almost everyone. All this is possible thanks to the smart home system. Not so long ago they could only dream of such a thing, and science fiction authors wrote about this in their books, but today it has become a reality. A smart home is a system that is able to ensure the safety and comfort of residents while saving all resources of the house.

The main functionality of a smart house includes such systems as:

- Home lighting control
- Microclimate control inside the house
- Room security system
- Household resource management (water, electricity)

Of course, the owner of the house will be notified of all actions of the smart home. The owner of the house independently sets the algorithms and sets only the command. Let's take a closer look at everything. Let's analyze a function as the distribution of resources within the house. A smart home does a much better job of distributing energy throughout the home.

Instead of the usual light bulb, which is installed in the corridor, we will install a LED light bulb and a motion sensor. Now you don't need to turn on and off the light every time when you return home. The movement sensor will do everything for you. The advantage of such a system is that it saves more electricity, and it is easier to use than having a regular light bulb with a switch.

This is just one of the many features you can install in your home. You can also install additional lighting, wall lamps, RGB backlighting, and you could control it all from your smartphone. You could also change the backlight color and contrast using your phone.

Now let's move to other smart home functions, namely smart furniture, and smart appliances control. These are pull-out transformers of a bed, mobile folding shelves, sliding tables, and everything that can come to mind. Such smart furniture has more options to use and looks futuristic. With one touch of a button, the vacuum cleaner robot will clean the entire room, and with another button, the coffee machine prepares delicious coffee.

An automatic ventilation system will supply fresh air into your house. A solar panel on the roof will generate electricity for the entire house. You no longer need to worry about your life and about your valuables inside the house, since the smart house will control everything both inside and outside the house, and, if necessary, can even call the police to your home.

Also, the smart home will take care of your garden and your pet. You no longer have to worry about the fact that your garden will be left unattended, and your pet will remain hungry. Your pet will be taken care of by the house and the automatic feed system.

The only drawback of a smart home that it can be noted that it is an expensive pleasure and that most likely you will have to hire a specialist to install everything in your house. On average, you will have to pay at least 30 thousand hryvnias for all components and for installation. Not everyone can afford such costs.

We can conclude that automatic systems develop every day, and every day our life becomes simpler and easier thanks to modern technologies. Although smart home technology is expensive, it pays for all the costs.

Be on the same page with your new home. Now home coziness and comfort will be the responsibility of your home.

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MODERN INFORMATION TECHNOLOGY

Kateryna Vandysh

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Modern community development characterizes the process of informatization. Informatization of society is a global process in which the peculiarity is the dominance of activities in the field of social production, accumulation, processing, transmission, and use of information based on modern computer technology, as well as on the basis of information exchange.

Today, the development of IT technologies increases the efficiency of social production in all areas of activity.

The ability to search, optimize, process, and exchange certain information open new opportunities, allows you to maximize any process, increase efficiency, and simplify business management, it is now very necessary.

Modern information technologies should be as open and useful as possible for users so that they can search for useful information without additional effort and make any manipulations with it in the future.

But for now, some sources of information are closed. That is, in order to preserve certain data sets, including archives and personal documents.

According to the type of information processed, IT technologies can be divided into:

- Data (languages, special table processors);
- Text (word processors);
- Graphics;
- Knowledge;
- Multimedia.

Most modern technologies can use several types of information processing. For example, text editors have many options for working with graphics, tables, and so on.

However, each method of processing is focused on operations with a certain type of information, therefore, the variety of elements from different industries allows you to create new, modern technologies that are currently used by certain companies and companies.

Analyzing the general understanding of information technology, it can be argued that IT covers all areas of information processing. But in the vast majority of cases, IT is related to computer technology.

Computer technology or Information Technology (IT) is the name of the technology that is responsible for storing, transmitting, processing, protecting, and reproducing information.

The concept of information technologies.

Information technology - scientific, technological, engineering disciplines that aim to cover the study of methods of organizing the work of people involved in the processing of any type of information.

Information technology itself requires very complex training, large and insignificant costs, and high technology (this is not always the case). Their introduction should begin with the creation of the simplest mathematical models, the formation of information flows.

The main principles of modern information technology are:

- interactive mode of work with the personal computer;
- integration with other software products;
- flexibility of the data change process

In general, information technology-specific operations implement the functions of information processing in the organizational structure using computer technology. The purpose of information technology is the formation and use of certain information resources for the needs of users.

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FOREIGN PRACTICE OF USING PIEZOELEMENTS AS ALTERNATIVE SOURCES OF ENERGY

Yaroslav Varvarov

Faculty of Electric Power Engineering and Automatics

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Today, the issue of harnessing alternative energy sources is very relevant and widely discussed. Attention has been increasingly paid to the research of and searches for appropriate areas of application of piezoelectrics as a type of dielectric employed for generating electric current and accumulating and using it subsequently for small scale generation purposes.

Piezoelectrics, or piezoelectric substances, and especially piezoelectric ceramics, have the property that allows electric charges to be induced as the result of the deformation caused by some external mechanical pressure. This effect, which was first noticed in 1880 by the Curie brothers, is called the direct piezoelectric effect. Shortly thereafter, namely in 1881, the inverse piezoelectric effect was revealed, proving that a piezoelectric substance located between two electrodes will change its shape in reaction to the voltage applied (Levkin, 2020).

Theoretical calculations and experiments show that piezoelectric materials that come into action due to the phenomenon of the direct piezoelectric effect can create an environmentally friendly source of electricity. However, the trend of development of methods and ways of using such energy converters is, unfortunately, growing only abroad and at a very slow pace (Tjijtoprodjo, 2005).

Every day people take thousands of steps, and apart from moving their body from point A to point B, it does not bring us anything useful. But when we are walking, we are spending a huge amount of energy, which can be forced to work for us. Thus, foreign scientists are trying to design applications that could take good advantage of it.

For example, the Japanese company East Japan Railway Company decided to use groups of walking visitors as an effective energy generator. Turnstiles with piezoelectric elements were placed at Shibuya station in one of Tokyo's districts, where hundreds of thousands of people pass every day. As passengers approach the turnstile, they step on the piezoelectric elements mounted on the floor, thus feeding the kinetic energy from the pressure of their body (Vieru, 2008).

A team of designers from Guangdong University of Technology (China) developed the Green Pass turnstile whose main feature is complete autonomy. The turnstile receives the energy supplied by people passing through it every day and

feeds it to the machines used for swiping cash cards when buying tickets. As a result, the cost of travel by public transport is reduced as passengers produce the electricity required for turnstile operation. (Mende & Dubrovin, 2016, Chinahush, 2010).

The concept of the Dutch company Boon Edam suggests replacing the standard doors at the entrance to shopping malls, which usually operate on a photocell system and start to rotate on their own, with the doors that visitors will push and thus generate electricity that can be used for various purposes. At the entrance to the Natuurcafé La Port shopping center, located in the Netherlands, there are energy-generating doors that work on this “push effect”. One device of that kind is said to produce up to 4,600kW/h per year, and you can imagine the great prospects of using such doors in all shopping centers around the world (Inhabitat, 2008).

The British company Pavegen Systems Ltd. successfully manufactures and sells unique paving slabs around the world, which generate electricity thanks to pedestrians walking on it. Pavegen Systems Ltd. received its first commercial order to build paving slabs for Europe’s largest shopping mall in Westfield Stratford City, near London. In 2012, during the Summer Olympic Games in London, Pavegen Systems Ltd. slabs had already been installed on several crowded streets, and in a couple of weeks, 20 MJ of electricity were collected, which was enough to power the lighting system of the UK capital’s streets. The company has a contract with the beverage manufacturer Diageo, which already distributes Pavegen slabs worldwide, and five slabs are reported to be able to power street lamps throughout the night. The slab can also send data wirelessly, thanks to the energy of steps, and thus be integrated into smart city systems (Nia et al., 2017, p. 4-5).

In summary, the possibility of using piezoelectric elements as a source of energy is quite promising and it has been already in use in some developed countries. The main advantages of this technology are simplicity and flexibility, and engineers are sure to keep working in this area, making further tests to make it efficient even for larger-scale operations.

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USE OF VERSION CONTROL IN SOFTWARE DEVELOPMENT

Andrii Vlasov

Faculty of Informatics and Computer Science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

The aim of this thesis is to identify and systematize uses for version control systems in the workflow of individual and team projects in software development. Starting with the first lines of product code, general development, project analysis, testing, and inter-team workflow become relevant problems and can be aided with the use of modern version control systems such as Git. This thesis will review the reasons that led to the creation of VCSs, VCS models, a collection of VCS software as well as historical background and broad analysis.

The need for version control in software engineering. In the process of software development, the program code is changed constantly. Sometimes minor changes lead to major unforeseen problems. Then, identifying the problem area can take a lot of time. This raises the question of controlling changes to the program. Also, given the current scale of software engineering, namely, that projects in most cases are developed not by one person, but by a group of people, a number of other problematic situations that are important to consider. For example, when two people wish to add changes to the same part of the project; when someone feels the need to experiment with a new idea, without sabotaging the main project and without having to branch off into a new one. So, the second question is how to design a workflow free of collisions between developers. In both cases, version control systems, or VCSs are used.

As of now, VCSs are in prominent use in software development. Currently, the technology is being further developed to cover more stages of the process. And with their rise in popularity, VCS users are finding new applications for the technology, such as scientific writing and engineering, among others (Mijač, 2015).

Analysis of the functions of version control systems. The version control system can store different versions of the same document, and allows users to navigate through different versions of the project, starting with the very first. When submitting a new version, all the changes to the document, who made them and when, are saved and later available. Traditional version control systems have a centralized model. The system has certain storage and management of this system takes place on the server. The order of the main actions with the VCS:

1. The user working with the file receives the desired version from the repository.

2. A local copy is created on the user's computer.
3. The user makes changes and saves the file, then uploads it to the repository. There, a new version is created, but the old one will not be deleted.

A file can be modified by two or more users. In this situation, one user may accidentally cancel another change. The version control system monitors such as conflict situations and is able to provide solutions. If the changes of two users do not affect each other, the system is able to combine the changes of both users into one resulting file.

Different VCSs allow their users to use multiple functions:

- creating different versions of one file, the so-called branches, which contain the complete history of the changes to the document before branching and the history of each branch separately;
- viewing a complete description of changes to the version of a single document, including who made changes to certain parts of the document and when
- keeping a changelog, which contains user-friendly explanations of these changes in each version of the document
- control of access rights of each user, for example, allowing or forbidding reading or changes of data, depending on the set access.

There are also distributed version control systems. Their main difference from centralized VCSs is that they have a distributed model rather than a traditional client-server model. They do not require a specific repository, since all change history and all versions are stored on the machine in the local repository. Only when necessary, the required parts of the documents are synchronized with a similar repository on another computer. The advantage over centralized systems is that each user works on their local copy and then adds (makes a push) to the centralized storage. But first, they need to download the desired version (make a pull). When there are conflicts in two versions of the document (the one on the other computer and the one on the local computer), resolve them. Distributed VCSs have a number of disadvantages:

- they require more drive space because the local machine will store all versions of documents;
- it is impossible to block or monitor a file or group of files from the workspace;
- there is no single end-to-end numbering of the system.

Advantages of distributed version control systems include:

- no need to allocate one of the computers to the server;
- no general resources need to be allocated when developing a small project;
- throughout the development of a large distributed project, when users can work for a long time on their local version, there is no need for constant Internet connection (Deraman, A., Ngah, A., Zolkipli N. N., 2018).

Software implementations. In this section, the following software implementations will be considered and analyzed:

- Concurrent Versions System (CVS);
- Apache Subversion (SVN);
- Git;
- Mercurial.

CVS first appeared in the 1980s but is still popular to this day. CVS is available to the public under the GNU Open License Agreement. The main function of CVS is to receive and send to the server a certain version of the document. CVS was created to resolve conflicts between versions during development. It is important to note that only the latest version of the project was available to users. This was the first version control system. The main disadvantage was that the user was had to send a new version of his document to the server before another user did. At the moment, this shortcoming has been solved with project branching (CVC, 2019).

SVN was created as an alternative to CVS. It was created to fix the shortcomings of CVS, as well as for backward compatibility. SVN is also a free open-source version control system. SVN is distributed under the Apache license. This VCS began to use atomic operations to preserve the integrity of the database. This means that when creating a new version, either all or none of the changes are applied to the latest modified version of the project. This created protection of the code from accidental and partial edits, which in some cases cause errors. The reason that developers preferred SVN and abandoned CVS is that SVN took the best of CVS and gave them more opportunities. SVN was created primarily for larger projects (Subversion, 2020).

Git was created to control the development of the Linux OS kernel in 2005. This system began to use an approach completely different from CVS and SVN. When creating Git, the goal was to create a faster distributed VCS. Apart from Linux, which it was created for, Git is also useable on MacOS and Windows. It is worth noting that each version contains the entire change history, which is a significant advantage for developers without a constant Internet connection since it allows navigation throughout the history (Chacon S., Straub B., 2014).

Mercurial was released around the same time as Git. And, like Git, Mercurial is a distributed version control system. Mercurial was an alternative when developing modules for the Linux kernel. Mercurial is used less, but many leading developers have preferred to work with this VCS, including OpenOffice.org. The main difference between this system and others is that it is written in Python, not C, except for some extension modules (Mercurial, 2020).

Conclusion. With a growing market in software development VCSs have found wide use in projects of different scales. Currently, they are being optimized to further streamline workflow with newer features and more practical models. Numerous version control systems are in use due to their diverse assortments of features and ways to use in various models of workflow.

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TOP 3 PYTHON FRAMEWORKS FOR WEB DEVELOPMENT

Anton Yablonovskiy

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Python programming language is one of the best web development tools. It is for this reason that there are so many Python web development frameworks out there. My article contains three of the best frameworks for python web development. The listed frameworks satisfy all the needs of modern web service development.

Tornado is the best framework for real-time web services.

- The framework can handle thousands of concurrent persistent connections.
- Tornado is one of the few frameworks that can handle the "10,000 connection problem (C10k)" without any problems.
- Tornado was developed by the FriendFeed development team, which in turn indicates the high quality of the software product.

Django is one of the friendliest frameworks for web development.

- Pinterest, Dropbox, Spotify, The Washington Post are all projects built using Django.
- DRY (don't repeat yourself) is one of the basic principles used to create Django.
- Django handles high-load web applications with dignity. It is successfully used in CRM systems, CMS, communication platforms, room reservation services, document management platforms.

Flask is one of the most concise python frameworks for web development.

- Netflix, Lyft, Reddit, Zillow, MailGun - these projects are based on Flask.
- Flask, unlike other frameworks, allows you to independently implement almost anything (it provides little out of the box).
- The framework uses the Werkzeug toolbox as well as the Jinja2 templating engine.

Conclusion

Python is one of the best programming languages for building web applications. That is why there are a sufficient number of frameworks for each of the tasks.

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RESEARCH PERSPECTIVES FOR CRYPTOCURRENCIES

Vladyslav Yelisevych

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Cryptocurrency is digital money. It means that there really is no physical coin or banknote — it is all on-line. You are able to send cryptocurrency to somebody on-line without any mediator, like a bank, for example. Bitcoin and Ethereum are world-known cryptocurrencies, however, there are new cryptocurrencies that are developed every day.

People may use cryptocurrencies for fast payments or just to avoid bank transaction charges and hide from paying taxes. Some may use cryptocurrencies as a risky investment, hoping that crypto value would sky up in a short period of time. You are able to purchase cryptocurrency with a bank account, or even acquire it with a process called “mining”. Cryptocurrency may be kept in a digital wallet, either on-line, on your PC, or on other specified hardware, such as a Ledger Nano X, which is considered to be one of the best and protected wallets for keeping cryptocurrency.

When cryptocurrency was initially introduced, there was a diversity of early buyers on the Web. As a consequence, a lot of businesses reviewed platforms like Bitcoin as slightly unethical and have reservations concerning any cryptocurrency to be a “bubble”.

Like all cryptocurrencies, bitcoin is presently unregulated. Perhaps, it's a protected payment system, and has some distinct benefits over more accepted forms of payment:

Comparable low fees – Transaction charges are lower with bitcoin than with credit cards, and once a cryptocurrency isn't exchanged, it additionally eliminates the need for bank charges.

Scam reduction – A payment created with bitcoin can't be called back after the fact. This is meant to differ from credit card payments, which can be reversed using refunds, a feature typically exploited by scammers.

Immediate payments – Credit card payments would take days or perhaps weeks to come over. At the same time, cryptocurrency offers instant transfers.

No government limits – Cryptocurrency makes international trade much more accessible by removing barriers and restrictions to trade, in other words making it easier to receive payments in numerous currencies.

Engage new customers – As bitcoin remains a reasonably new method of payment, offering it as a choice for your customers might help you allocate new business.

As cryptocurrency becomes widely spread, businesses may consider keeping a close eye on how this technology develops and appraise how it could be used to their advantage. If you are unfamiliar with blockchain, cryptocurrency and bitcoin, take a glance at the guide below on how bitcoin works.

First of all, you need to install a wallet application onto your PC or a smartphone. This particular wallet will be used to keep your crypto safely and to make transactions to other wallets.

Each wallet has a public key containing 34 letters and numbers that may be shared with a person you want to make a deal with. This key should only be used once you are making the transaction.

Then the wallet requests payer contacts from the other wallet using the public key and the transaction are confirmed by the private key that is encrypted into the wallet. The next step for the transaction is broadcasting to the blockchain network for confirmation and recording a block. Once the transaction is established and recorded in the network it cannot be changed or backed up and becomes an indefinite record.



Nevertheless, here are some main drawbacks of cryptocurrencies:

1. Many people find it difficult to understand - Perhaps the foremost problem when discussing crypto in terms of the numerous possibilities is that it is going to be a troublesome subject to acknowledge. The essential objective of a decentralized financial system that is kept due to blockchain technology may be tough to comprehend unless you are a tech-aware person.
2. You are helpless in case of loss – like each new developing technology, there are always people who are eagerly awaiting to scam inexperienced users, and snatch your hard-earned cash. This has actually verified to be one of the most popular cases with digital currencies, therefore you need to understand all the details of the safety management. Handle your ‘crypto’ just like real cash can get you out of trouble in a lot of situations as you just ought to follow basic security rules as you would with real-life currency. Speaking about people who use cryptocurrency to shop, gamble on-line, or maybe sell something via Bitcoin, they basically have to be as careful as they would with any type of investment. For online casinos, beware of the aged tricks

that may be updated to the digital manner, and do not believe companies that provide silly big bonuses, offers, and odds. In most cases, they will fraud you as soon as the payment will be completed. With a touch of fundamental security rules, you are actually able to lower your chances of getting a loss which may never be refunded.

3. Market volatility - There are many ways that you can use cryptocurrencies, however, most individuals believe that cryptocurrency is a new gold, therefore they use it only for investment purposes, with a hope to get a three-digit return percentage rate. Whereas most of the impatient users are using their digital money in order to buy tickets for sports events, visit an online casino, or even try to purchase a vehicle, but most of them are simply expecting the considerable market volatility to perform towards their expectations. Handle your bitcoins like any other assets that you own will get to conception how to behave yourself appropriately in many stressing situations.

With the COVID-19 Pandemic, it's changing into progressively apparent that there's an area for cryptocurrency in thought, particularly as cryptocurrency is being seen for its ability to overcome poverty and persecution. But, do these pros outweigh the cons?

Any type of investment certainly has its benefits and drawbacks, and cryptocurrency is no exclusion in this regard. So, if you are getting excited to speculate funds in Bitcoin, or any other form of cryptocurrency, the primary point is to ensure that you are going to make an informed decision.

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RESEARCH ON GAME DEVELOPMENT

(INFORMATICS & INFORMATION TECHNOLOGIES)

Yaroslava Yemelianenko

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

At first, you may think that the key element in game development is writing code obviously, so it is a quite boring pastime, but I should say that this process requires

remarkable willpower and creativity. Nevertheless, all the parts of game development couldn't be less interesting.

To be good at game creating you should have not only math or logical skills, but also critical thinking, storytelling and marketing knowledge, and the art of teamwork. Games are complex and if you really want to develop a classy product, you have no choice but to collaborate with other people to bridge the gaps in your knowledge (Marklund, 2019).

The more important thing is that you have to criticize your own and your crewmate's ideas and goals for the benefit of the project. You should be realistic and objective to make a proper plan to move forward (Wu, B., 2019).

The process of game development can boldly be called a circle or iteration. You fail over and over again until you look at all your achievements and the sudden thought struck your head. That is how you learn how to rebound from each situation.

Developing the game, you and your team go through many stages including Idea Generation, Pre-production, Production, Finalising (Stefyn, 2019). These ones differ in team composition, artifacts, and even management approach.

By the way, I should mention that in in-game projects, the situation is fundamentally different from the ordinary IT-projects. Firstly, the main purpose of a game is to bring us such a thing as Fun (unlike IT-projects where we have a certain technical task) (Bycer, 2019). Sounds a bit iffy, doesn't it? Secondly, despite the fact that games grew out of purely programming teams (or rather, even from the hobbies of single programmers), now, in order to make a game, it is necessary to involve a very diverse range of specialists. As the result, the programmers account for an average of 20% of the entire team. So, as I mentioned, communication problems are one of the main features of game teams (Kallist, 2019).

In conclusion, all of us need to work together and it is very difficult. Don't hope that everything will be organized by itself. The basis is informal and horizontal communication. By all available methods, the communication between different specialists should be provoked. The strong leader's task to create a friendly atmosphere in the team. Let's make good games.

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MULTI-AGENT SYSTEMS

Yuliia Yuzhda, Mykola Shevchenko

Faculty of informatics and computer science

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Within the classical hypothesis of fake insights, the arrangement of any issue is diminished to the creation of a few one brilliantly framework, called an agent, which, having at its transfer all the fundamental information, capacities, and computational assets, is able of understanding a certain worldwide problem. In the hypothesis of multi-agent frameworks (the name “multi-agent systems” is additionally frequently found), the inverse rule is taken as a premise. It is accepted that one operator has only a fractional understanding of a worldwide issue, which implies that he can fathom as it were a few portions of the overall problem. In this respect, to fathom a complex issue, it is necessary to form a set of agents and organize viable interaction between them, which is able to make it conceivable to construct a single multi-agent framework. In multi-agent frameworks, the complete extend of assignments is disseminated agreeing to certain rules among all agents, each of which is considered a part of an organization or bunch. Distribution of tasks means assigning to each agent a certain role, the complexity of which is determined based on the capabilities of the agent.

Within the hypothesis of multi-agent frameworks (the name “multi-agent systems” is additionally frequently found), the inverse rule is taken as a premise. It is accepted that one operator has only a fractional understanding of a worldwide issue, which suggests that he can unravel as it were a few portions of the overall problem. In this respect, to illuminate a complex issue, it is necessary to form a set of operators and organize successful interaction between them, which is able to make it conceivable to construct a single multi-agent framework. In multi-agent frameworks, the complete extend of assignments is conveyed concurring to certain rules among all agents, each of which is considered a part of an organization or bunch. Dispersion of errands implies doling out to each agent a certain part, the complexity of which is decided based on the capabilities of the agents.

To organize the errand conveyance handle in multi-agent frameworks, either a disseminated issue understanding framework or decentralized fake insights are made. Within the to begin with adaptation, the method of decay of the worldwide issue and the converse prepare of the composition of the found arrangements are controlled by a single “center”. In this case, a multi-agent framework is outlined entirely from beat to foot, based on the parts characterized for agents and the results of partitioning the worldwide errand into subtasks. Within the case of utilizing decentralized

manufactured insights, the dissemination of errands happens within the handle of interaction between agents and is more unconstrained. This regularly leads to the appearance of resounding, synergistic impacts in multi-agent frameworks.

The innovation of multi-agent frameworks, in spite of the fact that it has more than a decade of history of dynamic improvement, is as of now still in its earliest stages. Dynamic inquire about is underway within the field of hypothetical establishments of formalization of fundamental concepts and components of frameworks, particularly within the field of formalization of mental concepts. The most accomplishments in this portion are not however exceptionally centered on angles of commonsense execution and are still distant from home. In specific, when formalizing mental concepts, all the approaches created in fake insights for working with ineffectively organized concepts, not completely characterized concepts, strategies that are based on likelihood and fluffiness are totally overlooked. This shows up to be an endless, unused, and clean field for the pertinent experts.

Work within the field of multi-agent frameworks, particularly application improvement, requires the inclusion of information and innovation from a number of zones that were already out of the locate of masters in manufactured insights. To begin with, of all, this applies to parallel computing, open dispersed handling innovation, security, and operator mobility. Knowledge is required within the field of organized computer innovations and, in specific, within the field of programming on the Web.

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THE CONCEPT OF ARTIFICIAL INTELLIGENCE IN MODERN TIMES

Valeria Zabilska

The Faculty of Informatics and Computer Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Artificial intelligence is a brand-new field in the huge world of Information technologies. The existence of an AI is giving everyone a big amount of opportunities, along with a large number of questions, because today even the greatest sciences cannot understand what is AI, where to use it properly, and what are

its possibilities. However, there is no doubt that AI is a powerful tool that will make a big difference in the world in the next few years.

The term AI means Artificial Intelligence. First of all, what is Intelligence? To be short, the subject who can think is an intelligent one. For instance, humans, whales, and dogs are intelligent beings. Moving forward, when people started to build machines and use them properly, they thought about what if those machines had intelligent behaviors or could think as we people do? Scientists started digging deeper into computer sciences and came to the conclusion that a connection between a computer and a program is very similar to a connection between the brain and a mind. So, scientists had to build a machine with the ability to learn and to develop. This is where the foundation of AI - machine learning came from.

There are many definitions of Artificial Intelligence, but in simple words, it is software, or a robot, with an ability to learn and process information to solve problems, which are usually being solved by humans. Nowadays, AI is a sub-field of applied science; the way machines will imitate intelligence like humans and become more human-like.

Today the definition of an AI begins to shift from what it was at the beginning. It is happening mostly because of the big variation of goals people trying to achieve with associate AI systems. Three main objectives cause people to invest in AI development:

- building systems that will guess exactly as humans do. It is a so-called “strong AI”;
- simple getting systems to figure while at the same time not defining however human thinking works. It is a so-called “weal AI”;
- using human thinking as a model. But it is not the main goal.

Human beings are becoming smarter stronger by learning other weaknesses and training our bodies and brains. But all humans also have a weakness – we always want more because nothing is enough for us. The ability to learn and improve and the ability to control our biological bodies leads to the most powerful enemy of ours – Artificial Intelligence.

For example, in 2015 Goggle company introduced an Alpha Go – a computer program that could play Japanese chess, that actually in hundred times harder than regular chess. And what do you think? The program defeated the world champion 5 times and left everyone really surprised and probably a little bit scared. But then, in 2017 Google introduced another program called Alpha Go Zero which defeated Alpha Go with an unbelievable score which was 100 wins in a row.

So, just think about what is waiting for mankind in the near future, when the development of an AI will become more widespread, popular, or easier.

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THE ROLE OF COMPUTER SCIENCE IN MEDICINE

Maksym Chernykh

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Computer science has huge applications in the field of medicine. Especially for the analysis of medical data (big data) and diagnostics (biomedical signals). Almost every hospital has computer systems and equipment for analyzing and reading patient data.

The main task is to talk about the application of informatics in the field of medicine, as well as pay attention to the stages of collecting and analyzing patient data.

In medical research large number of data is collected. This data has to be compiled, analyzed, and interpreted. For this purpose, certain statistical methods are applied, these include calculation of standard deviation, standard error, application of tests of statistical significance. Statistical methods take a lot of time and knowledge. Through the use of computer technology, it has become easier to analyze a large amount of data and announce the result.

Diagnostics and data collection performed using special computer equipment. Such as MRI scan (Magnetic resonance imaging), CT (computer tomography).

The next step is to analyze the collected data. Finally, to make the conclusion of the research result.

To sum up, the time for research and analysis of patient data is reduced due to the application of computer science. Computer science is an important tool in the medical field.

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SOCIAL SCIENCES

THE ROLE OF LINGUISTICS IN VIRTUAL COMMUNICATION

Erkka Hakkarainen

West Finland College, Finland

In recent decades, the Internet has turned from a collection of information available in a virtual network into one of the leading factors in the development of society and individuals. It has attracted more and more attention of researchers from different fields of scientific knowledge such as philosophy, political science, sociology, theology, psychology, programming, etc.

According to Crystal (2006), the Internet is a complex, developed communication system that permeates all spheres of personal and institutional human activity. It includes chats, forums, e-mail, virtual game worlds, blogs, live journals, encyclopedias, etc.

Despite the semiotic heterogeneity, the verbal mode remains the main mode of existence of virtual reality, therefore the Internet is one of the most important and most promising objects of linguistic analysis. The study of virtual communication as a special medium of communication allows to significantly expand the range of linguistic problems and to involve additional extralinguistic aspects in the study of such linguistic facts as social, psychological, cultural, didactic, and others. In addition, Internet resources open access to text corpora containing samples of real language use. It allows experts to more sensitively respond to new trends both at the level of individual linguistic units and in the scale of communicative strategies implemented in extended fragments of discourse.

In general, despite the rapid pace of development, linguistics of Internet communication as a separate area of the science of language is located at the intersection of various branches of linguistic and non-linguistic knowledge. It needs further refinement and development of its conceptual apparatus and research methods, as well as more consistent involvement of various facts from different languages. Also, Danet and Herring (2007) suggest that the role of the Internet in the modification of regulated forms of communication in institutional discourse has not been sufficiently studied.

Thus, the relevance of this study is determined by a noticeable increase in the interest of linguists on the Internet as a dynamically developing communicative environment that has significant modifying potential concerning the systemic and functional aspects of the language. The formation of Internet linguistics as a separate area of knowledge about the language requires further development and clarification of its metalanguage and research methods. In connection with the expansion of virtual communication into professional activities, it is also relevant to study the

features of tactical and strategic behavior of participants in various types of institutional Internet communication.

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INFORMATION SECURITY IN MODERN SOCIETY

Olexander Adamenko

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Information security at the present stage of development of society occupies a very important place and is the subject of research for many professionals. In general, information security is understood as a state of protection of information needs of an individual, society, and the state, which ensures their existence and progressive development, regardless of the presence of internal and external information threats. The state of awareness determines the degree of adequacy of the perception of the subjects of the surrounding reality and, as a consequence - the validity of decisions and actions taken.

Modern realities of post-industrial society, due to the significant growth of information, open another area of human life - information. Modern means of communication and information processing have created fundamentally new conditions for human existence, which led to the emergence of a grand project to integrate national information and telecommunications systems into a global information infrastructure. An information system is organized into a single set of subjects and objects of information, communication channels between them, and information means of all possible types, which serves the activities of the society in order to optimize the relevant information processes. A wide network of interconnected information systems of different types and levels has long covered our entire planet, forming a set of information space of mankind (Gordenko, 2017, p. 39).

However, along with the growth of positive processes, this has caused some very serious problems. The main threats to information and psychological security include the possibility of negative consequences for subjects exposed to information and psychological influence, which are expressed in the following forms: harm to human health, blocking at an unconscious level of will, human will, artificial inoculation of her syndrome dependence, loss of ability to political, cultural, moral self-identification, manipulation of public consciousness, destruction of single information and spiritual space. To ensure the confidentiality, integrity, and availability of information, it is necessary to protect information not only from leakage through technical channels and unauthorized access, but also to exclude the possibility of negative impact on information, interference in its processing, and system failure.

The security of automated systems is one of the most important and complex problems in the field of information processing and protection, as the components of automated systems are hardware, software, information processed, communication lines, personnel, and documentation. Thus, the caused damage will be considered not only obvious damage of any separate component of the system but also various leaks of the information, changes of separate physical and logical characteristics of these systems (Dereko, 2015, p. 20).

Sources of threats to information security can be another person, software and hardware, a group of people, a social group or the state, the Internet, the media.

In conclusion, in such a situation a person and society need strong protection, in the role of which should be the state and the individual himself, who should be critical of the information received by him and moderately share information about himself with others, especially using global social networks and other similar systems. It is also necessary to develop areas for improvement of technical software that provides constant deep protection against unauthorized access. It is also important to form certain moral guidelines, a system of values to form a national idea that will help provide comprehensive protection.

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CRIMINAL LIABILITY AS A MODERN PROBLEM OF CRIMINAL LAW IN UKRAINE

Dmitry Afanasyev

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays a very important issue of criminal law is criminal liability, which occupies a very important place among the most discussed issues of our time. The problem of criminal liability is directly related to the law enforcement activities of law enforcement agencies and the judicial system of Ukraine, which in turn ensure the implementation of criminal liability (Andreev, 2013).

The function of developing a wide range of issues related to criminal liability, forms of criminal liability, grounds, and other equally important characteristics is performed by criminal law. Thus, it is a guarantor of the rule of law, constitutional

rights and freedoms of man and citizen promote the effective functioning of criminal law. It should be noted that criminal liability performs a regulatory, preventive, punitive, educational, and restorative function along with other types of legal liability, which is very important for the functioning of legislation in general. A proper and accurate understanding of the specifics of criminal liability will promote effective law enforcement, without error, courts, and law enforcement agencies.

Regular improvement of the domestic law on criminal liability will directly affect the correct application of criminal law.

After conducting a study of such an issue as criminal liability, we can conclude that this issue has always been relevant. During the existence of the institute of criminal responsibility, it has been actively developing, improving, and undergoing changes, but now scientists still have differences in understanding of the institute of criminal responsibility. The content of criminal liability is not only that a person recognized by a court as having committed a socially dangerous act prohibited by criminal law, should be responsible for it by applying to him measures of moral, material, and physical nature, but and that justice be restored, including by compensating in full the moral and material damage caused to individuals and legal entities by acts or omissions recognized by the court as criminal (Golovin, 2012).

The issue of criminal liability and its implementation is the most difficult issue in the theory of criminal law of Ukraine. Due to the multifaceted nature of criminal liability, at present, there is no specific and unambiguous understanding of the essence of criminal liability, but this cannot be considered a reason for the formation of a legislative definition of criminal liability.

All in all, it should be noted that criminal liability is a reaction of the state to a violation of a criminal law prohibition by a person. Its content is the application by the state to the guilty person of the appropriate influence in accordance with the law. Criminal liability performs a regulatory, preventive, punitive, educational, and restorative function.

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***DIFFERENCES OF THE CONSUMER BASKET IN UKRAINE
AND IN THE WORLD***

Marina Andriychuk

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The consumer basket is a set of goods and services needed to meet our priority needs on average per year. Often, this set is used to calculate the subsistence level. The modern consumer basket contains about 300 goods and services. By 2020, the cost of the minimum food basket was 42.1% of the minimum wage. It means that wages in Ukraine have risen more than prices.

The Ukrainian consumer basket consists of a minimum set of products. The consumer basket does not take into account the modern human needs associated with technological, intellectual, informational changes in modern society. Expenses such as the cost of utilities, the cost of treatment and education, the cost of personal development and recreation are insufficient. In Ukraine the composition of the basket is formed by the government, ordering the population that it can be bought for the minimum wage without taking into account the real needs. The calculation of the minimum subsistence level is performed according to an outdated method.

Analysis of foreign experience confirms that one of the important points in the formation of the consumer basket is the approach on the basis of which it is carried out. In other countries, the formation of the consumer basket is based on the results of a population survey that reflects information on what the average consumer spent money on. In developed countries, the composition of the consumer basket is determined according to statistics and the results of population surveys. For example, in the United States, the set included in the basket is determined by Geller's budget - those goods and services that citizens consider necessary for a full life. In this case, food is only 30% of the contents of the basket. For comparison, in Ukraine food products account for almost 50% (Zavora & Romanenko, 2019).

It should be noted that in developed countries, the composition of the consumer basket is more in line with the needs of the population. For example, the consumer basket in the UK includes champagne, beer, acoustic guitar, player, Internet connection costs. In the German basket, there is a digital camera, video camera, scanner, printer, device for measuring blood pressure, it is possible to visit a cafe once a week, as well as order pizza with home delivery. The French put the cost of visiting hairdressers, hairsprays, shower gels, and many other cosmetics, funds for hiring a babysitter, paying for dental services, car rental, taxis, the cost of food for cats and dogs in the consumer basket.

The world is constantly becoming more complex and different. Therefore, the filling of the consumer basket is constantly changing. The more fully the basket reflects the demands of the time, the richer the country. Only Ukrainians do not feel this dynamic and continue to live by the standards of the last century. It is worth

noting that with such low standards that still exist, we are trying to become a European country.

It can be concluded that the main difference between the consumer baskets of Ukraine and other countries is the method of calculating the composition of the consumer basket. In many countries, the composition of the consumer basket is formed on the basis of opinion polls and change almost every year. In Ukraine the composition of the basket is formed by the state, not the people, and therefore, many needs are not taken into account.

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ART THERAPY AND HOW IT WORKS

Darya Belova

Publishing and Printing Institute

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Nowadays, art therapy became popular as one of the methods in psychotherapy, especially among children. It is also used in pedagogy, social work, and even in business. The main aim of art therapy is to stabilize your state of mind and mental health. How it can help? You can express your condition and emotions on a sheet of paper, using different colors and lines. It also has a good influence on children, because it is more interesting for them than usual therapy. Additionally, it's more comfortable and relaxing for patients and doesn't cause stress and anxiety. Moreover, when a person sees that he can create something beautiful, it can improve his self-esteem. People don't need to have special talent to participate in art therapy. It also can help to uncover the internal forces of a person. In group work, it develops important social skills. Art therapy gives people the opportunity to improve their memory, attention, thinking, decision-making skills, and imagination. Sometimes, it's difficult to describe their emotions for some people, so art helps them to explore and understand their feelings and personality. There are many different kinds of art therapy: drawing, music therapy, dance therapy, clay therapy, and many others. Besides, a complex method was developed - art synthesis therapy. It is based on the use of a combination of painting, poetry, drama and theater, rhetoric, and sculpture. Some researches prove that we perceive colors differently and it can even change our mood. For example, blue causes confidence, green is the color of healing, yellow

reminds sunlight. The influence of colors also depends on temperament, on the properties of a person's character.

Art therapy techniques are used for a wide range of problems. It can be crisis conditions, losses, personal conflicts. Many doctors include art therapy as a part of treatment for people, who suffer from such mental diseases as depression, eating disorder, post-traumatic disorder, social phobia, etc. Kendra Cherry in her article "How Art Therapy Is Used to Help People Heal" (2020) stated, "Some research suggests that just the presence of art can play a part in boosting mental health". Professional art therapists say that this kind of therapy helps to develop cognitive and sensorimotor functions, emotional stability, gives insight and social skills (The American Art Therapy Association, 2017). Art therapy can be used not only in hospitals but also in schools, crisis centers, rehabilitation facilities, and private practices.

In the same way, art therapy can be useful for normal people, who have a busy day at work. It can help to avoid emotional burnout. It can develop the work of the right hemisphere of the brain, which responsible for creativity. Consequently, a person can make original and non-standard decisions in complicated situations. Many companies use this method to develop in their employees these skills.

Although the effectiveness of art therapy is not fully explored, many types of research and studies show that it has an influence on people in a positive way: improve mood and mental condition, suppress some symptoms of illnesses. In Ukraine in recent years, there has been a rapid development of psychotherapy. At the same time, psychotherapists active study this and other new methods. Not only specialists but also patients themselves began to show great interest in art therapy (Petrichenko, 2014)

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THE INFLUENCE OF CORRUPTION ON THE DEVELOPMENT OF UKRAINE'S ECONOMY

Daria Bieliaieva

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Corruption has become one of the most acute problems affecting all spheres of Ukraine's activity, and it is one of the reasons for our country's deep economic backwardness from other European ones. Most Ukrainians believe that the main

reason for the development of corruption is that government officials view their positions as a tool for their own benefit.

Spheres of the economy are the sources of "energy" for corruption because here is the largest number of profits. In addition, because of this, officials enter into corrupt connections, that is, the main basis of corruption became the combination of government and business. In general, this illegal activity has a very dangerous impact on the country's economy: occurs a reduction in the effectiveness of the economic policy of the state, encourages small and medium-sized businesses to act illegally, moving to shady policies, destroys the tax system, changes business activities rules, forces entrepreneurs to act with the help of bribes. In addition, the effects of corruption can generate a crisis in the country. The banking and tax system of Ukraine, foreign economic activity, lobby in the legislature, the distribution of budget funds - all these are areas of the economy where corruption schemes are most widespread in Ukraine. Thereby, we can highlight the components that generate corruption in Ukraine:

- 1) the use of official position by individual officials to steal public funds in personal commercial schemes;
- 2) providing benefits, including tax benefits for their commercial structures;
- 3) adoption of legislative acts at the state level for more comfortable working conditions of their own business in certain industries.

As a result, our country has the following:

- 1) small and medium-sized businesses begin to work not transparently: the shadow economy is expanding, the state does not receive taxes which form the state and local budgets;
- 2) absence or violation of competition rules. As a result, some monopolists illegally gain advantages in a particular market segment. And other companies are forced to leave the market forever;
- 3) inefficient use of budget funds - government orders are not received by those who actually need it;
- 4) the consumer suffers from unreasonably inflated prices for goods and services;
- 5) in general, the investment climate is deteriorating, which leads to a steady decline in production and quality of life.

These are the main negative consequences of the impact of corruption on Ukraine's economy.

Every January, Transparency International publishes "the Corruption Perceptions Index", which assesses the extent how much the countries of the world are ready to oppose corruption to their own officials. In 2019, Ukraine scored 30 points out of 100, which is 2 points less than in 2018, thus entering the group of "countries that take measures against corruption". Experts believe that the reason for this dynamic is the beginning of the transition phase associated with the change of power, as well as the cessation of active reforms and the fight against corruption. Compared to its neighbors, Ukraine is ahead of Russia (28 points), among the leaders - Poland (58 points) and Slovakia (50 points). Belarus has 66 points, while Romania, Hungary, and Moldova decreased by 3, 2, and 1 points respectively. Together with

Kyrgyzstan, Azerbaijan, and Djibouti, we rank 126th out of 180 countries (Transparency International, 2020)

Thus, the fight against corruption is one of the main problems of Ukrainian society. Many factors affect the fight against corruption, first of all, the implementation of certain government actions: the formation of effective anti-corruption policy, judicial reform, simplification of business conditions, ensuring the legality of the use of budget funds (LIHA: ZAKON, 2018).

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THE USE OF ENGLISH IN THE UKRAINIAN MARKETING

Ann Chizhova

Institute for Applied System Analysis

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Unlike the times of the USSR, now the choice of any product on the market is enormous, and therefore the competition between manufacturers is becoming tougher. And only marketing does help firms to understand better the needs of potential consumers and make them buy their product. And since marketing originated in English-speaking countries, all terms are in English.

The aim of the work is to study the reasons for the greater success of Ukrainian companies with foreign names over Ukrainian names, provided that they offer the same goods or services. The use of words of English origin in Ukrainian marketing (terms).

Here is the definition of marketing given by the American Marketing Association: "Marketing is the process of planning and implementing the development, pricing, promotion and distribution of ideas, goods and services for creating exchange situations that meet the goals of people and organizations".

Filipp Kotler (1999) stated that the main function of marketing is to "meet the needs of people through the exchange". And one more important term is hanging labels which refer to a technique that combines all attempts to give a person a more or less positive characterization.

I'd like to explain the reasons for appearing English named companies in the Ukrainian market. First of them is the trust of consumers. Unfortunately, in our country, people trust more foreign producers than domestic ones. That is why our manufacturers usually call themselves in English. Subconsciously, a person who has a choice to buy goods named in English or with a Ukrainian name in 80% will choose a "European product". This is mostly related to light industry goods. And the second

reason is the desire to have something they don't have, a desire for the best (after all, they are sure that in other countries everything is the best). In the course of the study, we defined and analyzed the most famous and successful Ukrainian companies. It's stated that the 5 most successful companies are English-named. We took these data into account when conducting an experiment. It's stated that this caused by more facilities to enter the world market. The reason for this conclusion is the wish of companies to expand into the world market.

What do you think is the purpose of all the companies that created in Ukraine? This is certainly the recognition, respect, and love of Ukrainians, but in reality, they all seek to enter the world market, since under such conditions the number of potential buyers increases by a thousand times. And since 1/7 of the population of our planet communicates in English, then firms with such names will be more likely to be popular with foreigners.

To sum up, the English language is one of the powerful instruments in Ukrainian marketing, which is mostly used for light industry goods.

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**THE CYCLICAL NATURE OF HISTORY AS A WAY TO ANALYZE THE
FUTURE**

Konstantin Dmitrienko

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays many scholars consider the issue in the context of cyclical history. This question is still relevant, and the search for an answer continues. It is necessary to reveal some aspects of this multifaceted issue and give us an example a few concepts of the cyclical nature of our universe.

It is no secret that even in the ancient world, people thought that everything in our world is cyclical. This arose even before the creation of science itself as history. This can be seen in religion and philosophy. An example of this can be Ancient Egypt or Ancient Greece, where you can see the philosophical concepts of the cyclical nature of everything.

It is needed to highlight religion as one of the foundations of this theory. Indeed, in some modern religions, you can see objects of cyclicity or the end of the world ("Day of Brahma", "Universal sweat"). The Inca calendars predicted many interesting events and it was very interesting the prediction of the end of the world in 2012. But in the modern world, it is quite difficult to single out a separate thought on religion, the number of different scriptures and the ramification in certain issues is so huge that it is difficult to understand them with one mind.

It is necessary to highlight another concept, where the main vector of the cycles of all mankind was the person himself. In historical chronology, one can observe the birth of great empires that conquered countless peoples. Some of these states existed for about a thousand years (the Roman Empire, Byzantium, various dynasties in China). Others ceased to exist after the death of the ruler (Empire of Timur, Mongol Empire). But each of the empires had its own decline. And the fall of this or that state can also be designated as the end of the cycle.

This concept is promoted by such a scientist as Arnold Toynbee. Thanks to this, the history of any civilization can be divided into 4 stages: origin, development, flourishing, and extinction. This idea is criticized by many other scientists, but in my opinion, it is the most probable and realistic. Examples of this would be the fall of Western Rome. After all, this event divides the world into two different eras: Antiquity and "Dark" Ages. A similar event will occur 1000 years later, in a different era. The fall of Constantinople-1453 is considered the beginning of the New Age (Renaissance). It can be noted that any state is obliged to go through these stages. But this will not mean the complete destruction of a people or culture. We can cite the history of China - the constant change of dynasties and the theory of the Heavenly Mandate, which is relevant even in the current Celestial Empire. And here, too, the theory is perfectly supported by religion and its concept, namely Confucianism. Thanks to her, the very term mandate and cycle change were introduced in the bureaucracy and other aspects of Chinese life (Is human history ..., 2015).

In conclusion, the concepts of the cyclical nature of history are a very interesting topic. Thanks to the analysis of the past, one can predict the future, find a way out of the problem, isolate the main factors of the situation, and effectively solve it. The theory of Arnold Toynbee one of the most plausible in this aspect. It can be perfectly proven by many historical examples and by the very cycle of these events. It is incredible that humanity is missing the lessons of the past and making mistakes from the past. But it is also not necessary to perceive the concept of cyclicity as the ultimate truth, because it is almost impossible to draw complete analogies. Each event has its own unique characteristics and factors, each religion is built on different concepts of happiness. Historians can only build on this and build a foundation.

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THE RIGHT TO A STANDARD OF LIVING IN UKRAINE

Yulia Dovgan

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The right to a decent standard of living is one of the basic social human rights, which guarantees a person the satisfaction of all his basic needs and promotes its

development. The level of security and implementation of this right depends on the economic level of the state and its resources. In the world, this right is one of the basic, and its implementation is supported by the entire world community. The main problem of ensuring this right is the insufficient economic development of our state, so the economic component plays a very important role in the mechanism of ensuring the right to a decent standard of living. Through reforms, the state should improve financial performance and promote a decent standard of living for the working population and a sufficient standard of living for all others, because the establishment of such a minimum wage as 5,000 hryvnias cannot ensure the realization of this right.

In our state, a large number of poor people cannot provide themselves with basic goods for normal existence. More than 10 million people in Ukraine still live below the poverty line. The problem of poverty and population decline outside the country is a topical issue for the entire international community.

In different countries of the world, World Bank experts use an absolute figure that takes into account the consumption of one person absolutely necessary goods for the survival of the individual at \$ 5. US per day (for Central and Eastern Europe and the CIS), on the basis of purchasing power parity, respectively, as a measure of poverty (Khomiak, 2014, p. 146-147).

The state establishes support for its citizens in the form of meager wages and social benefits, which refers people to those living below the poverty line. At present, due to economic problems, Ukraine cannot provide a decent life for every citizen.

A big problem in our country is the affiliation of the working population to the poor because again the minimum wage is less than \$ 150 or slightly higher. A citizen works and should receive a decent salary but the state cannot guarantee this. If the state provides a sufficient standard of living, then the issue of protecting the population from poverty is not on the agenda.

Having examined the issue of the right to a decent standard of living, a significant problem is that the legislation does not establish the concept of a "sufficient standard of living". A decent standard of living is a standard of living for citizens when all its needs are sufficiently met and thanks to this standard of living it can realize itself in various spheres.

The basis for the realization of this right is sustainable economic development, which will contribute to the creation of opportunities and conditions for a dignified life for citizens. Components of economic policy such as tax increases will not contribute to the development of small and medium-sized businesses. The state must create a more liberal economic model that can fill the budget with taxes in full, and the more citizens will start a business, the less the state will pay aid and support it. In the future, there may be an opportunity to pay unconditional income to our citizens.

The state does not fully cope with the realization of the right to a decent standard of living because the majority of Ukraine's population is poor and the state does not contribute enough to achieve this level.

The issue of improving the regulatory framework and adapting to the new criteria for forming a decent standard of living deserves special attention, namely the Law of Ukraine "On the subsistence level", in our opinion, certainly needs updating.

As a result, if we increase the subsistence level for citizens, it will provide a partially decent standard of living for Ukrainians.

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**THE IMPACT OF MARKETING STRATEGY ON BUSINESS
PERFORMANCE**

Vladislava Druz

Faculty of Sociology and Law

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

The study and practice of marketing have broadened considerably, from an emphasis on marketing as a functional management issue to a wider focus on the strategic role of marketing in overall corporate strategy (e.g., Kotler, 2000; Sudharshan, 1995)

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The study and practice of marketing have broadened considerably, from an emphasis on marketing as a functional management issue to a wider focus on the strategic role of marketing in overall corporate strategy (e.g., Kotler, 2000; Sudharshan, 1995)

Nowadays marketing is an essential aspect for numerous companies due to the highly competitive environment. It is a powerful instrument for businesses that give them an opportunity to boost the demand and ensure high profits in any case. The study and practice of marketing have broadened considerably, from an emphasis on marketing as a functional management issue to a wider focus on the strategic role of marketing in overall corporate strategy (Kotler & Keller, 2009).

There is a well-known fact that not all the products on the market are of high quality and acceptable for people. It depends on the raw materials, manufacturing process, and definitely people that are involved in it. There are a lot of cases when companies try to save on quality and set high prices at the same time. In order to operate successfully on the market, they have large marketing costs. They include advertising, market research, campaigning, and other activities and are mostly aimed at product promotion.

In the Ukrainian market and globally we can find lots of examples of successful marketing for not good products. Firstly, it relates to tobacco products which seriously harm people's health, in particular the youth. However, the advertising of large tobacco companies such as British American Tobacco, Philipp Morris International is aimed mostly at people aged 18-30. Therefore, such goods as

vapor, tobacco heating products became an increasing trend among young people. Although these companies guarantee that these products deliver reduced risks, they are not less harmful than simple cigarettes and are addictive.

Nowadays, it is really hard to notice for some people that such things as bright advertising, beautiful packaging relate to products of bad quality. For instance, there are a lot of promising statements from shampoo manufacturers that only their products can nourish, restore damaged hair. However, their usage can make the situation even worse. The same goes for other low-quality cosmetics that can damage people's skin and hair.

To sum up, it is crucial to understand that good marketing is not an equally good product. People should critically think while they are buying something and always look at the composition of the product. They should not blindly trust the products that are actively promoted with different marketing instruments.

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LEGAL REGULATION OF ELECTRONIC MEDIA

Alina Dyakina

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Today, the Internet has become an integral part of our lives, as we use it every day to transmit or receive information. In fact, information becomes the main value today, and the Internet, more electronic mass - media is a kind of tool for spreading information and acceptance.

The Internet is already a part of life because it opens up a lot of opportunities, and it connects a large number of people with each other, regardless of borders and distance, this is how communication on the Internet develops every day. After such an impact on people, Internet media start to fade into the background because of their social networks ahead and win, because they have contact with the back of the audience, which is not in the media. Social networks listen to the public and exchange world opinions due to certain comments, opinions, and wishes. Social networks are not just a common tool in the world of the Internet, but a separate structure that needs to be legalized.

Media is used worldwide as a synonym for media and communication. These include all types of media: print media, television, radio, and computer systems, that is the Internet, and in particular social networks. Multimedia is a special computer technology that combines both traditional static visual information and dynamic (Chalabieva, 2019).

Having defined what media is, we can now explain what social media is. Thus, social media are the same media, but they are distributed through the Internet, and with the help of different Internet services solve different human problems and needs.

The media also uses social media to more effectively display information. Therefore, there is such a thing as the Internet - the media, which refers to the system of electronic media. It plays an important role because the special channel of media communication is the so-called organization - a legal entity that has a large audience.

All the news that takes place in the state, all the important issues are in this organization and therefore everyone, every citizen, has access to the necessary important information. Also, this channel is a full-fledged public resource and, therefore, an integral part of the constitutional state. Absolutely everyone, both legal entities, and individuals, and public authorities use the media in their own activities.

Despite the fact that social networks are a special type of electronic media, and everyone in the country uses it, the issue of constitutional and legal regulation of Internet media is still unresolved. A unified apparatus could regulate the activities of the entire media system. And without this regulation, without the constitutional and legal status of electronic media, their activities cannot be regulated, and thus it is impossible to guarantee their safety.

In conclusion, we need to address this issue and regulate the media system or make social networks a subspecies of Internet media. This will be a significant step towards the "e-state".

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THE LEVEL OF PRESS FREEDOM AS AN INDICATOR

DEVELOPMENT OF DEMOCRACY

Bogdan Gavrilovskiy

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Outlining the situation with press freedom in Ukraine, we can turn to foreign studies that have shown that Ukraine is a country with partially free media. The structure of the press consists of four main elements.

The first element is the economic aspect – economic independence. In this regard, there are three types of media: private, public, state-owned. All these types differ in the methods of financing and owners. State-owned media are state-owned and maintained at public expense, so this may reduce their competitiveness. While private ones depend on advertising and various donations, the main disadvantage is the dependence on advertisers. Finally, the public receives funding from taxes and is controlled by the top of the public council. In Ukraine, the largest number of private media outlets are subordinated to groups of wealthy people, in turn, this group of people makes the most of the potential of the media in their own interests. The media

that reach the largest number of readers have the opportunity to impose their "rules of the game" (Pidkurkova, 2019).

Despite the country's economic situation, Ukraine has the most progressive regulation of rights among the eastern parts of Europe, although legal guarantees are not always implemented. Thanks to such a legal framework, Ukraine today has such a large number of information sources from which each citizen can choose which one he likes or with which he has one point of view.

If to speak about the legal protection of journalistic activity it must be noted that although Ukrainian legislation enshrines provisions for the protection of journalists after Euromaidan and the start of the war in the east, Ukraine has become one of the most dangerous countries for journalists. Various organizations investigating this problem have found that in Ukraine there have been various cases of restriction of journalistic activity.

Finally, let us consider the political aspect. The most important indicator of freedom of speech is the presence or absence of censorship. Article 15 of the Constitution prohibits censorship. However, at the same time, freedom of speech may be restricted for reasons of national security or in the public interest. An example is Russia's propaganda, which has led to the cessation of broadcasting by some media outlets.

In a conclusion, everybody should understand that freedom of speech is an indicator of the development of democracy in the country.

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PERSONAL CHARACTERISTICS OF THE LEGAL PROFESSION

Grechko Yaroslava

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The legal profession involves a number of important personal and professional qualities. The development and implementation of these qualities in practice is a complex and long process, so it is important to educate them all their lives.

Professionalism is a fundamental characteristic of the formation of a lawyer, as it includes the following components:

- professional training;
- socio-psychological preparedness;
- personal control (self-organization, self-analysis, self-control);
- psychological and professional maturity of a lawyer.

The psychological practice of the legal profession is strongly related to the issues of motivation, purposefulness, and productivity.

Motivation is a process that causes the activity of the individual and determines its orientation towards the future profession. It can be personal (self-awareness, and the formation of goals in accordance with their will) and external (depending on specific social phenomena).

Purposefulness is the desire of a person to achieve a goal. The professional orientation of a lawyer is usually realized through the establishment of justice and action in the interests of the law.

The lawyer's activity is marked by a special cognitive nature, which consists of constructive (mental activity aimed at planning and understanding) and organizational (practical implementation of constructive, ie the transfer, exchange of information, and organization of the implementation of plans).

Emotional state (psychological culture) is the development of mental personal qualities, called the so-called "cold mind", it is very important in the legal profession to stay on the side of the law, not personal impressions. To be able to find contact with a person without excessive emotionality. As the profession is directly related to surprises, the psychology of a lawyer (and its constant improvement) guarantees a certain adaptation and quick response (Marshalok, 2013).

In conclusion, the main components of the personality of the legal profession are competence (with motivation and determination), psychological maturity, and purity of mind (taking into account both personal values and compliance with the law). In general, the work of a lawyer is characterized by high demands and expectations (both from the individual and from the public side).

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21ST CENTURY EDUCATION: HOW TO LEARN LANGUAGE WITHOUT LEAVING HOME

Oleksandra Harnyk

Institute of Printing and Publishing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Each of us sooner or later faces one question in his life: "How to learn a foreign language?" Someone opens YouTube, someone starts Google, and someone calls an old acquaintance who knows a foreign language very well. But there is something that unites all these people into two groups: those who find courses or hire a tutor and those who start learning the language on their own. And yet, both of them

can study without going leaving their own apartment or house. In 2020, as never before, homeschooling is as relevant as possible. Due to the epidemic, we have much more time and opportunities for self-development.

So if you have a desire to learn a foreign language, then first decide on a goal. Think about why you want to learn a language: for traveling, for work, or to marry a foreigner. It is important to understand why you need so that you can create a training program based on your needs to focus on the right aspects, to promote motivation. Without a good reason, it is difficult to stay motivated in such a long process as learning a language, so it is desirable to find some personal reason.

The second step is to determine your level of knowledge of a foreign language. This can be easily done on the Internet. Now many sites will take only a little of your time for a short test which will determine your knowledge level.

If you decided to practice on Skype or Zoom, then your teacher will be the one who chooses which plan will you follow the studying. But if you still overcame yourself and decided to learn the language by yourself, you will need to make a clear plan of action. You need to set the period of time for which you want to learn the language and what you want to achieve in language learning, schedule your classes, and strictly follow this plan. It is important to turn a skill into a habit, so regular classes and discipline are your best friends.

Despite the above tips, there are a few things that can help you to learn a foreign language. The first thing I would like to talk about is immersion. You have probably heard many times that it is better to learn a language in a country of native speakers. But what if you can't go to France to study French or to China to study Chinese? You need to fill your home with an atmosphere of the language you are learning. Watch movies (initially with subtitles), read books, listen to music in the language you are learning. Find friends who will teach you something new and give you some practice. Now it is even possible to communicate in person with a native speaker. The main thing is the presence of desire and the Internet.

A good way to expand your vocabulary can be a "daily limit". Set a goal, for example, to learn 20 new words every day. You can use a variety of stickers on which you write words in a foreign language on the one side, and on the other - a translation. You stick these papers all over the apartment and you will involuntarily look at them and memorize new words. In addition, if you often pick up the phone, some programs display different words on the lock screen. It can also help expand your vocabulary.

There is also a technique of visualization and rapid language learning from Timothy Ferris. Here are some theses he advises to follow:

- The basis of any language is letters and sounds. Therefore, try to listen to what you hear and copy the pronunciation. Learn the basic combinations of letters and the sounds they convey. Remember how these sounds are conveyed in writing. So you can do the opposite process - transfer what you see and hear, even if at first it will be the most elementary things.

- If you are looking for the meaning of a word on the Internet, do not use the usual translator, but search by pictures. So a visual chain will form in your head and

the meaning will immediately be linked to the image, which will contribute to better memorization.

- Fluency in a language is not the knowledge of absolutely any word. There is nothing wrong with the fact that you cannot remember what the word “umbrella” is in English. The main thing is to be able to say that you need "that thing with which you can not get wet in the rain." Don't be a perfectionist by trying to learn as many words as possible. In real life and conversation, most of them will never be useful to you.

The main thing is to know that you can learn a new language at any age. It doesn't matter how old you are, but how much you want to learn something new and improve yourself. Learning for results is never easy, so you should stubbornly go to your goal. And remember, learning is the eye of the mind.

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**OPERATION "LOCALIZATION" ON THE EXAMPLE OF UKRAINE.
SUPPORT OF DOMESTIC MANUFACTURER**

Sasha Hladysheva

Faculty of Management and Marketing

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

The situation with the support of domestic producers has long been relevant in the Ukrainian economy. Ukraine has signed many international agreements concerning free competition on the world market. Although, in reality, we are not always able to play by the rules we create. The main direction of the research is the concept of localization of production and its consequences for Ukraine.

Consider the situation with the scandalous law, which provides for the introduction of an additional criterion in the public procurement system of the level of localization of production. Bill №3739 proposes to introduce the degree of localization of production in several segments of mechanical engineering: railway transport, passenger urban transport, special equipment, municipal vehicles, energy engineering, etc. The law is expected to enter into force on January 1, 2021, and will be valid for 10 years (GMK Center, 2020).

Such a policy of protectionism has a good purpose, but its implementation in the conditions of our production becomes impossible. Given the scale of subsidies and incentives provided to their companies by leading countries, domestic producers have no chance to compete, because in Ukraine it is due to cheap labor, raw materials, or product uniqueness, and not because of the classic: modernization, cheaper production, and innovation. Therefore, in such conditions, we are doomed to lose on public procurement around the world and in ourselves (Andrusiv, 2020).

According to research by the Kyiv School of Economics (KSE), if this solution is implemented and implemented, Ukraine's GDP will decrease by 0.52-0.55%. While a complete ban on imports in the engineering sector could lead to a reduction in GDP by almost 5% (GMK Center, 2020).

The logic of such calculations arose on the basis of the premise that Ukraine will not be able to buy imported parts, analogs of which may not be produced on the domestic market, and foreigners under some conditions will not want to share with our manufacturers. Thus, the restriction of imports will reduce supply in the Ukrainian market, and therefore increase its price, and this will significantly affect the budget of consumers (GMK Center, 2020).

The Main Legal Department of the Council in its opinion on the bill indicates that confirmation of the degree of localization may lead to corruption risks in its provision. In turn, the Ministry of Economy emphasizes the transparency of the introduction of the degree of localization (GMK Center, 2020).

Turning to the results, we note that without modernization and innovative products of Ukrainian manufacturers, especially in the field of mechanical engineering, we will not be competitive in the world market, because for the development of successful business, first of all, it is necessary to have modern equipment. Therefore, any import restriction policy should be based on a high level of domestic supply. And we need to start with the development of young people as future producers, improving the quality of their education and ensuring transparency on the part of the state in the further promotion. Ukrainian manufacturers must prove that their products are of such quality that they should be used in the production of foreign machines.

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GENERAL CHARACTERISTICS OF CRIME DURING CORONA DISEASE

Oleg Holovatyuk

Faculty of Sociology and Law

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Covid-19 is one of the many viruses that have affected humans and their consciousness. The crime as a form of antisocial behavior is characterized by danger

to other people. Society always tries to live by the established rules but there is no human community in which such rules are not violated. However, people are beginning to commit crimes against their will. Crimes are divided into certain groups, depending on the characteristics defined by criminal law, which reflect the degree of punishment for a crime. Thus, such a criterion in the classification of crimes is their severity.

Anyone who has contracted coronavirus disease without realizing that they may be a carrier of the virus deliberately spreads the virus but is not punished by law. Coronavirus has changed the lives of hundreds of thousands of people and many countries. In our country, there are many different understandings of crimes that are committed even without realizing it or without knowing it. But all the same, crimes are defined and prosecuted by the Criminal Code of Ukraine. Understanding of norms and parts is quite ambiguous and spelled out in general legal terms. The formulation of parts, sections is extremely difficult for the average person (During the quarantine, domestic crime increased by 500%, 2020).

According to the statistics of the state police and human rights organizations, the number of crimes increased by 13% during the period of coronavirus disease. The number of crimes of small and medium gravity increased by 3%. And crimes that have a greater public danger such as serious and especially serious crimes by 5% (among these crimes are premeditated murder, rape, fraud, robbery). It should be noted that the period of coronavirus disease continues and the number of crimes increases as people try to express a certain moral and psychological protest to the state and other people who may fall victim to a sick or socially dangerous person. The punishment imposed on such people will never bring back the life of the person who was deprived of that life. However, we can say that most crimes and attempted crimes are investigated by the police effectively. It is worth paying attention to the legal principle that not knowing the laws does not release us from responsibility (Coronavirus pandemic: the number of crimes has increased in Europe, 2020).

The number of crimes has increased. The understanding of these crimes has not changed, but people still commit crimes. The concept of crime is a specific and extraordinary phenomenon that exists not only in our country but also in Europe and North America and so on. However, this phenomenon can be prevented from childhood because the concept of good and bad is laid down from the first years of life through a more detailed explanation on the Internet, television, and in schools that specialize in children who are able to perform similar actions that can change their lives. Coronavirus is just a period of time that has changed our lives and the lives of our children and will have an impact on the future (Criminogenic situation in quarantine, 2020).

To sum up, coronavirus disease is one of the temporary problems that have affected us and changed our lives. However, the topic of crimes has become quite relevant and widespread among Ukrainian society.

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ART DURING AND AFTER PANDEMICS

Karyna Kaminieva

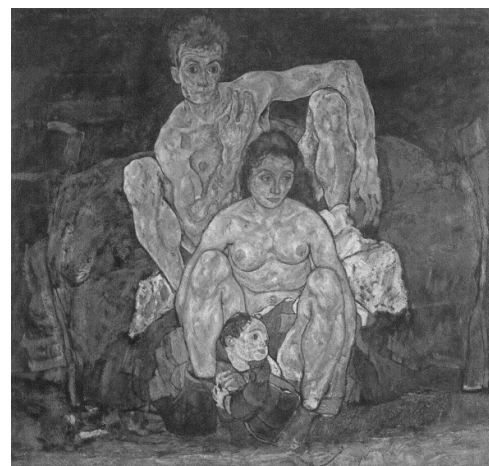
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

It is difficult to overestimate the impact of epidemics on various spheres of society – deadly diseases not only killed millions of people but also created conditions for the emergence of new sciences, trends in art, ingenious architectural, artistic, and literary works. This is surprising, but the consequences of these terrible pages in the history of mankind have become a decoration in the paintings of past and present eras.

The plague is currently considered the largest pandemic in the history of humanity, which reached people through rodents. It was most aggressive at the end of the 6th century and the 14th century. Justinian`s Plague appears at the end of the power of the Roman Empire and originates from Egypt. Unfortunately, no significant works of art of that period have been preserved to this day, but this theme was actively developed by the artist of subsequent eras. An example is a painting by Lufenix, where Saint Sebastian prays for the victims of the Justinian Plague (Picture 1). The second large-scale wave is usually called The Black Death. It originated in Asia and lasted for two years. The pandemic has left its mark on medieval art. The dark period of existence becomes the background for works with apocalyptic motifs. The most popular stories were called “Dance of death” (Picture 2). Such works symbolized the insignificance of human life and the equality of all people in the face of death. After the plague era, one of the greatest periods of society's existence came - the High Renaissance. According to the article “Art during and after pandemics. How the plague changed Europe” (Yaroslav Solop, 2020), it can be concluded that the achievements of outstanding artists and scientists make it invaluable. It is at this time that the work of the well-known Renaissance Titans Leonardo da Vinci, Raphael Santi, and Michelangelo Buonarroti, as well as many others whose works we still enjoy today. These people revived in society the desire to live and create, to explore the world and improve.

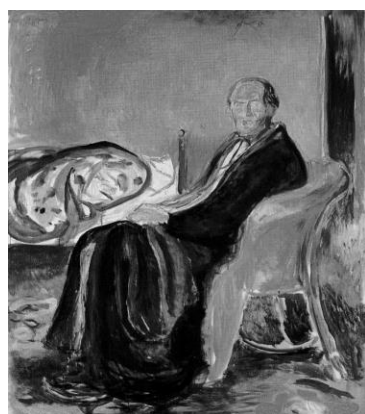
Spanish flu and its imprint on art

The flu pandemic, which was the largest in terms of mortality in history, lasted about two years and originated, according to scientists, in the United States. The name spread through the Spanish press. During the pandemic, many new styles became popular, in particular Expressionism, which was used by well-known artists at that time. There are quite a lot of examples of works of art from the Spanish flu era, so we can learn about the internal state of people of that period thanks to them. Vivid examples are the works of Egon Schiele or Edvard Munch, which are



Picture 3, "Family", Egon Schiele

described in the article "Apocalypse Now: Epidemics in Art" (Artfragment, 2020). All



of them are imbued with sadness and depression, which was then inherent in society. Egon Schiele before his death paints a picture called "Family" (Picture 3), where he really depicts his family: a woman who recently died pregnantly, his unborn child, and himself. At the end of the work, the author dies, leaving us in the cultural heritage of his work, which shows the real despair and

insecurity of a person before death. Edvard Munch also distinguished himself in the topic of Spanish flu. In particular, he devoted a picture called "Self-Portrait after the Spanish flu" to this topic. The author actually had this illness, after which his already unsteady mental state worsened even more.

This virus spread in 2019 in China and spread to almost the entire world. It is familiar to every modern person and it is we who have a unique opportunity to observe how history is created and how works of art are created that our descendants may one-day study. The coronavirus pandemic has been able to affect all areas of our lives. It did not bypass art either. Due to the availability of various materials, people around the world cover this topic in completely different ways in their works, what you can see in the article "How a pandemic affects art: a selection of art" (Gromadske radio, 2020). Many works of art are dedicated to medical professionals. There are indeed a lot of works, but some of the most interesting are paintings by artists such as Pony Wave (Picture 6) or Gilles Tytgat (Picture 5). Various paintings and art objects will continue to be created for a long time in remembrance of this period in the life of humanity and in our memory, they will live forever.



Picture 5, "Inflatable Mona Lisa with a mouth mask", Gilles Tytgat



Picture 6, Untitled, Pony Wave

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**POSITIVE AND NEGATIVE FUNCTIONS OF CONFLICTS IN HUMAN
LIFE AND SOCIETY**

Yevhen Karpenko

Faculty of Sociology and Law

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Their needs and interests drive most people’s activities. But during the actions, the interests of one person may not correspond to the interests of another. In this case, there may be a conflict between them. And the greater the commonality of people, the more contradictions can arise. Most see conflict as a negative phenomenon, but this understanding of this complex phenomenon is incorrect. Like any phenomenon in the world, the conflict has both positive and negative sides. Therefore, in order to better understand the essence of the conflict and the functions it performs, it is necessary to consider it from both positions. Therefore, in today's world, it is important to know what functions conflicts play in human life.

It should be noted that conflicts occur at different levels: personal and social. Both their positive and negative functions are manifested at both levels. It is necessary to start with personal conflicts and the influence they show at this level. The positive thing is that during the conflict we have the opportunity to learn more about the person, his character, inclinations due to the fact that during the contradictions, which is an emotional shock, people show themselves as real.

Through conflict, we can relate our capabilities and skills to those of our opponents and thus form an adequate and objective self-assessment. Actively arguing with others, we gain new experience, knowledge, which would take a lot of time without conflict. Also, conflicts, as paradoxical as it may sound, help a person to socialize, because, in conflict, a person either finds his place in a certain group or realizes that he can't be in this group of people.

As for the negative impact of personal conflicts, it is usually a decrease in the level of psychological well-being of the individual, the possibility of a sense of hopelessness, depression, stress. Also, very often conflicts contribute to lower self-esteem, destruction of normal behavior, change of moral values and beliefs. There is also frustration in others, loss of confidence in them.

At the societal level, conflicts also have a wide range of positive manifestations. With their help, it is possible to identify problematic issues and situations in society, to understand the interests and needs of large masses of people. Conflict resolution helps to eliminate the same problems that contribute to the stabilization of society. Very often, in the event of a major conflict, a certain group of people or society as a whole come together to unite to achieve common goals and protect interests. Through conflict, social groups relate their forces to other communities, thus defining their niche in society. Finally, conflict situations in society help to bring something new or modernize the old, thus renewing society.

But at the same time, the destructive forces of conflict in society are also quite strong. Firstly, the power conflict (military) is accompanied by significant losses, both human and material. This leads to the weakening of society, its destabilization. Quite often, significant contradictions hinder the development of human communities in various spheres, so society may begin a stage of stagnation and even partial degradation. Public sentiment in the event of a conflict also declines, exposing new contradictions. Even a resolved conflict can leave some insults and inconsistencies that could lead to new clashes in the future. As a result of conflicts, the discipline, efficiency, and manageability of certain institutions, organizations, and enterprises are reduced.

Thus, we can conclude that conflicts play an important role in society and man. Thanks to them, you can assess your strengths, accelerate change, or learn something new. But the destructive consequences of conflicts are also very significant. Therefore, in my opinion, it is better to prevent conflicts and carry out their timely prevention.

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EDUCATION AS A NEW TREND IN THE WORLD OF ART

Alexander Habenyuk

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays in Ukraine, there are significant changes in education and one of the tasks of a modern school is to reveal the potential of all participants in the pedagogical process, giving them opportunities to express their creative abilities. The solution to these problems is impossible without the variability of educational processes, in connection with which there are various innovative activities in the educational process, which require deep scientific and practical understanding.

Pedagogical innovation is a new pedagogical product, the result of the process of creating a new one, which updates pedagogical theory and practice, ensuring the achievement of the educational goal.

Based on the definition of "innovation" in accordance with the Law of Ukraine "On Innovation", innovations in education or educational innovations can be interpreted as newly created (applied) and improved competitive technologies, products, or services that significantly improve quality, efficiency, and effectiveness educational process.

Today we are witnesses and participants in processes that are directly related to reforming the content of education. The conditions of modern life, the growing amount of information require modern school trained students who are able to independently acquire the necessary knowledge, to quickly orient themselves in a particular life situation. Society needs a person who not only has knowledge but is guided in the flow of new information, applies it in practice, adapted, able to solve problems.

The study of mathematics and science is important for the education of young people, but such subjects do not have a cultural aspect that can expand our cultural opportunities. On the other hand, art and music can be successfully involved in this function. For example, if students participate in extracurricular activities such as art and music classes, it can broaden their cultural worldview. Music is a means of communication that reflects the spirit of the country, giving the opportunity to feel it through the performance of musical works (Tsarina, 2019, p. 1-7).

In conclusion, education is one of the most important components of a young person's development. Students should study musical arts in addition to other subjects, because art and music will help to expand their cultural worldview and because students will be able to achieve better general development than those who do not receive such knowledge.

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RESPECT FOR HUMAN RIGHTS DURING QUARANTINE

Anastasiya Kisil

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

This year many restrictions have been imposed on human rights and freedoms around the world due to the COVID-19 pandemic. To a greater extent, they were processed, so they were responsible for ensuring the following values: life, health, well-being. If this is reflected in the invitation of the Cabinet of Ministers of Ukraine by the relevant resolution, which provides for the introduction of quarantine restrictions on the territory of our state. These measures were aimed at banning the evaluation of educational institutions, forced closure of food establishments, holding mass meetings, etc. Public opinion was divided into several parts, supporting the introduction of restrictions, others expressed dissatisfaction. Let us consider what rights were restricted.

Firstly, it is the right to freedom of opinion. Ukraine has closed its borders and banned the entry of foreigners. Our state tried to return Ukrainian citizens who remained abroad by all possible methods, including charter flights. In addition, interregional connections, subway operations, and other public transport were canceled.

Secondly, the right to peaceful assembly and religion, which prohibits mass rallies, as well as the gathering of people in churches for confession. Unfortunately, it even affected a holiday like Easter, so people were forced to celebrate it at home.

Third, the right to education. All universities, schools, colleges, etc. have switched to distance learning, which has become an extraordinary novelty for both teachers and students. This also applied to cultural and entertainment activities, which were prohibited, so the only entertainment left was walking in the woods or in the park. It should be noted that there is a very big difference between violations and restrictions. Violations of human rights are arbitrary oppression or disregard for human rights, which will lead to liability and damages. A restriction is a lawful action that is temporarily requested for a specific purpose. However, in order to impose such a restriction, it is necessary to have grounds for these laws. These include quality law, legally justified purpose, social need. Disputes on this topic continue now. In addition to these elements, one can also listen to the balance between human rights and the rights of nations related to ensuring the security of society and well-being. Using complex warehousing when introducing any limited speakers, there is sufficient quality and feasibility. Referring to international legal instruments, in particular the Convention for the Protection of Human Rights and Fundamental Freedoms, it can be argued that rights may be limited, but subject to the imposition of a state of emergency. In particular, Art. 12 of the International Covenant on Economic, Social and Cultural Rights allows states to apply special measures for the prevention,

treatment, and control of epidemiological diseases, but the rights cannot be repealed (Restriction of rights during quarantine..., 2020),

In conclusion, no one gives an unambiguous, specific answer to this question. Perhaps this is due to gaps in the legislation, inconsistency of action by government agencies, or disinterest in these citizens. In this regard, it is necessary to study the separate legal system of Ukraine, international treaties, which ratified it and equipped them with regulations issued during the quarantine.

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THE PHENOMENON OF DUTCH DISEASE

Olha Klymovych

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

There are economic and trade ties between the countries. Active exchange of goods and services brings certain income to states and stimulates economic development. However, some countries specialize in exporting only certain types of goods and services. In modern economic doctrine, such countries are defined as having a "Dutch disease." "Dutch disease" is a relationship between sectors of the economy within one country, in which there is a rapid development of only certain sectors of the economy and slowing down the development of others. A country with this economic model uses only exports of certain goods and services, which negatively affects its economic development. This depresses certain sectors of the economy and reduces the competitiveness of the goods and services they produce. There is a depreciation of certain professions in the labor market, the number of jobs is declining and, as a result, unemployment is rising. There is also an influx of foreign currency into the country, which means the depreciation of the national currency. In addition, the demand for those goods and services that are not produced in the state is increasing. Therefore, there is a demand for imports. All this together can lead to the country being in a phase of depression, from which it will be quite difficult to get out.

Today we can trace such trends in the Ukrainian economy. Exports of food products, metals, equipment, etc. are growing in our country. Other goods and services do not have sufficient development for export, so we import them. For this reason, we buy commodities from industry, engineering, minerals in very large quantities. Over time, insufficient development of certain areas will lead to inflation and devaluation of the national currency due to excessive trade. As a result, social change will lead to mass protests and strikes. To avoid this, the government must draw up a clear plan for the country's economic and social growth. It is also necessary to create conditions for the simultaneous development of all sectors of the economy.

In this way we will get the economic prosperity of the state, where exports will prevail over imports and social conditions will be suitable for a comfortable life.

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**PROBLEMS IN SOCIETY AND THEIR SOLUTIONS AND
ACTIVITIES OF JACQUES FRESCA**

Vadim Klyshkan

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Jacques Fresco is a well-known American futurist, engineer, and also known as the founder of "The Venus Project". I consider him one of the greatest men of our time.

Since childhood, he was a very curious and inventive guy. At an early age, he began to think big, which often caused him problems at school with teachers, whom he asked questions that they could not answer, and put them in an awkward position in front of the class without realizing it. He had many friends of different nationalities, this factor later greatly influenced his views on society.

The realities of our time are cruel, people have forgotten what kindness, love, sincerity, care for others are, everyone thinks about themselves and their own benefits. Now it's hard to find a stranger who would be happy to help without demanding something in return. Money has become a tool that will open many doors to your desires.

On his travels, Jacques fresco interacted with the aboriginal people of the tribe to learn their way of life, their material and moral values, and the relationships within the tribe. Over time, he noticed a very interesting factor: when the natives caught fish, they simply distributed it to everyone in the area, since there was a lot of it. It was then that Jacques realized how disastrous the consequences of scarcity are and how much they affect people's behavior and the formation of their values. The problems

started when the tribe didn't have enough food to feed everyone. In this case, the person's behavior changes greatly, he steals, cheats, and even fights.

It is easy to see that in our society, as in the native tribe that Jacques visited, people are able to steal other people's property for their own benefit or start disputes if they can not divide a particular thing among themselves. Isn't it a sign of scarcity that makes people do such disgusting things? Many people are able to cross the law and engage in theft if they do not have enough money for expensive medicines that can not be bought for a low salary in their region, or they urgently need money for an expensive operation to save a loved one.

For some time, Jacques Fresco paid attention to people who were addicted to alcohol and drug addicts. He tried to help them and find the problem that brought them into this life. But eventually, he realized that he needed to find a way to solve such problems on a global scale, and over time, he came to the decision to start his own project called the Venus Project. He wanted to create a society in which there would be no Government, a society in which people would help each other regardless of their social status, a society in which everyone could buy what they wanted, engage in self-development, and take care of others.

His ideas about creating an ideal society are not just a rush of dreams, but a real embodiment of the project into reality, but this requires the support of many countries and peoples, but unfortunately people are not so interested in this, most people think about themselves, and not about the common good and the future of society. Perhaps in the future, something will change for the better and people will be able to solve the problems of society and become as Jacques Fresco wanted.

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ENSURING ANIMAL WELFARE AND PROTECTION FROM CRUELTY

Anastasia Kolomiets

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Recently there have been increasing reports of animal cruelty. In Ukraine cruelty to animals isn't punished as severely as this action deserves. The problem of cruelty to animals has always been relevant not only in our country but around the world. Complete impunity leads to the fact that a person is completely unaware of the gravity of his crime. Animal safety in Ukraine has never been on the government's agenda. Our country, apparently, doesn't consider animal rights protection as one of the important problems of modern society.

Any person must be responsible for animal cruelty. In Ukraine, some laws guarantee protection and real punishment for cruelty and even just a negligent

attitude towards animals. Responsibility for such actions is spelled out in two codes – administrative and criminal. However, responsibilities for such illegal actions in Ukraine are mainly administrative. Therefore, the current legislation almost doesn't prevent cruelty to animals. If you witness a crime of this kind immediately contact the police.

Animal cruelty in various fields has reached indescribable proportions in recent years: photo business with animals, dog fights, mobile zoos, poaching, killing stray animals with drugs, "rental" business with horses, the propaganda of media cruelty, sites with scenes of animal abuse, the public killing of animals on religious holidays and more (Zubchenko, 2015, p. 208). The imperfection of the legal norms governing the humane treatment of animals leads to numerous cases of cruel treatment of animals, the emergence of various conflict situations which often don't have a legal solution to the problem.

In Ukraine, there is no comprehensive system of legal regulation of human-domestic relations, the introduction of which would strengthen the responsibility of pet owners, prevent the emergence of homeless animals, improve the culture of treatment.

Our behavior toward animals shows the level of maturity of a society. If animal protection laws began to operate in Ukraine and people began to receive punishment for bullying animals, parliamentarians need to adopt at least one of the animal protection bills. If we close our eyes to the cruelty that some people inflict on animals this doesn't mean that it doesn't exist.

In European countries, anti-cruelty legislation provides for huge fines. For example, in Italy – up to 160 thousand euros, in the UK – 20 thousand pounds. Imprisonment for the following acts is also common in some countries: Great Britain, Portugal, German, Italy, France. In our country cases of violence against animals are generally not perceived as criminal activity. Thus, a significant problem of why the crime of cruelty to animals goes unpunished is the inaction of witnesses who for one reason or another don't pay attention to the manifestation of aggression against animals. It is important to be aware of the legal awareness of citizens which wouldn't allow remaining indifferent to such cases (Shumilo, 2015, p. 128).

Violence against animals is committed on a daily basis and only such a level of legal awareness of citizens can become a real help at which cruelty to animals will not be perceived as normal. Animal cruelty goes unpunished precisely because of the inaction of citizens. In our society, there should be a zero level of tolerance for any kind of violence, as numerous studies show that cruelty to animals, if it is a violent crime, sooner or later can turn into violence against people.

Summing up, the attitude of society towards animals, the availability of modern control mechanisms for keeping domestic animals, and the regulations of the number of stray animals by humane methods are important criteria for belonging to the culture and values of European civilization. Fortunately, a lot of volunteers have recently appeared in Ukraine who are dealing with this problem. In general, more and more people pay attention to what is happening around them. If we continue popularizing important topics among the masses, we will change our way of life not only in words but also in deeds.

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COMPARISON OF NAZI AND SOVIET CONCENTRATION CAMP SYSTEMS

Dmytro Kotenko

Faculty of Informatics and Computational Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nazi and Soviet concentration camp systems made a huge impact on history and people's lives. Our research paper aims at showing the consequences and demonstrating the important part of history that cannot be forgotten.

To begin with, in 1941, the world shuddered. The Great Patriotic War began, the confrontation between the two strongest regimes of that time, the Third Reich and the USSR. One of the main weapons of both sides was concentration camps— places for the forced isolation of real or supposed opponents of the state, the political regime (RIA, 2010). Despite the fact that both sides used similar methods, they often pursued different ideological goals. In order to understand the goals of both parties, you need to know the history of the emergence of these structures in both countries.

In 1933, on the outskirts of the city of Dachau (near Munich), the first concentration camp was established in Nazi Germany. His "pioneers" were opponents of the Hitler regime, as well as people recognized as inferior by race: Jews, Gypsies, etc. Soon, a whole network of such prisons appeared on the territory of the whole country.

Unlike Germany, the USSR inherited ready-made penal servitude from the Russian Empire. Soviet jails began their activity at the beginning of the Civil War in 1918. Soon, individual prison structures in Siberia turned into the world's largest network of concentration camps, known as the GULAG.

Now about the motives. The Third Reich, led by Adolf Hitler, led a racial ideology called "Racial hygiene" (Wikipedia, 2020). It was an incredibly cruel theory that divided people between the worthy (Aryans) and the unworthy. The roles of those unworthy of life were: gypsies, Jews, the mentally ill, the disabled, homosexuals, and a number of other categories of citizens.

The Soviet side pursued similar motives, only they were interested not in blood purity, but politics. A person who lived in the USSR could only be a communist and a Bolshevik. Otherwise, you would have been expected to be repressed or even shot.

And now about the most important, living conditions and statistics of the death of Germans in soviet and in concentration camps and vice versa. On both sides, the living conditions of the prisoners were unbearable and it makes no sense to discuss who was better. Therefore, let's move on to dry statistics. From 1941 to 1942, the mortality rate of Russians in German structures ranged from 10 to 40%. But unlike the USSR, Germany also had special death camps where the mortality rate was 100%. The proportion of Germans who died in the red camps in the first few months was more than 40% but soon dropped to 10%. These huge percentages, in the beginning, are very easy to explain. After the defeat of Great Germany, many could not accept this and committed suicide en masse.

After analyzing the above information, we can conclude that both sides were committed to inhuman actions and both were punished in the form of the destruction of these regimes. But after analyzing the statistics, we can objectively say that in this battle the Germans turned out to be crueler.

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THE MINNESOTA «HUNGRY» EXPERIMENT 1944

Natalia Kovalchuk

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Have you ever thought about what happens to a person when he is starving? So, in this article, the information was collected about the experiment of an American scientist who conducted tests on people who agreed to take part in a long hunger strike.

To begin with, Dr. Ancel Keys' plan was simple: first, bring subjects to a state close to exhaustion, and then return them to a normal diet. The Doctor divided the "hungry" experiment into three parts: the first three months - the control period (the usual diet), the next six months - fasting, the last three months - rehabilitation.

Participants in the Keys experiment are volunteers who don't want to participate in military service for conscientious reasons. Keys didn't promise the volunteers that he would provide money and warned them of the serious consequences of long-term fasting, but despite this, he received more than 400 applications to participate in the experiment. Keys selected 36 young men to participate in his experiment, who seemed to him strong, strong, and resilient enough to withstand a long period of fasting.

Volunteers arrived in Minnesota in November 1944. They lived in the bedrooms of a laboratory that looked like a dormitory. They worked 15 hours a week in the laundry and kitchen. They attended classes in politics and foreign languages.

Men also had to cover 35 km a week. In addition to this, they had to pass various physiological and psychological tests (University of Minnesota School of Public Health, 2014).

In the first phase of the experiment, they received 3500 kcal per day. Each participant was expected to reach their ideal weight by the end of 12 weeks.

During the second phase, they were fed only twice a day. There were 3 types of menu: potatoes and grain white bread, cereals and cabbage, turnips and rutabagas. Sometimes small portions of meat, sugar, milk, or butter were included. The average daily calorie intake was 1,570 calories.

Daily and weekly, changes were made to the diets of the subjects, depending on their success in achieving the goal: the one who lost weight too quickly received more potatoes and bread, the one who lagged behind received reduced portions.

In young people, mental apathy arose from the first weeks of the experiment. Previously, young people discussed politics, romance, and sex, but now they have lost all meaning for them. Food was their biggest concern.

Men often would become irritable and aggressive if the food was not served on time. The food was ordinary, but young people relished every spoonful. Someone added water to food to increase its volume and trick the stomach.

Between 2 meals, Dr. Keys allows subjects to chew gum, drink water, and drink black coffee without restriction. He noticed that participants ate up to 40 packs of chewing gum a day and drank 15 cups of coffee.

The participants began to go crazy for food. Over time, they began to eat food without the knowledge of the doctor.

Initially, all people were of normal body weight. During the control period, their average weight was 70 kg. After the start of fasting, they began to rapidly lose weight, turning into walking skeletons.

Despite all the physiological changes, the subjects did not consider themselves too thin. On the contrary, they began to think they were normal, but the rest of the participants in the experiment were fat. Such thoughts are typical of people with anorexia.

The cheerful and noisy company they were within the first months became boring and sluggish, unable to plan and make decisions. They were in groups with visitors and preferred solitude. Tolerance and endurance left them. Outbursts of anger and emotions were constant. They grumbled, complained, and constantly exaggerated the discomfort of their conditions (Wikipedia, 2020).

While walking around the city, they made spontaneously, rash purchases, the purpose of which they did not know when they returned to the laboratory: a stack of old books, a rumpled coffee pot, a set of spoons. Dining manners became simply unrecognizable: some pounced on the food like hungry dogs, at the moment eating everything that was on the plate, others stretched the sensations for hours.

Mental health also deteriorated. The examination revealed hypochondria, depression, and hysteria. The subjects definitely became neurotic, which was then corrected during the rehabilitation phase. Symptoms of their neuroses were irritability, antisocial behavior, depression, nervousness, and emotional instability.

After six months of fasting, the subjects lost almost a quarter of their weight. Their average weight was 52 kilograms.

The "hungry" experiment ended on October 20, 1945. Now young people could eat whatever they wanted. Keys asked some of them to stay in the laboratory for a couple of months to observe them during the "period of unrestricted rehabilitation." He noticed that young people began to consume 5,000 to 10,000 calories per day. For several months they all declared that they could not satisfy their hunger, no matter how much they ate.

In the end, we see what happened to the people who took part in the experiment. As a result, you can understand that fasting affects not only physical health but also psychosocial well-being. So, if you want to lose weight or get healthier, then it is better to get a sport or consult a nutritionist.

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SOCIAL AND ECONOMIC ASPECTS IN POLITICAL DECISION MAKING

Zlata Kunitska

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The process of coordinating the development of society is directly related to political decision-making. All these decisions are based on those events and phenomena that existed in society before, and phenomena whose significance today is undeniable. Such solutions are designed to bring change to the world, and in particular to its various systems and elements. The political decision-making process must be fully streamlined and systematized. This is only possible in light of the social and economic elements that are required. It is especially important to take these factors into account in today's turbulent world. Today there is a huge number of different processes that directly affect the economic and social sphere of life. Political decisions must make this impact as effective as possible.

Recently, the scientific world has been of the opinion that political economy, macro-social analysis, and economic sociology are largely similar in many respects. This similarity emphasizes the complementarity and synergy between these approaches; explains both the constraints and the opportunities created by the socio-economic environment; shapes political processes, influences the allocation of resources, access to goods and services, development results (Quitow, 2006, p. 6).

The macro social analysis focuses on the features of the structure of society. It uses a variety of methods to understand how social groups interact through processes and institutions and examines the attributes of societies and social groups. Economic sociology examines the social dimensions of economic processes, including the social

meanings and social interactions that they promote or hinder (Keizer, 2005, p. 74). Political economy studies the relationships between political, economic, and social processes in society. It focuses on understanding how political and economic actors shape institutions and policies, influence the processes of production, distribution, and consumption (Hahnel, 2002).

Based on this, there is a problem of making a political decision that would achieve a balanced interaction of civil society, government agencies, as well as which would have a positive impact on economic relations. Therefore, it is important to structure political decisions that would combine all the important elements for the above areas.

In general, the decision-making process can be divided into four stages: the emergence of the problem, problem analysis, decision-making, and implementation of this decision. At all these stages, elements of many spheres must be taken into account, in our case the most basic economic and social.

At the first stage, there is an analysis of the initial state of the problem. Both internal and external factors that may have influenced the problem are taken into account. The analysis itself should take place directly within these areas. All aspects of economic and social life that could in one way or another cause and even simply influence the development of the problem itself should be considered.

The second stage is the collection of information from various sources, including from our areas. If we talk about the social sphere, then the means of gathering information can be questionnaires, interviews, various social project groups, and so on. In this case, the subjective opinions of everyone are very important, in the analysis of which you can get some objective information. In the economic sphere, it is generally necessary to take into account a variety of economic indicators. These can be both accounting reports if we talk about certain individual structures and economic processes in the state as a whole.

In the third stage, after the information from all these areas has been generated, it goes to the center of political decision-making, where it is directly processed. On its basis, the decision itself is made in the future.

And at the last stage, this decision, of course, is being implemented. And it is implemented in such a way that ideally should meet all the requirements of the social and economic spheres of life.

In today's world, political decision-making cannot be based solely on the assumptions and intuitions of management, as the consequences can be extremely negative. The solution to this problem is to take into account the relationship between various spheres of life, in particular social and economic. All this is possible only with the rational structuring of the solution itself when at each stage of the process of its development each area is taken into account separately.

Therefore, it is important to systematically improve the political decision-making process, and it is equally important that no decision can be effective without taking into account the social and economic processes taking place in the country.

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MONOPOLY: FEATURES, POWER, AND TYPES

Yelyzaveta Khaleska

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

In modern conditions, due to the rapid technological and economic process, monopolies have formed - a type of market where power is concentrated in the hands of one or more firms.

The main features of monopolies include the following provisions:

1. Occupy the main place in various spheres of tangible and intangible production.

2. The goods and services of the monopoly producer are the main ones and are not subject to competition.

3. Market leader exercises strict control over all manufacturers and doesn't allow the penetration of new competitive firm (Bazilinska, 2005, p.146).

There are the following types of monopolies: natural, open, and closed.

A natural monopoly is characterized by the existence of a single enterprise that produces products in a unique form and excludes substitute products. That is, consumers either buy this product or refuse it altogether. This type of market brings a large share of Gross Domestic Product to the country's economy. And this in turn helps to ensure the country's profits and strengthen the infrastructure.

An open monopoly is one of the types of monopolies where the firm has a leading position in the market but is not enshrined in law. A feature of this sector is the availability of free entry to enter this market. Such an enterprise is formed when the manufacturer is the first to attract innovative technologies, mechanize production processes, improve personnel management, and reduce labor costs.

A closed monopoly is a market created by government bodies through special legal acts, laws, and agreements. The reasons for such monopolies are:

- Optimal use of natural resources. The state grants the right to use them to only one enterprise. This reduces the amount of exploitation.

- The decrease in production and demand for goods such as weapons, drugs.

- Protection of rights to uniqueness and copyright (Ergin, 2008).

The main disadvantages of monopolies are that they set prices, hinder perfect competition, have a large impact on other economic actors, often do not take into account consumer preferences, and create an unequal distribution of income due to different prices for the same products.

Therefore, the state controls their activities through the establishment of antitrust laws.

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CORRESPONDENCE OF THE MODEL OF OVERCOMING POVERTY OF NOBEL LAUREATES TO THE CONDITIONS OF THE ECONOMIC SITUATION OF MODERN UKRAINE

Oryna Larina

Faculty of Management and Marketing,

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Since the proclamation of Ukraine as an independent state, the living standards of the population have increased significantly. Despite the positive developments, Ukraine still faces many challenges: The protracted war, one of Europe's lowest GDPs, and growing international debt. These aspects have a strong negative impact on the welfare of the population.

The 2019 Nobel Prize winners – Abhijit Banerjee, Esther Duflo, and Michael Kremer (UNIAN, 2020) – showed how to solve the problem of global poverty by breaking it down into a series of smaller – but more precise – issues at the individual or group level. They responded to each of them with a specially designed field experiment (The prize in economic sciences 2019, 2020).

The first study of the winners focused on the problems of the education system. The main obstacles identified by the Nobel laureates were the inconsistency of the program and method of teaching with the needs of students, the frivolous attitude of teachers to the performance of their duties, and the low level of schools. By addressing this, additional targeted work with the weakest students is seen, which has a positive effect in the medium term.

Another study in this area was to increase the motivation of teachers by employing them on short-term contracts. Teachers were more interested in better

teaching students since the test results would determine whether their contract would be extended or not.

The next branch was medicine. The study found that 75 percent of parents gave their children deworming and antiparasitic pills if they were free, compared to 18 percent when the price was about one US dollar. The lack of doctors, the inaccessibility of a number of medical services in small towns and villages, and the constant shortage of vaccines have been addressed through mobile clinics.

The microcredit program did not have a significant impact on improving the well-being of the population.

As a developing economy, Ukraine has a similar list of problems with the countries listed in the study, so ways to solve them can be borrowed.

In their research, Nobel laureates looked at key areas of human capital development, such as education, healthcare, and personal finance. The question arises: what is the situation in Ukraine with these industries?

In Ukraine's state budget for 2020, these public funding areas have undergone the largest reductions compared to previous years. Expenditures of the consolidated budget of Ukraine by functional classification, % of GDP, have been reduced by the following items: health care, education, social protection, and social security (ZN.UA., 2020).

In all educational institutions of the country, the number of students is declining sharply. In the coming years, the aggravation of the problem of the shortage of qualified personnel in Ukraine will be a very expected phenomenon.

Real gross domestic product (GDP) in the second quarter of 2020 compared to the previous quarter (taking into account the seasonal factor) decreased by 9.9% and compared to the second quarter of 2019 – at 11.4%.

The personal finances of the population also underwent significant reductions. If in 2010 as of January the amount of arrears of wages in the country as a whole amounted to 1390.8 million hryvnias, in September 2020, the arrears increased to 3421.4 million hryvnias without taking into account part of the occupied territories in Donetsk and Luhansk regions (State Statistics Service of Ukraine, 2020).

Reduction of consolidated budget expenditures on health care, social protection, and social security, reduction in the number of students in higher education institutions, fall in GDP, increase in arrears of wages - all these are factors in the falling level of economy and development of Ukraine.

It is easy to say that, of course, the use of the Nobel laureate model in Ukraine will have a positive impact. Still, the problem will not be fully resolved because it is very multifaceted and requires a comprehensive approach, the work of government officials and the public. This scientific work can be presented to public activists as recommendations on areas of work and ways to implement them, but in no case as a scientific basis for legislative processes, the lack of which is so detrimental to the national economy. Therefore, recommendations should be developed for government officials that can be used in the development of regulations.

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**THE IMPACT OF THE COVID-19 PANDEMIC
ON THE WORLD ECONOMY**

Nazar Loik

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

During the exacerbation of the COVID 19 pandemic, for lack of vaccines against the disease, it is unknown how long the quarantine measures will last, so it is advisable to analyze the economic situation in the world to prevent a new economic crisis

Undoubtedly, the pandemic has negatively affected the economies of all countries, without exception. Due to the spread of the virus, world GDP in 2020 will decrease by as much as 4.4%, but this is less than analysts noted at the beginning of quarantine (Ukrainska pravda, 2020). This was reported by the IMF in its report "Prospects for the World Economy" (Voice of America, 2020). However, this is just the beginning, and not because the quarantine measures will be prolonged, the following factors will contribute to this:

- rising unemployment, for example, according to the Financial Times since the beginning of the coronavirus in 2020, unemployment in the US rose from 3.5% in February to 10.2% in July, and in the European Union rose from 6.5% to 7.1% (Huryn, 2020);

- the media spread panic in society;

- the fall of the main indices of the world's leading stock exchanges in Japan, the United States, and Britain in late 2019, when COVID 19 just began to spread;

- reduction of demand for goods and services.

This in turn will give rise to a new global economic crisis. The biggest losses are in the service sector, namely tourism. According to the UNWTO, because of the pandemic in the period from January to June 2020, world tourism lost \$ 460 billion (BBC NEWS Ukraine, 2020). Through closed borders, tourist countries such as Cyprus, Bali, and other countries, most of whose GDP is accounted for by tourism services, suffer billions in losses and most small business owners go bankrupt.

With the beginning of COVID 19, the word "remote" began to be used at every step. The virus has certainly affected all, without exception, the sphere of human life. The world economy is no exception. Most small and medium-sized businesses have begun to reorient from the offline market to the online one. Those who did not reorient in time have collapsed or are still suffering huge losses. But not everyone who went to the online market was able to work effectively. Because of such a mass transition, professions such as web designer, web developer, targetologist and others have become extremely popular and profitable.

So we can say that the biggest losses are suffered by small and medium-sized businesses, namely, it provides the majority of the population with jobs, so the government of each country, in quarantine, should support it as much as possible. You can also predict a further decline in the economy, which according to the IMF will stop only in 2022. Another pandemic will significantly accelerate the development of the online market and the information society as a whole.

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ROBOTS' RIGHT

Vladislav Magdych

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays artificial intelligence is developing very rapidly. There is a need to develop legal regulation for robotic equipment because it is moving to automated control without interfering with human control.

Realizing the dangers of uncontrolled development of artificial intelligence, some scientists insist on the prohibition of relevant research and control over the spread of artificial intelligence in the field of nuclear energy. Others say it is impossible to stop the development of technology. It is claimed that technology will be invented and disseminated regardless of our desire or attitude.

A significant segment of this problem area is to be solved within the framework of legal science. In the classic system of legal coordinates, we already have certain solutions: the rights and responsibilities of developers, owners, and persons who operate robots are defined. This solves the use of autonomous vehicles, so-called "social" and surgical robots, innovative prosthetics, and so on.

This approach to the above material leads to considering robots as subjects of law. Today, such a decision may look like fiction with signs of unfounded legal romanticism. The most important argument is that the created artificial intelligence follows the established program and does not have freedom of choice, freedom of will. Since the latter is an attribute of the subject of law, the issue is allegedly closed. There is no doubt that at a certain stage of technology development and complication of relations in robotics, the decision-making process of artificial intelligence will be so complex that it can be considered as an act of human behavior (Karchevskiy, 2017).

The legal regulation of the socialization of artificial intelligence will go from considering the robot as an object of relations to endowing it with rights and responsibilities. At the same time, the criterion for the quality of legal support will

obviously be the ability of the law to stimulate the socially effective use of technology and minimize the risks of technology abuse.

European countries are already aiming to develop such regulations that will regulate artificial intelligence in the legal aspect. This is due to the fact that in European countries, artificial intelligence is developing faster than in Ukraine, so the legal regulation is faster as well.

In conclusion, in the development of artificial intelligence and technological inventions in the field of robotics, there is a need to regulate the legal relations of robots. This is a necessary goal that must be developed beyond the development of robotics today.

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SEPARATION OF CRIMINAL MISCONDUCT AND CRIME IN CRIMINAL LEGISLATION

Karina Maksymenko

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

As a result of the Minor Criminal Reform, which entered into force on 01.07.20, the concept of a criminal offense and its division into misconduct and crime appeared.

Nowadays there are doubts about the relevance of such changes at the present stage of the development of Ukrainian legislation. In accordance with Art. 12 criminal misconduct is an act (action or inaction), for which a penalty in the form of a fine of no more than three thousand tax-free minimum incomes of citizens or other punishment is not related to imprisonment. We can conclude that the main criterion for the separation of crime and misdemeanor is the measure and type of punishment. This practice is used in a number of European countries, in particular Germany, Poland, the Republic of Austria, and others.

However, there is a question about the feasibility and effectiveness of such a system in Ukraine. Firstly, amendments to the criminal procedural code of Ukraine require the adoption of a separate law on criminal offense. In addition, procedural law cannot substantiate the need to adopt a law relating to substantive law.

Secondly, this law is untimely. Maintaining the concept of "criminal offense" requires a reasonable doctrinal basis, revising the concept of "crime" and punishing acts. In addition, the reform took place at the level of the Criminal and Criminal Procedure Code and, today contradicts the Constitution of Ukraine. The Basic Law still uses the concept of "crime" as a socially dangerous act for which criminal

liability is provided. Accordingly, criminal misconduct cannot be provided for by the Criminal Code.

Thirdly, there are problems with the distinction of "criminal offense", "criminal misconduct" and "crime". Due to the fact that they differ only in the size of the punishment, and punishment is not included in the signs of a criminal offense, these concepts are considered identical.

Another controversial issue of the reform is the lack of criminal status in persons who have committed criminal misconduct. The presence of a criminal record is a crucial feature of criminal liability, which distinguishes it from administrative, disciplinary, etc (Lipina, 2019, p. 158-159).

Consequently, the amendments introduced during the Minor Criminal Reform do not fit into the system of criminal legislation of Ukraine and require revision.

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EUTHANASIA IN MODERN SOCIETY

Sofia Ogievich

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Unfortunately, the extremely progressive development of science, including the field of medicine itself, has not yet reached a level at which society could fully protect its health from hundreds of thousands of diseases and be completely protected from all possible risks. Diseases such as cancer, HIV, AIDS, tuberculosis, paralysis of the body, and so on are considered especially dangerous and difficult today. In addition, most of these diseases are not specific to one particular category of people, but to people of any age, nationality, gender, and social status. People who have fallen victim to these diseases find themselves in difficult situations. Some of them are looking for strength to fight and live on, overcoming all difficulties. However, there are those for whom it is too difficult to continue the path without the human capabilities that were the basis of their lives. Every day causes them both physical and moral pain. They lose all hope and the slightest desire to fight because their object of struggle is too unattainable, sometimes even unrealistic. In such cases, the issue of enshrining the euthanasia procedure at the legislative level becomes relevant.

The main priority today is human life, which is the highest social value. Thus, the Constitution of Ukraine enshrines the fundamental right of everyone - the right to life, which guarantees the inviolability of the physical existence of every person. However, euthanasia is the practice of a doctor terminating the life of a person who has an incurable disease in order to stop his or her suffering. Thus, euthanasia encroaches on the highest social value protected by the state - human life.

Today in Ukraine euthanasia is prohibited in Article 52 of the Law of Ukraine "Fundamentals of the legislation of Ukraine on health care", where "medical workers are prohibited from carrying out euthanasia - intentional acceleration of death or death of a terminally ill patient to stop his suffering" (Rapaeva, 2014, p. 183). Physicians are obliged under all circumstances to provide full medical care to a patient who is in critical condition.

The Netherlands became the first country in the world to legalize euthanasia in 2001. In 2002, euthanasia was legalized in Belgium and could be applied to adults suffering from incurable diseases. Luxembourg became the third country in Europe to legalize euthanasia in 2009. Formally, euthanasia is prohibited in Switzerland, but in fact, it is allowed, because according to its legislation, assisting in the act of suicide in the absence of personal useful purposes is not prohibited. Foreigners come here for this purpose, as it is the only country in Europe and the world where euthanasia is allowed for residents of other countries (Podkovenko, Sozanska, 2017, p. 43).

However, the practice of enshrining the right to euthanasia at the legislative level has made it possible to establish its negative consequences. In some countries, euthanasia has become uncontrolled: doctors often use it for their own selfish motives, the number of cases of euthanasia is constantly growing, and among them, the number of cases of euthanasia to mentally ill patients is becoming more numerous.

Numerous social polls in Ukraine indicate the division of public opinion into two categories: supporters and opponents of euthanasia. The former believe that euthanasia can alleviate the suffering of terminally ill people, while the latter perceive euthanasia as the killing of one person by another (by a doctor). In addition, a survey of health professionals shows that even if the law on euthanasia is passed, they are morally unprepared to provide such services to their patients, even within the law (Rapayeva, 2014, p. 187). Most doctors believe that their main task is to treat patients, not to kill them. Moreover, every patient must have the hope and task of a doctor - to provide moral support to his patient, and in cases of severe pain, you can always use a variety of painkillers. In addition, death is an irreversible path from which it is impossible to return and change your mind.

We can conclude that the euthanasia procedure is regulated differently in different countries. Such a difference in the legal regulation of the euthanasia procedure leads to the emergence of such a phenomenon as deadly tourism. In order to strike a balance on this issue, it must be regulated not only at the national but also at the international level. At the same time, it is necessary to take into account all the negative consequences and possible side effects of the decision, because along with euthanasia there are a number of controversial issues that are quite difficult to resolve and anticipate within the law.

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CURRENT PROBLEMS OF HIGHER EDUCATION IN UKRAINE

Alyona Ostrovska

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Knowledge in the modern world plays an important role, it helps a person to realize himself in this life, to adapt to the requirements of modern society, to achieve certain results and success, to gain recognition. In order for a person to be able to acquire this knowledge, higher education institutions have been established that train future highly qualified workers in accordance with the requirements of the modern labor market. Unfortunately, the problem of higher education is still relevant in Ukraine.

A first problem is the large number of universities. There are universities that have a long history, prestige, and a good reputation among students. However, some universities are not only unknown to anyone in the field of education but also have suspicions about their licenses, teaching activities, and qualifications. In my opinion, such institutions are unlikely to be able to produce truly professionals.

The second disadvantage is the massiveness of higher education. This phenomenon originated in Soviet times when parents forced their children to enter higher education because then it was prestigious. Moreover, not everyone could boast of a diploma in those days. This continues in our time because everyone believes that without higher education you will not find a good job. However, no one cares that some do not need this education, and after graduating from university only a few students go to work in the specialty. Others simply wasted their time and parents' money.

Next, I would like to draw attention to the fact that students are oversaturated with information. This does not mean that students should not study. The oversaturation of information indicates that when a teacher talks a lecture and gives examples, students are more interested in examples from the modern life of society, rather than what happened 5 years ago. The relevance of the topics also attracts the attention of young people, because they are interested in studying and analyzing, what is happening around them.

The next no less important, in my opinion, is the problem of obsolescence of the teaching staff. This does not mean that all older teachers should be retired. Because they already have some work and life experience that they can share with their students, and they also have some degree. However, young faces are not bad. Moreover, it is easier for a young teacher to find a common language with students. Because they were students not so long ago. A young teacher may more interest students in studying his subject. For example, giving good and interesting examples

from your own life. Whether to introduce new teaching methods into the educational process. Also, it is easier for students to connect with modern teachers, because they are well versed in technology, have e-mail and use social networks. In my opinion, it is more interesting to learn and assimilate the material by discussing it with the whole audience, expressing your thoughts on a certain issue, than just memorizing the material of the lecture.

Along with the problem of outdated teaching staff. There is a problem of obsolescence of the subjects and the educational program. They need updating because with such training students will not be able to gain the professional skills and knowledge that will help them realize themselves in today's world. Therefore, universities need to be modernized, namely to introduce computerization in the educational process. With the help of different presentations, it is much easier and more interesting to learn the subject. Also, the requirements of the modern labor market are that future professionals must have the skills to work with information technology. Moreover, with the development of innovation, the role of information in society increases. Therefore, the task of higher education institutions is also to teach students about the flow of various information, to find reliable and useful.

An even bigger disadvantage than others is the reluctance of students to learn. How often can we see that among a group of students there are those who study hard and others who are just lazy? The student can develop himself and improve his knowledge only in the field of competition. Also, it teaches students from the learning stage to be able to express themselves and their abilities. Therefore, the lack of competition significantly worsens the educational process. Second, students must study not only to obtain a diploma, but they have to realize that thanks to the knowledge and skills they have acquired at university, they will be able to obtain a good profession. Again, some parents need to understand that education is not for everyone and that it is better for some to go to work, and then, if they wish, to get an education in absentia, than to suffer from learning that does not go to mind.

The last problem is that students are afraid to enter the universities that rank first in the rankings because they consider them corrupt and prefer to go to study in commercial institutions. Therefore, it is necessary to talk to students and explain to them that if the university takes the first position, it does not mean that corruption is widespread there, but it means that it provides students with good knowledge that will help them become true professionals (Petrunyak, 2016. p. 26-28).

In conclusion, we see that there are still problems with higher education in Ukraine. Therefore, the task of the government and society is to eliminate these shortcomings in order for universities to work more efficiently to provide our country with truly highly qualified specialists.

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STUDYING ABROAD

Yelyzaveta Ovsichuk

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Each year more and more high scholars after graduating from school want to study abroad.

But they should think twice about this decision because it has both positive and negative qualities.

Pros: Firstly, a student will become more independent and learn how to take care of himself, make difficult and important decisions, which will influence the future life (Scholar Ace, 2019).

Secondly, he will have an opportunity to travel, discover new things about the place where one lives, and make friends with local folk.

An international student can learn the language more in-depth and speak fluently with native residents (Nassaris, 2016).

Living in another country can help you get to know new cultures, build relationships with people of different races, ethnicities, and religions (International Student, 2019).

The most important thing is that the student, who moves abroad, is able to learn and experience new cultures and people's mindset who live in another country and being raised by other social standards. An international student can learn how to appreciate and love others if he takes the opportunity to experience an alternative culture. One can try new things such as exotic food or listening to music which he has never heard before.

One of the biggest preferences of studying abroad is the chance to meet new lifelong friends with different backgrounds (Nassaris, 2016).

Finally, you get personal development, life experience, and the opportunity to have a better job (Nassaris, 2016).

Cons: Firstly, the international student has to leave his hometown and family (Nassaris, 2016).

Secondly, it can be hard speaking a language fluently and understand others. And if a student being shy and antisocial it would rather be difficult to be isolated from society (International Student, 2019).

Unfortunately, education is expensive. And traveling to another country leads to extra expenses (Scholar Ace, 2019).

Finally, endless chores and responsibilities maintaining long-distance friendship (Scholar Ace, 2019).

So, in conclusion, the international student should choose the best way of getting an education.

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THE IMPACT OF THE COVID-19 PANDEMIC ON THE DYNAMICS OF UNEMPLOYMENT IN UKRAINE

Amina Parkhomuk

Faculty of Management and Marketing

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Today, unemployment is a serious macroeconomic problem facing the world. First of all, unemployment is a socio-economic phenomenon in which part of the working population does not use its labor potential. Unemployed are those who do not have a job but are actively looking for job offers.

The COVID-19 pandemic has affected various areas of our lives, especially employment. The Ukrainian labor market has suffered damage in several areas. First, the production of goods and services focused on the domestic market of Ukraine suffers. Second, focused on the foreign market. And third, the process of migration of the Ukrainian workforce abroad was disrupted. After all, Ukraine is the exporter of quality labor to other countries.

The current situation in the labor market had negative consequences for the socio-economic sphere. The proof is the average unemployment rate in the world – 10%. In Ukraine, this figure in June 2020 reached 9.6%, which is 1% more than last year. Since the beginning of the quarantine, 525,000 Ukrainians have become unemployed, which is 53% more than last year. But such negative indicators are somewhat conditional. Since the beginning of the pandemic, not only the supply of labor has decreased, but also the demand for some goods and services, such as electricity. Most enterprises, large and small, stopped using electricity during quarantine measures, so the supply of its production had to decrease.

However, the Government, in an effort to assist citizens in this situation, is taking a number of measures to employ the unemployed and simplify the process of obtaining unemployment status, including the work of the State Employment Service. The minimum amount of unemployment benefits was also increased by UAH 350 and assistance was provided to employers of small and medium-sized businesses who ceased their activities during the quarantine. The work of employees of employment services to find suitable vacancies for the unemployed and labor for entrepreneurs does not stop.

As a result, for the entire period of quarantine as of October 9, 2020, 342 thousand Ukrainians found work with the help of the State Employment Center.

Several trends are inherent in the Ukrainian market during the quarantine period:

- maximum cost optimization – currently the management of enterprises leaves only the most necessary employees, minimizes the cost of improving work and developing new strategies, trying to get the maximum profit at the lowest cost, but at the same time, adhering to quarantine measures;

- a sharp increase in competition in the labor market – with the increase in the unemployed and the decrease in vacancies due to the pandemic, more and more people are fighting for a vacancy at work;

- rapid change of priorities and unevenness – in some areas of employment the demand for labor is growing, in others – it disappears completely. And such drastic changes in the structure of employment occur constantly due to frequent changes in the relevance of some areas.

Thus, although the second wave of COVID-19 infections is growing worldwide, the number of unemployed in Ukraine is gradually declining. The Ukrainian government is trying to reduce the number of unemployed, stabilize the labor market, and prevent the recession of the Ukrainian economy by implementing certain regulatory measures.

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LAWYERS AND THEIR ETHICAL VALUES

Victoria Perevozniuk

Faculty of Sociology and Law

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

No one will be surprised today by the violation of the rights and legitimate interests of man and citizen by law enforcement and human rights workers: judges, prosecutors, investigators, lawyers, police officers. It can be argued that modern Ukrainian realities do not speak in their favor. Through their incompetent and sometimes criminal actions, they gradually take away the confidence of citizens in the right to protection from arbitrariness, lose their trust.

Ethics is the doctrine of morality. Moral norms do not arise as a result of coercion but as a result of a choice of actions that are remembered and passed down from generation to generation. In addition, these rules do not require legal support but are the very guidelines for the formation of law. A person's morality is determined by

the habit given to him in the process of upbringing to follow the principles of justice, to be honest, responsible, modest, to respect his dignity, to be always ready to help others.

It is well known that a lawyer occupies a special place among other legal professions, because he performs a unique and universal function in society - protects the rights and freedoms of citizens.

The principle of honesty and the good reputation of a lawyer is a recognized international standard of advocacy, which is reflected in the codes of conduct of lawyers of different countries.

However, not all of these principles are followed by lawyers in the performance of their professional duties, and sometimes they are violated, and, what is especially unacceptable, they are not responsible for it. Thus, it is quite common in the professional environment to accept a power of attorney from a client by a lawyer incompetent in this field, without notifying the client, and to conduct a large number of cases by one lawyer, which leads to unprofessional, inefficient and unfair consideration and resolution of these cases.

That is why the problems related to this topic are relevant today and need an immediate solution. The question of why lawyers with higher legal education and a lawyer's certificate commit these offenses and sometimes crimes, and what causes violations of human rights and freedoms by Themis followers and guardians of justice in the country, remains unanswered (Chervatyuk, 2009, p.200).

As a conclusion, it should be noted that the task of modern legal education is to raise the level of competence of a lawyer and restore respect for this profession. At the legislative level, it is necessary to strengthen the lawyer's liability for breach of his professional duty and the rules of lawyer's ethics, as well as to introduce the institution of compulsory professional liability insurance. This will lead to a more responsible and honest attitude of lawyers to their professional responsibilities

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CAPITALISM. WHY HAVE PEOPLE BECOME MORE MISERABLE NOWADAYS?

Vladyslav Pidgorny

Faculty of informatics and computer science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Why does capitalism make us richer but still makes us miserable more often? Capitalism was extremely productive in a separate way. In a certain sense, it was liberating. But also, the economic system changes people's minds, leading them to self-destruction, literally to suicide. The suicide rate has increased dramatically since

France became an industrialized country and consumer capitalism has taken over the minds. In England since the 19th century, the suicide rate has been twice as high as in Italy and in wealthier and more advanced Denmark 4 times as high as Great Britain. Many sociologists tried to explain why people became so unhappy in modern society and identified 4 important factors (Durkheim, 1897).

Firstly, individualism. In traditional societies, people's identities were closely related to belonging to a clan or class. They had very few choices about behavior and activity. But under modern capitalism, a person starts to choose everything from profession to religion, marriage, and environment. And if suddenly this choice leads to sad consequences, he begins to blame himself and becomes more unhappy.

Secondly, there are excessive hopes. Capitalism gives hope. "Try and you will become the boss". Advertising fuels ambition, showing us the boundless luxury we could have if we made the right bet. A man can easily become deeply dissatisfied with his destiny precisely because of envy, not because he is restless thinking about so many things that are inaccessible to him (Weber, 2002).

Thirdly, religion. Religion has ceased to justify its purpose by having the best side of human interaction, it could be the most useful to restore the worn-out social tissue. The sense of community and comfort that religion offers is very important for people, and capitalism still has nothing to offer in return. Science can certainly offer opportunities for exchange, but they are not as powerful.

Fourthly, freedom. We have too much Liberty. The countries in which capitalism is established become more complex and diverse and the people in them are more anonymous. People no longer have so much in common with each other. Collective answers to very important questions such as marriage or parenting have lost their value and become more generalized, less specific. In this society, it is common to judge, "Whatever works for you".

This slogan sounds friendly enough, it gives freedom of choice. But it also means that no one cares what you do and society no longer has the answers to your personal questions and problems.

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GRAMMARLY'S STORY: HOW THREE PEOPLE FROM KYIV CREATED A \$1 BILLION SPELLING CHECKER

Sonya Pobiedimska, Kate Pavlovska

Faculty of Applied Mathematics

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

English has been used as an international communication tool for years. For more than 82% of speakers, this language is not native. This fact creates several

difficulties in understanding each other while speaking or chatting because almost every person from non-natives makes grammar or stylistic mistakes.

Modern technologies make it easier to check whether the text is correct or needs changes. Artificial intelligence can provide us with an ability to discover how does our letter or essay sounds – cheerfully or aggressively. All of these are functions of beloved Grammarly, an English spelling checker. In short, it provides users with a spelling-checking tool, helping clients create accurate, clear, and impressive texts.

This simple software on its seed-stage was given a market value of \$100 million. Afterward, the number of service users has increased drastically, and the service value estimation overcame \$1 billion. Grammarly has grown out of a “pet project”, which belonged to three Ukrainian students: Maxim Lytvyn, Alexey Shevchenko, and Dmitry Leader.

Alexey Shevchenko and Maxim Litvin have met at the University in which both of them have entered. The concept of the first mutual business was born very fast. Friends noticed a certain need – teachers were struggling with reviewing works of students on plagiarism and many wrong marks were given to students who did nothing but cheating. They called an invention MyDropBox. Market competition in the niche was extremely low – there were no such tools before, so MyDropBox had all chances to become an extremely helpful tool generating huge income.

The friends having neither extra experience nor any working background started making business. All they had – was their enthusiasm and faith. Maksim Lytvyn’s share of impact was high: he was writing the program code of the service. After the massive part of the final idea was produced, the main friends’ headache was to find the proper monetization model.

Initially, Alexey and Maxim suggested Grammarly to different businesses in Singapore and the United States and began selling access to unlimited technology usage to leading American universities. Time passed, and friends decided to take an MBA course, to develop their business. Maxim enrolled in an MBA in Tennessee, and Alexey moved to Toronto. For these twelve months, no one could dedicate hours to MyDropBox, as both have been passionately studying. But in process of negotiating with versatile book publishers, no doubts left that the idea was worth investing time and money in it.

The founders were locating all their resources to client acquisition. They searched for their first paying customers at educational technology conferences, where they could get suggestions about the service and meet with university professors.

Such assertiveness attracted the attention of many education literature publishers. It certainly made a perfect match in companies’ values because both wanted to spread literacy across the world. First sales gave an ability for Grammarly to hire 15 new developers and 5 salesmen in North America. By 2007, the number of service users reached 2 million students.

Soon companies MyDropBox received several offers to buy their service. Funding was needed, so friends agreed to sell their creation. That did not affect either an employee’s courage and ambitions nor it ruined a small company’s values.

Big business is not about running everything along and being the king of the mountain, but about collaboration, so the third founder was needed. Friends had no doubt about the choice they are making when hiring Dmitry Leader, one of the first developers in MyDropBox. He was given the responsibility of leading the project of adapting the product to the requirements of the owning company.

During Maxim studying in Washington, Alexey and Dmitry began developing future Grammarly's main feature: spelling-checking.

The minimum valuable project (MVP) of a new feature appeared in less than a year after Dmitry became a co-founder. But making a good product is not enough to generate income, so a new challenge appeared – advertisement was needed. Founders have driven a short test and received the first subscription even before the product was officially launched.

That was the beginning of a world-changing business. Three Ukrainian students who gave birth to a “unicorn”, inspire more and more people to work hard on what they believe in.

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PSYCHOLOGICAL FEATURE OF THE JUDGE ACTIVITY

Elizaveta Porokhovata

Faculty of Sociology and Law

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

The role of the court in society is invaluable. Since the court is called upon to solve the case completely, to form citizens' legal awareness. The psychological structure of judge activity mainly follows from the main function of the judiciary to establish objective truth and consists of cognitive, constructive, and educational activities of the court.

The main purpose of cognitive activity is the accumulation of necessary information for constructive activities. It should be noted that the materials of the preliminary investigation used at this stage of the proceedings always give a certain model of events, actions, and relationships, which are subject to thorough examination in the courtroom. Moreover, there is a special discipline of mental activity - strict control over information. If there is no control, judges will not be able to perceive the flow of information properly, and some facts may be found to be erroneous. Cognitive activities involve people with different interests, which contributes to different perceptions and explanations of existing facts.

Constructive activity in court is sentencing the offender. It is carried out by each judge separately but always ends with a collegial decision. In particular, constructive activity is not a process of passing a sentence, but also ensuring its implementation.

The court also performs an educational function that means the process of collecting, analyzing, and sending to the penitentiary institution data on the identity of the offender.

The central place in the psychology of judge activity scientists gives the personality of the judge, in whose activities a significant number of special qualities and professional skills, extensive life experience. One of the main aspects of a judge's activity is a communicative activity that means communication in the conditions of legal regulation. Amazingly, professional judges are perceived by litigants not only as executors of their own professional role. Everyone expects from him a professional attitude towards himself: tact, politeness, respect for human dignity, fair treatment of the participant.

In the administration of justice, much attention is paid to the problem of the inner conviction of the judge. Management of the trial within the procedural law requires a highly organized judge and the ability to manage all persons in the courtroom (Chernovsky, 2009).

In conclusion, the psychological structure of judge activity is a multifaceted phenomenon. And the courts, performing a cognitive, constructive, and educational role, create an atmosphere of moral condemnation of the offender, note the legal truth, and stimulate society's efforts to identify the causes and conditions that contributed to the crime.

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THE ROLE OF COMMUNICATION IN BUSINESS DEVELOPMENT

Anastasiia Selivonenko

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Looking at successful and self-sufficient people, we often ask ourselves what is their secret? After all, many of them are no better than us, and sometimes even have no higher education. In most cases, all successful people are more adept at communicating with their colleagues around them.

Scientists give many definitions of the term communication. For example, according to S. V. Borisnev, communication should be understood as a socially conditioned process of transmission and perception of information in the context of interpersonal and mass communication through various channels using different

means of communication. But the simplest explanation of what communication is the statement that communication is the verbal and non-verbal exchange of information.

There are various communication functions: informative (transmission of true or false information), interactive (organization of joint work), perceptual (establishing relationships between partners), expressive (expression of emotions). As well as functions, there is an infinite number of communication goals: from satisfying basic needs and ending with building a business, developing in it. The latter will be discussed further.

To build a successful business, you need to have business communication skills. It is communication that makes up $\frac{3}{4}$ of the time of an enterprise manager, because such important functions as organizing personnel, establishing contact with partners and suppliers, entrepreneurial communication with direct competitors, cooperation with the public, including with the media, professional associations, and government agencies.

Ineffectively working organizations, managers devote 95% of their time to communication in order to coordinate the human and material factors of the organization's activities, according to research by Hicks & Gullftt, 1976. Thus, the ability to communicate with people, namely, to do this effectively has a positive impact on all spheres, without exception. Life and becomes a powerful tool to achieve your goals.

In the 21st century, it is very important to keep face during business negotiations, especially for leaders of large companies, since one wrong move can entail huge losses. A striking example of this is Elon Musk - an American entrepreneur, inventor, engineer, and billionaire. The podcast author, American comedian Joe Rogan, and Musk struck up a dialogue. During the conversation, the comedian suggested that the head of Tesla and Space X light a cigarette. The leader of the companies could not restrain himself and smoked a cigarette with marijuana on the air during the interview. This phenomenon certainly did not go unnoticed. Tesla's products immediately fell 1.4% in value, and the company's shares fell 8%. Thus, we see that in the modern world it is worth observing etiquette almost always and everywhere.

During the Covid-19 pandemic and quarantine, it is difficult to keep in touch with employees and customers, as many of the enterprises work remotely, which significantly reduces the productivity of robots. There is a lot of research on how telecommuting affects business operations and human progress. According to a 2010 study by Stanford Professor Nicholas Bloom, a travel agency Ctrip in China, which relocated 13% of its call center employees, after 9 months it was found that the company saved about \$ 2,000 in office costs per year per remote worker. ... The tasks, technique, and work schedule – in the office or the apartment – were the same. The employees themselves increased their working hours - by 9% per day, and the number of processed calls – by 13%. Analysis of the conversion of "calls to orders" and monitoring of records showed no difference in the quality of work of employees in the office and at home.

But not everything is as good as it seems. Remote mode is not for everyone. Massachusetts Institute of Technology professor Thomas Allen argued that the less

spontaneous communication, the less chance of a new idea emerging. This communication method is not suitable for creative enterprises and inhibits the progress of humanity as a whole.

What can you do to achieve effective results during quarantine and how to stay afloat? In no case can you lie low and protect yourself from all communications. You need to keep in touch with customers as much as possible.

An important point is the need to readjust from working with your own eyes to communicating with the audience on social networks. Now such powerful platforms as YouTube, Instagram, Facebook, and others are freely available, which contribute to the creation and promotion of a personal brand by communicating with the audience. By the way, the income of such famous bloggers as Anastasia Ivleeva, Yuri Dud is about \$ 1.5 million and 173 million rubles per year, respectively, according to the latest data. The phenomenon of their success lies in the creation of quality content aimed at a specific audience, and incompetent advertising.

Many people still cannot understand why bloggers become rich and famous. Why are they ready to admire them and pay absolutely outrageous money by philistine standards? Probably, advertisers here can explain something about the reach and target audience, and ordinary subscribers will simply say: "They are cool," but once you delve deeper into this issue, it becomes clear that the success of these people is in the ability to competently build communications with people.

The Internet has revolutionized the media industry and brought in a new generation of content creators. It is difficult to imagine that on any TV channel a show about the device of the photosynthesis process, recreating antique hairstyles, grinding gadgets in a blender, solving algebraic problems can be launched - and such videos are in demand on YouTube. Moreover, more than half of the views are provided by mobile phones – in Russia, this indicator grew by 140% over the year - which allows us to speak about the formation of a new habit of information consumption.

Thus, we see that the role of communications in 2020 is at a very high level and currently it is practically the most important tool for achieving business success.

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LIFE AND ART OF CLAUDE MONET

Oleksandra Shapovalova

Institute of Publishing and Printing

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

Claude Monet famous French artist painter who worked in direction of Impressionism and left behind a large number of paintings. He worked in various genres. Painted caricatures, still lifes, portraits, but mostly landscapes. Interest in the landscapes that surrounded him can be traced back to childhood.

The artist's creative path began with caricatures he made at school age. Pictures were great so they quickly spread throughout the city. Monet earned them and they brought him his first popularity. Walking around the city and beyond, he often admired the beauty of the landscapes that surrounded him (Claude Monet is a man who tried to draw light).

First teacher Claude Monet's was artist Eugene-Louis Boudin, who mainly painted in the marine genre. Monet himself mentioned that he felt Boudin's work immediately, but he became good friends with him. A large number of registered letters that the young artist received from other artists of the city is considered a service of the teacher. His aunt also helped him to form, which allowed him to work in the workshop (Interesting facts about Claude Monet, n.d.).

Claude Monet is often confused in life with another artist named Manet. Started with the first exhibition where success awaits the artist. Eventually, the confusion stopped. At another large exhibition, their paintings were placed side by side. Claude Monet and Edouard Manet became good friends. Monet even defended his friend's picture "Olympia", which was harshly criticized at the time. He stated that it should hang in the Louvre, which happened later (Claude Monet is a man who tried to draw light).

Artist's favorite museum and model was his wife Camilla Monet. She is depicted in many paintings such as "Lady in Green", "Woman in the Garden", "Japanese", "Camilla with a Dog". But she died at the age of 32. Also on two versions of the picture "Lady with an umbrella" already his adopted daughter, who was very similar to the late mother.

Artist painted his paintings only in sunlight, even though Edison had already invented the incandescent lamp and it was used by other artists (Claude Monet is a man who tried to draw light).

Claude Monet's work shows different colors, due to the fact that he underwent eye surgery, after which his worldview changed (Interesting facts about Claude Monet, n.d.).

The picture that first brought the artist fame is "The Lady in the Green Dress", on which his wife was depicted. Big success also came after the 1886 exhibition where all of Monet's works were highly praised (Claude Monet is a man who tried to draw light).

Interesting that in the film "Titanic" (1997) you can see one of the paintings of the artist, namely "Water Lilies" (Interesting facts about Claude Monet, n.d.).

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ROLE OF INNOVATIONS IN PROVIDING ECONOMIC DEVELOPMENT OF THE COUNTRIES

Myroslava Shenger

Faculty of Management and Marketing

National technical university of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

In the formation of global innovation space, each country faces a problem concerning increasing and effective using its innovative resource. At the present stage, important dependence between the development of highly technological sectors of the economy of the states and building up their global competitiveness is observed. The countries which have chosen a productive competitive strategy and realized their economic and innovative potential have become leaders of the world economy.

New information technologies are not simply a tool for application, but at the same time also the process owing to what the difference between users and creators in some measure disappears. For the first time in history, human thought is a direct productive force, and not a simply certain element of the industrial system (Revtiuk, 2015). The People's Republic of China is a vivid example of a country that has actively been increasing the innovative and economic potential over the last 50 years. It is proved by an increase in volumes of gross national product, gross national product per capita, expenses for basic researches (Fig. 1).

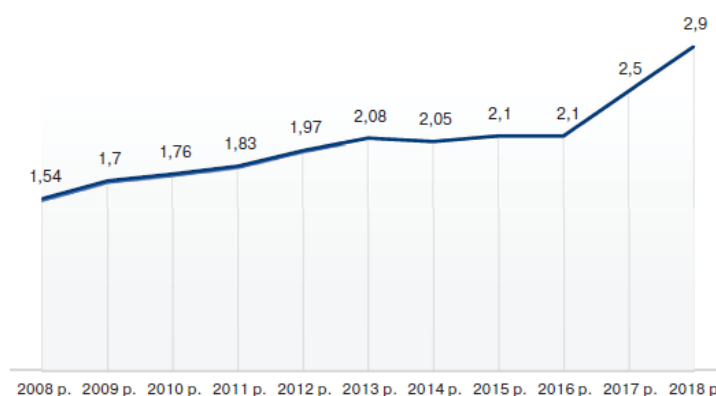


Fig. 1. Increase of funds in % allocated for innovative researches in China in 2008-2018

Source: (US-China Business Council, 2020).

At the present stage of development of the world community, China is one of the main innovative giants creating the newest enterprises, exporting new business models on the world market.

Volumes of patent activity and highly technological export are actively increasing in Heavenly Empire today. The number increase of researchers per 1 million of the population is observed, as well as of university graduates majoring in engineering and of technical employees stimulating the development of innovations. Positions of the country which increases and effectively use its innovative, scientific and technical and research-and-production potential, in world rating increase. So, according to the Global innovative index the country has occupied 6 places (Cornell University, INSEAD, and WIPO, 2020), having taken a hugely innovative and technological step to the future.

According to the State Department on affairs of intellectual property of the People's Republic of China in 2019 over 4,1 million copyrights were registered in China that was 21 % more, than in 2018. Almost 1,5 million registrations of copyrights were made last year for computer software that was 34 % more than in 2018, the aforementioned department informs (Xinhua News, 2020).

At the World Conference on Internet issues "Digital opportunities for the creation of the best future: the general construction of a community of uniform destiny in the cyber domain" which took place from 23rd till 24th of November 2020 in Wuzhen in the province of Zhèjiāng (East China), two reports on Internet development in China and the world, in general, were presented. Under their data, the volume of the digital economy in China in 2019 achieved 35,8 trillion yuans/5,45 trillion dollars/, or 36,2 % from the total amount of gross national product of the country.

The concentration of world geniuses in the Chinese companies, volume of increased investments, the huge market, and other factors became a push to the continuous development of the state's innovative system. Growth of the newest potential assisted in building market strength of the Heavenly Empire in the world economy, strengthening relations with other countries. Next decades the Peoples' Republic of China has every chance to turn into an economic superstate, an innovative country with a high level of human development, a society of general well-being, and a green state.

So, processes in the field of innovative development contribute to the steady growth of the economy of the countries, transforming them into world leaders. Innovations, on the one hand, bring them together, and on the other hand, contribute to an aggravation of the international competition. On the world scene, the global innovation space is being created which defines development strategy as innovative processes, and the globalized economy as a whole.

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PROSPECTS OF ARTIFICIAL INTELLIGENCE

Dima Shevchuk

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays scientific and technological progress is advancing extremely fast and artificial intelligence (AI) is proof of this, as it can be ten times smarter than humans. Therefore, AI can provide signs of law, but signs not only as a subject of law but also as a subject of criminal law.

A person's ability to be aware of their actions, to analyze them, who they are and what they do - all this is inherent in AI, but if AI is endowed with legal status, then it, like a person, can be harmed, and in this case, it can be considered not as an object but as a victim. As a victim AI does not receive much harm compared to a person because it can be break into his database, change, break or even delete, but it can all be restored, but if a person is crippled, he cannot always be updated and brought to a fresh state.

The strength of AI is that it is impossible to inflict moral damage on it, it will not take offense and will not throw a stone at you in response to insults. But why should AI be a subject of criminal responsibility? Because it makes no sense to hold developers or users accountable. AI can develop on its own and be responsible. It independently acquires the rights and obligations of the subject of law and it is responsible in case of violation and receives appropriate sanctions.

As a result, the relationship between people and AI needs to be regulated. AI can act not only as a subject of law but also as an offender and a victim. Therefore, humanity has faced an extremely important question about the place of AI in society.

Unfortunately, Ukraine is currently lagging behind in many areas of development, namely: in almost all sectors of the economy, in terms of the state's performance of its functions, primarily law enforcement. In general, in the functioning of the state mechanism. Therefore, we are at the initial stage of the development and formation of artificial intelligence and the environment in which artificial intelligence will function as a subject. We need a government program to stimulate the development of artificial intelligence and its environment, which must be careful and balanced because scientists already warn that the uncontrolled

development of these technologies poses a great threat to humanity because such systems have long been used by armed forces and their autonomy raises questions at the level of international law, human rights and humanitarian law (Griga, 2019).

In conclusion, AI is not just a program, it is an electronic person who is on the same level as a person. He can be harmed but not so hard as a human. Also, we should not forget that AI can also cause damage, sometimes extremely expensive. So, we need to analyze the situation, make a plan for further action, test it in practice, and only then recognize the AI as a subject. We should not forget that all this must be confirmed by people's opinions.

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CAPITAL PUNISHMENT

Marko Shkepast

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, there are many ideas about capital punishment, the pros and cons of it. However, it is a significant question and this is the reason why the government should look for the correct choice for their country.

Some would agree that governments over time should correct this situation. Although, we need to know about capital punishment.

On the one hand, the sentence to death is the most horrible punishment, but there are people in our world who deserve it. Violence must be punished. Murderers and terrorists take a human life and they need the same punishment for their crime. They cannot decide whether to live, but there is another punishment like a sentence to prison, it is less cruel than death.

On the other hand, capital punishment is very serious. Firstly, sometimes, a judge can sentence to death an innocent person. Often the trial lasts a very long time and it is not a 100% guarantee that the decision is right or the judge and jury find guilty. Secondly, nobody can decide should a person live or not. Accused can be sentenced to jail for a long period or whole life, but he or she will be alive. It is a more humane way of punishment.

There are many ideas for and against capital punishment, every country and government should decide it themselves. However, that is not a reason to avoid taking action.

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WHICH EDUCATION IS MORE IMPORTANT? WHICH YOU GET IN YOUR FAMILY OR THE EDUCATION YOU GET IN SCHOOL?

Milana Shlapak

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Nowadays, there are many problems with children's education. Parents worry about the future of their children and send them to the best schools with perfect teachers and modern facilities, but they forget about the education that they give to their children by themselves. Parents should give knowledge to their sons and daughters as much as a school.

Scientists agree that this problem is very global today. More and more moms and dads do not like to teach their children. In spite of this, some parents help teachers, furthermore, they give new information to their children. It is wonderful when parents and teachers work together. Family and wealth — and not education — are the most important factors in whether a child succeeds in life according to a 30-year study by researchers at Johns Hopkins University in Baltimore (StateImpact, 2014, «Study Finds Family More Important Than Education For Success»). Therefore, that will be true.

On the one hand, parents should tell their children what is good and what is not, bring up and take care of them. This is the hard work, but only parents can make behavior better, instill a love of nature, and many other good character traits. Moreover, moms teach how to be both kind and outgoing, while fathers give a piece of advice.

On the other hand, teachers in the nursery and primary schools will teach a child all about Mathematics, languages, or Chemistry. They can give knowledge, but parents teach them to be both concentrated and disciplined. Parents can not know some answers to the question, but teachers probably can and this reason will help to encourage kids to learn.

To conclude, parents and teachers need to work hard together. Thereafter, it will give more and better results. Kids will grow up intelligent, open-hearted, and assured in their actions. Parents should think about their children's future in advance.

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THE MAIN REASONS OF PROBLEMS OF ECONOMIC DEVELOPMENT OF UKRAINE

Kristina Shmuilo

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The country's economy is almost the main indicator of the country's economic potential and is important in determining the place of the national economy in the world economy. Therefore, the issue of economic processes is very important. The current level of economic development in Ukraine is quite low compared to other European countries.

The main reasons for this phenomenon:

- insufficient funding by the state, as well as foreign investors, of new scientific and technical developments and their implementation in relevant sectors of the economy, which slows down the development of innovation and modernization of economic sectors;

- low level of state support for Ukrainian producers, which slows down the development of small and medium enterprises. This leads to a shortage of jobs and, accordingly, to an increase in the unemployed population;

- the activities of the "shadow economy". The shadow economy in Ukraine is a set of economic activities that are prohibited by the legislation of Ukraine, or those that for various reasons are not taken into account in official statistics (Kachan, 2008). The "shadow economy" slows down the development of the state's economy, like corruption, informal employment, and tax evasion are inhibitory elements of economic development (Kachan, 2008);

- irrational use of natural conditions and resources that the country is endowed with. Excessive extraction of exhaustible non-renewable resources, improper use and distribution of natural resources, inability to rationally use secondary raw materials, all this harms economic progress;

- lack of global strategies and a large-scale economic plan that will ensure the step-by-step, continuous, effective development of each individual sector of the economy, which will ultimately form a strong state economic system.

Addressing the root causes of backward economic development is undoubtedly possible. First of all, to get the result as soon as possible, you need not just to see and understand the existing problems, but to start acting and solving them. The first steps to help raise the level of economic development are:

- allocation of the state budget share for the development of education and science and for the modernization of economic sectors. This will, firstly, increase manufacturing efficiency; secondly, it will make it possible to rationally use natural resources; third, it will help minimize the negative impact on the environment;
 - attracting foreign investment;
 - increasing the share of waste-free manufacturing, which will ensure the rational use of nature;
 - de-shadowing of the economy and the introduction of harsh legislative measures to combat the "shadow economy", as its total volume according to the results of research in 2018 is a quarter (23.8%) of the official GDP of Ukraine, equal to 846 billion UAN (Ministry of Economic Development, Trade, and Agriculture of Ukraine, 2020). Therefore, eradicating and combating such processes will help significantly increase the level of economic development;
 - conducting an effective regional policy that will stimulate the effective development and deployment of productive forces of individual regions, the rational use of natural, productive, and labor potential of the population, ensuring environmental safety.
- Each problem has its solution. Ukraine needs a quick understanding and immediate solution to economic problems.

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PSYCHOLOGY

Yuriy Stanislavskyi

Faculty of biomedical engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Psychology has become an important science during the recent 30 years. Even though it wasn't given much attention to a century ago. More and more young people choose psychology as their future profession and truly believe they will be able to contribute to the well-being of society as well as to their personal everyday success. It is extremely important to know that psychology is both applied and theoretical science it's not surprising that it can be used in various ways. Of course, studies do

not quite fall into the category of easy reading for an average person. However, the results of these experiments and studies can be significantly applied in daily life.

First of all, using psychological methods and tricks can be a powerful motivation. No matter what your goal is to quit drinking, learn a new language, or completely change your lifestyle, psychology lessons generously offer tips for getting motivated. Moreover, knowledge psychology helps individuals become great leaders. No one will deny that leadership skills are absolutely essential for anyone who would like to achieve success, no matter what work of life they work in. As Brian Tracy once said, “Leaders set high standards. Refuse to tolerate mediocrity or poor performance”, which means that the more anyone knows themselves, the more they realize what they really need to do in life.

One more important feature of psychological science is the possibility to improve communication and people’s interpersonal relations. The deeper you dive into psychology the more you understand nonverbal signals in the process of communication. You also learn how to express yourself in a nonverbal manner and how to read the nonverbal cues in people surrounding you. Therefore, you learn how to communicate more effectively during business negotiations and in everyday personal situations.

Finally, knowledge of psychology can bring people a huge motivation for productivity. It teaches people to make the right choices and be disciplined for example Marty Smith said: “Discipline is making the choice between what you want now and what you want most.” It’s extremely motivating for those who are ready to give up on whatever they are doing but thanks to it they do.

So, psychology is a vast and extensive topic that can never be fully covered but anyone can find something useful and applicable to use and follow. As they say: “You know too much psychology when you can’t get mad because you know everyone’s reasons for doing everything”.

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**INTERNATIONAL RELATIONS AND DIPLOMACY OF THE
UKRAINIAN HETMANATE**

Anna Tkachenko

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

With the formation of an independent Cossack Hetmanate in Ukraine, the Hetman Bohdan Khmelnytsky was faced with the question of establishing political relations with foreign countries. The main purpose of this activity was to find a reliable ally in the unstable political arena. States such as Moldova, Wallachia, and Transylvania have played a significant role in this issue.

Venice also entered into diplomatic relations with Ukraine. This kind of agreement was formed because of the war between Venice and Turkey. Venetian diplomacy expected to get some help from the Cossack Hetmanate's army in resolving the conflict with Turkey. At the same time, the Hetman held active negotiations with Turkey, exchanging embassies, declaring a readiness to accept the sultan's protectorate.

Another country that expressed its interest in the Ukrainian Hetmanate was Sweden. The Swedish king hoped to achieve his goals through agreements with the newly formed country in Eastern Europe. But the development of these relations was hampered by the tense situation between the Moscow and Swedish governments.

The alliance with the Crimean Khanate did not give Ukraine the desired results, as it did not comply with the conditions and was unreliable. However, the hetman hoped to get the Tatar cavalry as an additional army in the main battles.

But along with the new alliances, the Hetmanate faced a negative reaction from Catholic states. France, the Kingdom of Spain, the Austrian Habsburgs, and the Papal States expressed their support for the Polish-Lithuanian Commonwealth in the struggle against the Ukrainian Cossacks.

International relations with Moscow became the most destructive for the independence of the Ukrainian hetmanate. The country became part of the Moscow state on a confederate basis (Sahaidak, 2012).

Bohdan Khmelnytsky's foreign policy is often characterized as a manifestation of Ukrainian-style Machiavellianism (Gerasimovich & Makarchuk, 2008). In a short period of time, he managed to organize the Ukrainian state as a part of international relations. Moreover, Hetman established contacts with representatives of Russia, Crimea, Turkey, Poland, Transylvania, and Moldova. He managed to show himself as a strong leader with a well-thought-out system of Ukrainian diplomacy.

The main tasks of Bohdan Khmelnytsky were the successful end of the war with the Polish-Lithuanian Commonwealth, finding a reliable tread, formation of an independent state, and restoration of the Orthodox faith.

A special place in this system was occupied by the specialized diplomatic service of Bohdan Khmelnytsky. In addition to the constant characteristics of the

reception of foreign representatives, embassies were formed with the distribution of roles among the Cossack elite. They included translators, road experts, people adapted to nomadic life, secretaries of embassies, envoys, and ambassadors (Stepankov, 2004).

As a rule, the Hetman rarely took a direct part in the negotiation process. Usually, it was done by a well-educated Cossack sergeant. However, a lot of efforts to develop the diplomatic service were made by Ivan Vyhovsky. His activities helped to obtain some help from the Crimean Khanate.

In conclusion, the diplomacy of the Ukrainian Hetmanate was effectively developed during the time of Bohdan Khmelnytsky and proved to be a reliable system for regulating international relations. This can be seen on the basis of specialized diplomatic apparatus and concluded agreements.

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STRESS IN HUMAN LIFE: CAUSES AND WAYS TO OVERCOME

Oleksandra Tsaryk

Faculty of Society and Law

National Technical University of Ukraine “Igor Sikorsky

Kyiv Polytechnic Institute”

Stress is a mental or physical reaction of the body to stressful situations in areas of human life. Because our body burden can be both physical and mental, stress can also be physical and mental. Physical pain is caused by pain. Pain may appear suddenly, or it may appear due to injury, temperature fluctuations, and body overload. Emotional stress arises as a result of awareness of deception, threat, danger, constant excitement, tension, anger, aggression from others (Shevchenko, 2018, p.10).

There are a lot of causes of stress in both children and adults. Stress occurs throughout our lives in different situations. For example, stressful situations and increased anxiety-causing by problems in the family, parents worry about difficult relationships with their children, their lack of success, and children because of dissatisfaction, misunderstanding, and constant employment of parents. What's more, teachers, and children are worried about difficult programs, tasks, the possibility of

mistakes, there is a fear of possible criticism. Interpersonal relationships affected by family difficulties, group bullying, family conflicts, children suffer much longer than adults. We cannot turn a blind eye to the extremely difficult situation in Ukraine. The analysis of this society leads to a particularly vulnerable reaction of all segments of the population, whose psyche in this period is particularly sensitive.

Owing to recent events, the picture of the child's world view has changed too dramatically. The child comes into the world unconscious and does not know all the subtleties and extremes that can await him and believes in what is not. Now, traumatic information is pouring on children with uncontrollable information from TV screens, the Internet, they hear the conversations of elders - all this causes too drastic a change in the child's picture of the world. And from a cozy and protected world, he turns unpredictable and ruthless.

There are some signs of stress: cognitive - memory problems, inability to concentrate, anxiety, fixation only on the negative and negative results; emotional - feelings of overload, loneliness, insecurity, irritability, tension; physical signs of stress - sleep disorders, loss of appetite, high blood pressure, heart rate, respiratory rate, muscle tension. As a result, the following problems occurred: stomach cramps, headaches, neurological diseases. Due to stress, a person loses the desire to be a team member, apathy, increases the time to perform tasks, and deteriorates as a result, and becomes obsessed with his appearance (Bulakh, 2014, p.13).

Let us consider the basic tips for reducing emotional stress:

- physical warm-up – walk down the street in the morning or the evening on foot while listening to your favorite music, walk with friends in the open air, not sit in a café or at home, try 1-2 stops to walk to your house, instead of riding a bus or dancing to your favorite tune, just like that, at home when no one sees you;
- dialogue - a conversation with a friend, called "on the soul". This fact is an important feature in a person's life because everyone wants to have someone they can trust and talk to;
- pleasure - hot or cold shower, chocolate, cross-stitch, fruits, a cup of coffee, anything, or treat yourself. An amazing way to distract is to watch movies that will take your time and lift your spirits;
- sleep is a responsibility for one's own health. Learn to manage your time. Try to go to bed at the same time and get enough sleep;
- set priorities - try to use time rationally, find time to relax in the daily hustle and bustle, and stop overloading yourself;
- laughter - stay optimistic!

Finally, stress has a negative effect on our body in all aspects. This is a phenomenon that prevents a large number of people from revealing themselves and living normally, especially teenagers, who in this case often remain lonely and unheard. Signs of stress indicate that it causes a lot of problems with both physical and psychological health. However, the ways of overcoming stress have a positive effect on the well-being and emotional state of individuals. With the help of the proposed methods of overcoming stress, they become calmer, more focused, confident in themselves and in the work they do. I think these tools are really

productive and effective. Succeeding these recommendations gives effective results in the fight against stress.

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PROBLEMS OF THE TOURISM INDUSTRY DUE TO THE COVID-19 PANDEMIC ON THE EXAMPLE OF ALBANIA

Margarita Valeeva, Olexandra Grachova

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Coronavirus is a concept that causes everyone different feelings: fear, despair, but certainly does not leave anyone indifferent. There are no people in the world today for whom COVID-19 does not pose a threat. The universe is now at war with an invisible enemy. The coronavirus is very close, it is close, and unfortunately, no one knows what will happen tomorrow. Now the people in white coats are real heroes who do everything possible, but sometimes impossible to save a life. Medicine is nobility and incredible nobility. We do not cease to thank you for everything: we appreciate and make sure that without you we can not. However, in addition, our entire planet is choking with depression and pain. After all, everyone has their own, different meaning of life, which helps to move forward, despite the difficulties. The coronavirus pandemic continues to roam the planet, threatening not only the second wave but also serious consequences for the world economy. Recently, UN experts announced disappointing statistics on the prospects for the recovery of the tourism industry in the context of the coronavirus crisis. According to experts, the number of international tourists this year may benefit from 58% to 78%, which will reduce the cost of visitors from \$ 1.5 trillion (in 2019) to 310-570 billion. Further fight against the pandemic could lead to the fact that about 120 million people will be left without work in this sector.

According to statistics, almost 45% is tourism. Traveling not only brings positive emotions or new knowledge to everyone but also inspires and motivates. Someone on his vacation met his friend, with whom he walks in life, others - true and eternal love, and the latter – found their vocation in life. However, now, from March 2020, all tourism is on its feet. Due to the spread of the infection, the borders are being closed, and thus the way to the dream country is blocked. According to the statistics of our country and the world in general, the economy has fallen by 25% due to tourism. According to Boryspil Airport, passenger attendance has decreased by 65% since the total lockdown in March 2020. However, there are still those who flew on vacation from June 15, the opening of the borders. Therefore, it happened to me.

Despite the quarantine, my family and I decided to visit the beautiful and sunny Albania. At the time, statistics showed that Albania was one of the safest countries. COVID-19 was only 5,000 people and our Ministry of Health took it to the green zone. In Albania, there are no negative consequences due to tourism, because in July-August it was visited by more than 5 million Ukrainian and Belarusian tourists. Albania is one of the first to open for us without tests and quarantine, which attracts us. Being in this fabulous country, you can see that restaurants, cafes are full, but despite this, the beach is long-distance and almost no one communicates with each other. On the beach there is a distance of 2.5 meters, before entering the public space everyone is checked for temperature and forced to wear a mask. Many are afraid of flying, believing that there you can get sick. This is a myth that has nothing to do with reality. All passengers on board are in masks. I was in a respirator, which protects 99%.

Among passengers, there was a distance, only family, friends, or husband and wife who had been in contact before can be together. We also filled out a certificate, however, that in case of coronavirus infection, we will immediately notify travel agents. Fortunately, we did not bring the coronavirus, because, after arrival, law-abiding citizens passed the test.

However, unfortunately, our own experience shows that almost 40% of people who arrive or come from vacation do not check their health. And, as a result, it all does not end so happily. After all, by such actions, we endanger not only our own lives but also other people around us. Since many people think and are convinced, that they are completely healthy, they do not want to sit at home in isolation and go outside without masks, they do not even suspect how they transmit the virus to a passer-by. Because even when a person is not sick, he can be a carrier of this virus. If people are more responsible, then I think we will soon forget what a coronavirus is. Today the condition of our country is getting worse. Nevertheless, we can only blame ourselves for this because who should take care of us except for us.

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**STRATEGIC DIRECTIONS FOR IMPROVING THE COMPETITIVENESS
OF PHARMACEUTICAL ENTERPRISES (ORGANIZATIONS)**

Yuliia Vasylieva

Faculty of Management and Marketing

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Today, the issue of the ability of any company to be competitive is quite relevant, since for the development of the corporation, a company it is necessary to ensure: the necessary volume of output of innovative products, quality improvement, and availability of financial assets, production efficiency, and so on.

Competitiveness determines the viability of an enterprise, namely the results of its production activities, the ability to function effectively and ensure profitability in market competition. In other words, the ability to ensure the production and sale of competitive products.

The competitiveness of the products of a domestic pharmaceutical enterprise is expressed by the ability of this enterprise to produce and sell medicines, the price and non-price qualities of which are more attractive than those of similar products of competitors in the foreign market. Based on the economic situation of domestic companies, the main problems of competitiveness that prevent the execution of competitive advantages of most enterprises, not only pharmaceutical organizations, are their technological backwardness and unfavorable business climate in the state. To improve the situation, we can propose strategic directions for sustainable development, in particular growth and stabilization strategies that will ensure not only sustainability in the domestic market but also the development of the country's drugs in the world markets. The process of developing a product competitiveness strategy of a domestic enterprise should include monitoring the competitive environment, assessing the competitiveness of the enterprise, its products, and main competitors, and implementing and monitoring the implementation of the enterprise's competitiveness growth strategy.

First, confirming the above, the competitiveness of the enterprise should be ensured by such indicators as high production efficiency, which can be realized thanks to modern equipment, technologies, qualified employees, and the ability to maintain a stable position in the market for a long time through the effective use of marketing management principles. However, in my opinion, to create a Competitive Enterprise, it is necessary not only to modernize production and management but also to understand the goal setting and the reason for achieving it. Thus, it is easier to identify and continue to effectively use your advantages in comparison with other competitors to further fight for the first place of the enterprise in the market.

Based on the latest research of the domestic pharmaceutical market, we can identify several ideas on the list of strategic directions for improving the competitiveness of domestic pharmaceutical organizations. Some of the following may have already been suggested, but I support the ideas of my like-minded people. In addition, I would like to highlight the following and more effective, in my opinion, strategic directions for improving the competitiveness of domestic companies and corporations, namely:

One of the priority strategic directions to increase the competitiveness of domestic companies in the pharmaceutical market, I want to highlight the expansion of the range of medicines produced by domestic enterprises, by providing favorable conditions and support from the state by creating an appropriate regulatory framework for the pharmaceutical industry of Ukraine, by supporting the stable activity of the pharmaceutical sector to ensure an appropriate level of quality, the

production of new and ancillary substances, providing innovative technologies for the production of medicines for the treatment of rare diseases (for example, research and progress of injections for the treatment of Covid-19), providing high-tech equipment for the work and development and production of new dosage forms by domestic enterprises. Thus, the first and most important strategic direction of the domestic pharmaceutical industry is the establishment of its own high-tech production facilities, namely serums and vaccines, antibiotics, hormones, as well as drugs based on them, as well as drugs containing alkaloids or their derivatives.

My opinion is also confirmed by the data of the study of the pharmaceutical and pharmacy market in Ukraine for the period 2019-2020, conducted by Pro-Consulting, that it is necessary to pay attention to increasing the range of the above-mentioned medicines of domestic production because most of the most popular medicines on the market belong to this group and show the greatest profitability. Therefore, it is better to develop sales of those domestic products that occupy a decisive and special place in the domestic market among consumers.

The second effective and most important strategic direction of ameliorating the competitiveness of domestic pharmaceutical companies, I want to highlight the training of domestic highly qualified employees for the pharmaceutical sector of Ukraine using the best traditions and the heritage of domestic higher education and science and modern innovative experience with the study and implementation of nanotechnologies in the production of medicines, with in-depth study and research by these specialists of original substances of synthetic and plant origin in order to further use them in the production of domestic medicines. Training of these specialists should be carried out on a full-time basis and with systematic replenishment of knowledge through training, participation in international practical seminars, constant research, and development in special innovative structures. It is also necessary to pay attention to the targeted training of specialists to work in rural pharmacies, which will contribute to the positive development of the pharmaceutical commerce in the country and its competitiveness as a result, as well as in attracting professional personnel for the State Medical Inspectorate of the Ministry of the health of Ukraine and its territorial divisions for further quality control of medicines and production to take the best international positions in pharmaceutical markets.

The sphere of sale of medicines can claim to be a fairly effective strategic direction of increasing the competitiveness of domestic pharmaceutical companies by optimizing the placement and development of the pharmacy network, state support for pharmaceutical institutions that provide the public with narcotic, psychotropic drugs, prescription drugs, which is the annual trend to increase sales, and help the functioning of pharmacies that have production sites for the production of the above drugs, adopt a certain list of medicines for which pharmacies would have the right to produce and sell them. I also believe that it is necessary to develop a pharmacy network both in cities and in rural areas. My opinion is confirmed by the current data of 2018-2020, conducted by marketers of the domestic pharmaceutical industry, that there is a tendency to increase the number of pharmacies, but a reduction in pharmacy points.

So, in general, the analysis of the pharmaceutical and pharmacy market in Ukraine with a retrospective showed significant qualitative changes, which makes it possible to predict its trend towards development. Thus, we should continue to develop the pharmacy network, but not reduce pharmacy points. It is necessary to highlight such a strategic direction of improving the competitiveness of domestic organizations as quality control of medicines, because it is necessary, as I have already pointed out, to train professional personnel for the State Medical Inspectorate of the Ministry of health of Ukraine and carry out certification of the quality system of the State Medical Inspectorate, create the latest equipped laboratories for quality control of medicines, create a quality control system for medical products at all stages of circulation and introduce international quality management standards in them.

Separately, I want to pay attention to such a strategic direction of increasing the competitiveness of domestic pharmaceutical companies as advertising of domestic medicines through mass media and telecommunications networks both in the domestic and foreign markets of the country with a mandatory guarantee to consumers of medicines of the truthfulness of Information, proper product quality and availability of its cost. Thus, the advertising program of measures to raise awareness and awareness of consumers of domestic medicines will positively affect the development of the domestic pharmaceutical industry and bring Ukraine closer to the most well-known and competitive countries in the pharmaceutical market.

I want to conclude that in order to increase competitiveness, pharmaceutical companies, in turn, should improve their organizational systems, improve the quality of products and services, use modernized equipment, take into account the training of highly qualified personnel, and use an advertising program of events. In other words, you need to create and develop your own competitive advantages by using certain statistics of production and sales and conducting market research.

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LEGISLATIVE FRAMEWORK FOR ENSURING THE RIGHTS OF NATIONAL MINORITIES

Maria Vodiana

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The XX century was a turning point in the history of many states. This period is characterized by the beginning of an active struggle for democracy and the creation of guarantees to ensure the protection of human rights.

In 1991 the Ukrainian people took the opportunity and won the independence of our state. The demand for the new time was the reform of all spheres of public life. As Ukraine is a polyethnic state, there is an urgent need to create a modern legal framework for state policy on national minorities.

The first step in forming a proper legal framework was the Declaration of the Rights of Nationalities of Ukraine, adopted by the Verkhovna Rada of Ukraine on November 1, 1991. In this act, the state enshrined guarantees of equal rights for all national minorities living in Ukraine. Namely: to freely use native languages in all spheres of life, to profess any religion, to freely choose a place of residence.

The next step was the adoption of the Law of Ukraine "On National Minorities in Ukraine" in 1992, which significantly expanded the range of rights and freedoms of citizens belonging to certain national minorities. They received the right to hold any public office. Citizens also received the right to national surnames, names, and patronymics.

The next step was the adoption of the Law of Ukraine "On National Minorities in Ukraine" in 1992, which significantly expanded the range of rights and freedoms of citizens belonging to certain national minorities. They received the right to hold any public office. Citizens also received the right to national surnames, names, and patronymics.

This law also provided additional funding from the state budget for the development of national minorities. For its part, the state has committed itself to promote international cooperation with national minorities.

An important achievement was the establishment of the Institute of National Relations and Political Science at the Academy of Sciences. This institution was assigned a number of tasks to develop research on the history of the national development of the Ukrainian people.

As a result of the research, there was an urgent need to establish a Ministry of Nationalities and Migration. This authority has been operating since 1993 (Stetsenko, 2020, p. 172).

As a conclusion, analyzing this scientific article, it becomes clear that Ukraine, as a potential member state of the European Union, has adopted its basic legal principles and principles. From the very beginning of independence, the authorities created all the necessary conditions to ensure the rights and freedoms of citizens belonging to various national minorities. Therefore, it is safe to say that Ukraine will continue to create all the necessary conditions to balance the interests of its citizens of all nationalities.

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PERSON AS A SUBJECT OF SELF-DESIGN

Anastasia Vysotska

Faculty of Sociology and Law

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

In the process of developing the individual takes responsibility for his own life. Authorship involves the creation of a project «I» and its reflection. Implementation of such a project gives the opportunity to the person to materialize in a society. Authorship is an indicator of the person who has comprehended itself and their own life experience.

Creating his own life-project, a person builds his own life strategies. In other words, self-design is a task for an individual to comprehend himself, his life situation, and perspective. There are three types of personal projects: biological, social, and personal.

The socially-oriented project arises at the level of socialization. Every socialized person knows how to build or run his life. Also, such a person knows what events should take place in it and therefore includes them in future biographies.

Personality-oriented project is unique for each person who has reached a personal level of development. Such projects are associated with the activation processes of self-interpretation and self-understanding. Also, such projects are set unique for each person`s vector of development and some transformations. These projects are the result of a deep understanding of socio-cultural realities. That`s why a person is aware of their own capabilities and limitations.

An alternative or biological project is the most creative part of life. It conceives ways of self-development and chooses strategies for self-realization. Thus, the alternative project prepares the field for a person to start the path from «I-available» to «I-other». Such ideas are formed in the inner semantic space of the individual (Chepelieva, 2018).

In conclusion, each stage of human development has its own features. At the first biological stage, the person acts according to the established adult projects. On the second-social, borrows socio-cultural projects. In the third stage, the individual has the ability to create their own projects. They provide an opportunity to build a path of their own life development.

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INTERNET MEME AS THE EMBODIMENT OF POSTMODERN CULTURAL RECYCLING

Bohdana Yakobchuk

Faculty of Biotechnology and Biotechnics

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The term 'meme' was created by Richard Dawkins in his book *The Selfish Gene*, first published in 1976. The word itself originated from Ancient Greek μίμημα [mí:mé:ma] which translates to 'imitated thing'. This neologism means 'a unit of cultural information; an idea, symbol, or type of behavior that is spread from person to person to popularize the phenomenon, theme or meaning'. A meme can be transmitted through pictures, music, speech, writing, or video; apparently, through any method of informational transport. A meme is a cultural analog of a gene in that they self-replicate, can mutate, and respond to specific selective pressures. Nowadays memes are often seen as an exclusive internet phenomenon of a popular comedy pattern. Regardless, the whole human culture is based on memes and memeplexes. Memeplex is a meme complex, a term chosen to represent complex meme systems such as religions (which consist of ideas and behavioral patterns, therefore, consist of memes) or superstitions (Dawkins, 2016).

A meme can be considered successful if it replicates. Now, that sharing all types of information is easier than ever, every meme goes through several stages of mutation – from the original piece to the point where only very competent consumers will recognize the connections between the first and the latest stages. Consequently, there is no need to create original memes, so, obviously, every 'new' meme is, in fact, an old one, presented in a new way. Without a comprehensive knowledge of the context, subject, and ability to process abstract concepts and ideas, a meme cannot be accessible to the average viewer. The sense of humor of the new generation – so called "generation Z" (people born between 1995 and 2005) - differs extremely from one of the older generations. Young people who grew up with access to the internet are more likely to be into abstract, absurd comedy. This is caused by significantly higher exposure to all types of information than previous generations ever had, making the "usual" humor and punchlines too similar and out of fresh societal context to be funny for a mind so saturated with all types of entertainment accessible at any times. This directly correlates with our age being called postmodern.

The main idea of postmodernism claims that everything was already thought, said, and/or created, therefore, we cannot produce original ideas(memes) leaving us with the only opportunity – to rethink cultural pieces and present them in a new way. At first sight, it exclusively applies to art, but in reality, our whole society is postmodern. All we do is recycle old ideas. We recycle popular art in modern one by

mentioning it or coping patterns and archetypes; recycle and transform rituals and stereotypes; recycle scientific ideas created in the past by blindly achieving the set goal or by using the idea as a base for new ones; recycle nonsenses such as activating or homeopathy and even recycle some medieval beliefs like the theory of Earth being flat. Creating something unique and original is barely possible. The amount of people that lived on the planet at some point and just the general amount of time humanity exists makes it statistically undoubtedly that the thought you are thinking, the meme you are creating was already thought. At this point, human culture is a giant recycling bin, joint one, that is giving you unexpected random results of reforming and renovating the memes.

Talking about culture, we should consider the fact that culture does not consist only of outstanding pieces of art or revolutionary scientific ideas but most of popular widely spread behavioral systems and symbols. Therefore, the major part of modern cultural forms is on the internet, where most of the interactions and communication belongs. Connecting the whole world into one giant web, the internet creates popular human memplex.

The first-ever meme to be considered “internet” developed in 1992 after the release of the computer game *Zero Wing* which was poorly translated from Japanese. In the opening, one of the characters says “All your base belongs to us”. The phrase in the form of a GIF animation was popularized during the 2000s. Since then internet memes started becoming so widely-spread and well-known that they have become the most important part of making anything popular. The best example of it is the usage of memes in advertising. Modern marketing is built on memes. You do not have to create something original to popularize the product, you only have to use some kind of a meme. It does not even have to be relevant – if it will be bad cringe culture will still make it work. The cringe is when someone acts or is so embarrassing or awkward, it makes you feel extremely ashamed and/or embarrassed. Cringe around the irrelevant meme creates memes about it being bad. It works provocatively, still giving popularity to the product.

Some people claim that internet meme culture illustrates the degradation of society and culture because we do not create – only recycle. That is debatable. Meme-based culture produced a new type of creativity – creative recycling. Creative recycling is when you do not come up with the original meme – you invent a new way, a new form of its presentation. It is the base of the postmodern culture. Young people, “millennials” and “generation Z” will seriously question your social intellect, if you know nothing about memes.

Culture is a mutable structure with its own type of replicators – memes. We have to recognize it changing and accept the new ways in which our culture exists. The recycling culture is dominant for our times, and the embodiment of it is, obviously, a meme.

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DEPRESSION IS ILLNESS OF MODERN SOCIETY.

PSYCHOANALYTIC METHOD OF TREATMENT: COGNITIVE BEHAVIORAL THERAPY

Diana Yarovykh

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

So far, studies have shown that depression is becoming more prevalent. This is not surprising, as the modern world accelerates the pace of life and increases the demands on human beings. Depression is defined as a mental disorder that is accompanied by sadness, a lack of desire to learn something new. According to studies from different countries, more than 300 million people of all ages are affected by the disease. Depression can become a serious health disorder and, if prolonged and severe, can result in a fatal outcome. Annually about 800 000 people die by suicide.

So how do we define that a person has a mental illness like depression? In fact, the manifestations of this disorder vary widely, depending on the form of the disease and the psycho type of the person. But still, the symptoms of the disorder can be categorized according to such manifestations: emotional, physiological, behavioral, and mental. Emotional manifestations are characterized by such criteria: dissatisfaction with oneself, a desire for zero interest in the surrounding world, longing, oppression, anxiety, possible irritability. Although depression is a mental illness, there are physiological disorders such as insomnia, changes in food intake (overeating or refusing to eat), gastrointestinal disorders (constipation, swelling, diarrhea, etc.), increased fatigue, weakness, as well as cases of pain or various discomfort. Of course, human behavior changes, and people can procrastinate, move away from society, and become passive. There are also important aspects of thought: difficulties in concentration, the predominance of grim thoughts about oneself and about existence in general, pessimistic views about the future, as well as frequent cases of suicidal thoughts or self-harm.

When analyzing a person's performance, a therapist can infer a type of depressive disorder. They come in different difficulties and types, the most insidious is «smiling» depression. In this state, one is not even aware of the existence of the disease, because a human may have the same lifestyle as before, but when he is alone with himself, and he will feel depressed, even suicidal thoughts, panic attacks, or

physical pain. Childbirth can also lead to mental illness like postpartum depression, as women have a completely different hormonal background and a huge burden of caring for a new person. There is also unipolar depression (one of the most common), bipolar depression, and seasonal depression.

Of course, like all diseases, depression needs to be treated. The first step in treatment is a medical examination by a doctor because there are viral diseases that can cause the same symptoms as a depressive disorder. If the tests do not show any physical ailments, psychological examinations must be carried out. This may be done either by the attending physician if he has the relevant knowledge and training, or by a psychologist or psychiatrist.

After determining the severity of the disease and the variety (which I have described above), the doctor makes a decision about the treatment method. All methods can be divided into two main ones: psychotherapy and medication. Each person is treated differently, for example, for a mild form of the disease, psychotherapy can be dispensed with, but for patients with severe disorders, both drugs and psychotherapy need to be combined. The treatment uses several types of antidepressants, each affecting different parts of the nervous system and brain, so psychiatrists can prescribe multiple drugs for the most effective combination.

In general, psychotherapy is recommended in the early stages of treatment, as it determines how much people are susceptible to the conversation and the analysis of their own problems. Some studies suggest that cognitive-behavioral therapy is effective. But interpersonal therapy, psychodynamic and problem-oriented therapy in both individual and group formats, psychoanalysis, Gestalt therapy, and others are also used.

Cognitive-behavioral therapy (hereinafter referred to as CBT) is a form of psychotherapy that consists of changing behavior and thoughts by studying all negative and/or emotional moments in a patient's life. With the help of the CBT, the physician assesses the thoughts that visit a person's head. Since in some cases anxiety can distort reality directly in a person's head, the therapist determines what has led to the formation of such thinking and whether the perception coincides with the reflection of reality. There is no age limit, so it is possible to treat most mental illnesses, in particular all forms of depression. It has been established that this method of treatment can produce results within a short period, usually from 5 to 20 sessions, but there is no time frame.

The subject of mental health has evolved from taboo to fashion revelation. Cinema, TV series, music has long romanticized mental disorders. On the one hand, there is a silver lining, which is that society learns about these diseases and becomes more understanding. But on the other hand, the downside is that people's perception of mental disorders is markedly distorted. Now anyone who wants to stand out can say they are sick. Unfortunately, really sick people are hurt. In summary, it is not necessary to ignore the really visible factors of the disease, it is better to consult with qualified specialists.

Take care of yourself and your loved ones.

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INTERETHNIC TOLERANCE AMONG UKRAINIANS

Daria Zahorska

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The problem of tolerance has been studied in researches in different fields like psychology, philosophy, pedagogy, sociology. However, today it needs further detailed study in the context of the formation of positive interethnic relations among Ukrainian youth. The problem of interethnic tolerance is at the center of attention of philosophers, sociologists, psychologists, teachers as international relationships are a very important issue nowadays due to correlation among countries and nationalities in various aspects, namely in education.

Ukraine is a multinational state the territory of which is inhabited by representatives of more than 100 nationalities. Unfortunately, in recent years there has been a trend towards increasing tensions in interethnic relations and intolerance towards members of certain minorities, migrants, etc., which actualizes the problem of formation of interethnic tolerance among the citizens of our state.

In my opinion, a deep and detailed study of the phenomenon of interethnic tolerance will provide an opportunity to understand the nature, manifestations, and factors which affect its content.

For the Ukrainian language, the concept of "tolerance" is relatively new and has not yet been unambiguously interpreted. But we can find explanations among foreign statements and definitions.

Tolerance is the art of living in the world of different people and ideas, the ability to have rights and freedoms, while not violating the rights and other people's freedoms. Constructive interaction of social groups with various values, ethnicities,

political, religious guidelines can be achieved on a common platform of social norms of tolerant behavior and skills of intercultural interaction. Formation attitudes of tolerant behavior, religious tolerance, peacefulness, countering various types of extremism and their constructive prevention is of great importance as in the field of social and political life multinational Ukraine, and on an interstate scale (Bardier, 2001).

In sociological science, there are several approaches to understanding the essence of tolerance. Among them are psychophysiological, interactional, personal, humanistic, socio-psychological, situational approaches.

Since I am speaking about ethnic tolerance, values, and personal characteristics, I consider it appropriate to focus on the concept of tolerance in the socio-psychological approach.

According to V. Moskalenko, the socio-psychological understanding of tolerance implies tolerance for different opinions, impartiality in the assessment of people and events (Moskalenko, 2008).

V. Sokolov defines tolerance as a certain worldview and moral and psychological attitude of the individual to the extent to which they accept or don't accept different, first of all – foreign ideas, customs, culture, norms of behavior, etc. The main idea of tolerance - tolerance for others (Sokolov, 2003).

G. Bardier considers tolerance as a social attitude; as the attitude of the individual (including the attitude to himself, to people, to their activities; as a cause or effect of protective mechanisms of the individual (rationalization, identification, denial, displacement, projection, substitution, etc.); as a property of the individual, its value orientation and worldview (Soldatova, 2003).

Thus, the most general definition of tolerance is as follows. Tolerance is respect for other opinions, beliefs, behaviors, different from ours but if they do not pose a threat to our physical and moral condition.

Features of the social distance of youth to representatives of different states were detected by frequency analysis. The minimum level of social distance of interaction (acceptance as relatives, the possibility of marriage) Ukrainian youth demonstrates to the representatives of Germany, Italy, Spain, Poland, France, Belarus, USA, and Canada. This closeness can be explained by the fact that Ukrainian youth go to these countries to work, to live, and stay there due to choosing a spouse from those countries. Quite a few Ukrainians have relatives or friends who live in these countries (Atroshchenko, 2017).

A wider range of representatives of other countries could be perceived by Ukrainian youth as friends, but among them, we find only European countries (Belgium, Italy, Spain, Poland, France, Czech Republic, Latvia, Lithuania, etc.) (Atroshchenko, 2017).

As colleagues, most respondents perceive only citizens of Germany. In my opinion, this is due to popular belief about the responsibility, punctuality, reliability of the Germans in business affairs (Atroshchenko, 2017).

Respondents treat representatives of other countries as partners in marriage, as well as colleagues and friends but they don't want to see them as citizens of their

country. In my opinion, this is due to the orientation of Ukrainian youth to life in more politically stable and economically powerful countries (Atroshchenko, 2017).

Looking at some statistics, we can say that 51% of people are dominated by the social type of tolerance, 25% - ethnic type, 25% - tolerance as a character trait. Such results indicate that young people are more likely to actualize tolerance in relation to people with a different social status than to people of another nationality.

But for the last 10 years, the decline of intolerance in Ukrainian society is evident according to the data from other opinion polls. In particular, the monitoring of the Institute of Sociology of NASU "Ukrainian Society" illustrates the dynamics of the national distance of the population of Ukraine (Snikhovsky, 2013).

According to the study of the Kyiv International Institute of Sociology, the level of xenophobia in Ukrainian society has a steady upward trend. According to the sociological data, presented above, in Ukrainian society, the level of tolerance (psychological dimension) is constantly declining, due to the actual presence of conflicts on ethnic grounds. In Ukrainian society, the level of psychological isolation, national isolation of certain ethnocultural groups continues to grow, the level of xenophobia increases, and ethnic stereotypes are replicated through information resources (Snikhovsky, 2013)

Reduction of the level of tolerance negatively influences the international image of Ukraine as a European democratic country. A threat to the peaceful coexistence of ethnic groups and minorities can appear which will interfere with the national consolidation and integrity of the country, formation of civil society, and development of Ukrainian and political nation. Thus, tactical decisions and actions are needed, that will encourage the development and enforcement inter ethnic tolerance as well as the creation of strategic approaches towards international and inter-religious relations.

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THE TRAGEDY OF THE FIRST WORLD WAR

Anna Zalizko

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

In the summer of 1914, a shooting in Sarajevo, fatal to the heir to the Austro-Hungarian throne, Franz Ferdinand changed the lives of millions of people, triggering a mechanism of unprecedented force – the First World War. Huge multimillion-strong armies from different countries were involved in this war. States with a small unprofessional army are forced to move to a general mobilization of the population. Inventions created in the late 19th – early 20th century was used not for good, but against humanity. The use of technical means of destruction, the duration of the war, genocide have led to terribly large losses of various peoples of the world.

The main tragedy of the First World War is that it devalued the cost of human life, surpassing all international conflicts in the number of losses. In the first week, almost 900 million inhabitants of the planet were in a state of conflict with each other. And during the whole war, which lasted 4 years and 3 months, about 74 million people were mobilized, of which 10 million were killed, 20 million were wounded, 3.5 million were disabled.

The First World War opened a box with terrible trials for humanity, such as devastation, inflation, decline, rising prices, falling prices. It has also led to a large number of refugees. People were forced to leave their homes and settle in remote areas. This led to epidemic diseases, shortages of drinking water, and medicine. The First World War had an unprecedented impact on the economy of the warring states, which were forced to expand the military industry, to transfer many enterprises to produce products for the war. However, the needs of the front were still not met. It led to the transition to positional warfare. This war also became a kind of catalyst for national uprisings and revolutions, as people could no longer tolerate this way of life (Reyent, 2016).

In conclusion, I would like to say that no war has had and has no right to exist. Human life cannot be devalued through political or economic interests, through conflicts of states. No one should be deprived of their home and see the horrors of war. War is not a natural phenomenon, it is a terrible and inhumane thing. The task of each country must be to prevent the recurrence of this phenomenon, to preserve peace.

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GENDER GAP PAY

Valentyna Zhyr

Faculty of Management and Marketing

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Women still have lower wages, which they will receive working on an equal footing with men. Is modern society able to manage it?

According to the World Economic Forum in 2018, it will take 170 years to eradicate this problem, but today this figure has risen to 257 years. This indicates that the situation is only getting worse. In addition, the present situation is compounded by the underestimation of this problem: there are many opponents, and even some popular and influential media post articles to refute this theory because wages must be influenced by additional factors (age, experience, education).

Undoubtedly, these factors have to be considered. However, the main thesis is that the difference is observed even under the same conditions. It is also worth noting that the salary difference increases with the level of the position. A vulnerable group is also women from minorities. Women are discriminated against by skin color. For example, black women in the United States receive 63% of the wages of white men, and Latinos about 54%.

What are the reasons for this gap?

The main cause of gender inequality is the prospect of motherhood. Women may suffer discrimination because they may go on maternity leave in the future. One in three employers can turn a woman down because she has a family and children. For example, today in the 21st century. Due to the influence of gender stereotypes that determine the "role" of men and women, it is traditionally believed that a woman should spend more time with her family - so she can choose a profession that is more convenient to combine with raising children. Due to a large amount of time spent on household chores or childcare, a woman is forced to suspend her work or switch to part-time work, and when she returns to work, she often has to accept lower wages. All factors greatly hinder the realization of women.

If you compare a man with a woman with the same level of education and in the same position at the beginning of their career, the difference in salary will not be significant, but it will increase every year, especially if a woman has children. This phenomenon is called "maternity fine". With each child, the gap will be increased.

The situation is the opposite with men. The salary of a man with children will be higher - "bonus for parenthood".

Another major reason is women's underestimation of their demands on employers, which is reflected in the desired level of wages.

How can this situation be changed?

The decision depends on both the gender policy of the state (with a majority of male government officials) and the women themselves.

The experience of some countries shows that the situation with gender inequality can be improved. For example, in the UK since 2018, the average

salary/bonuses of men and women are recorded, and the state based on these data makes a rating of companies. It is believed that transparency should help firms evaluate their actions. Also in Ukraine and many countries, the Labor Code prohibits gender discrimination.

A big step in overcoming this problem is a fairer division of parental responsibilities between women and men.

Thus, every woman is able to change the situation by actually stopping dumping and fostering a sense of gender equality since childhood.

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GDP AND ITS TYPES

Ann Zhluktenko, Halyna Zinchenko

Faculty of Management and Marketing

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

The term Gross Domestic Product (GDP) is commonly cited in economic reporting, analytics, and news. Media channels report its changes, planned values for next year, etc. Central banks of different countries analyze GDP growth or decline, assess countries in terms of GDP, and assess the economic situation. It can be a rather challenging task for non-experts to understand what is GDP and why we do need this indicator.

The position of each country in the world rankings is determined by various factors. The economic performance significantly reverberates the rating. One of the main indicators of economic success is the GDP.

Gross domestic product (GDP) is the total value of all goods and services on the market produced in a particular country over a period of time (for example, for a month or a year). The indicator first appeared in the United States in 1934 and was proposed by Simon Kuznets.

Gross domestic product indices are calculated for the following industries: extraction of natural resources; energy, agriculture; building; industrial production; transport industry; health care and education; activities in hotels and restaurants; commercial area; finances; other services. GDP has a significant impact on stock indices, government monetary policy, exchange rates, and so on.

End goods and services - finished products that are ready to meet the needs of end consumers and have already left the production process, it can be both consumer goods and services and various means of labor (facilities, equipment, machinery), ie investment goods.

As the price in a market economy changes every year (increases or decreases), in order to level the price factor is calculated using two types of prices (currency).

Nominal GDP is the volume of production measured in prices that currently exist in production, ie current and constant) and two types of explosives (real and nominal).

The formula by which this indicator is calculated: $GDP_n = \sum p_1 q_1$

p_1 – prices of goods in the current period

q_1 – production volume in the current year

Real GDP is the volume of production measured in basic prices, so it can be concluded that this indicator can only be affected by changes in production volumes.

The formula by which this indicator is calculated: $GDP_r = \sum p_0 q_1$

p_0 – commodity prices in the base period

q_1 – production volume in the current year

Imports account for a significant share of demand if GDP growth is weak. But with GDP growth, the domestic currency also rises.

Thus, gross production enables the effective estimation of the country's domestic production. Economists can find out: how effectively domestic economic activity is carried out, calculate the performance of economic entities, assess national income, identify macroeconomic trends.

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MEDIATION AS A WAY OF ALTERNATIVE CONFLICT RESOLUTION

Elizabeth Zolotareva

Faculty of Sociology and Law

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Mediation refers to the so-called alternative dispute resolution, abbreviated as ADR (Alternative Dispute Resolution). The concept of ADR was introduced in the 70s of the twentieth century in the United States and ten years later became widely used. Without mediators in the field of economy, politics, business in this country there is no serious negotiation process.

World practice shows many examples of legislative regulation of the mediation procedure. Examples of states that have regulated the mediation procedure and the powers of a mediator in detail are Austria and Germany. It was in Austria that the Law on Mediation was drafted in 2001, and three years later the Directive on Mediation in Civil Disputes came into force.

The term "mediation" comes from Greek (medos – neutral, not belonging to any party) and Latin (mediati – mediation). Modern legal doctrine has shaped different approaches to understanding this process. In particular, O. Spector defines

mediation as an independent method in the system of alternative approaches to conflict resolution, which is to ensure that the parties make an independent compromise mutually acceptable solution to the dispute in the process of direct or indirect communication with the assistance of the parties by mutual consent. independent third party.

Polish scholars, in particular A. Kalisz and A. Zhenkiewicz, define mediation as a form of dispute resolution based on the activities of a third party that is neutral and impartial in relation to the parties and the subject matter of their dispute, whose main tasks are:

- promoting an understanding that is mutually acceptable and takes into account the interests and needs of both parties (problem-solving / interest-based paradigm of mediation);

- the formation of positive relationships and grounds for cooperation between the parties to the dispute, as well as the promotion of self-knowledge, self-improvement, and the so-called internal moral growth (transformation – we paradigm of mediation).

As we can see, in most cases, mediation is defined as an informal method of dispute resolution based on trust, in which a neutral and impartial third party assists the parties in mutual communication, identification of interests and main issues, disputes, and finding a joint mutually acceptable solution based on understanding.

The draft law of Ukraine "On Mediation" also defines it as an alternative (out-of-court) method of dispute resolution, by which two or more parties to a dispute in a structured process try to agree on their own, on a voluntary basis to resolve their dispute through a mediator.

The purpose of mediation is to reach an agreement, ie such agreements that will be acceptable to all parties to the dispute. Of course, the idea is to find a solution that reflects and optimally reconciles their interests in the sense that each party gains something and loses nothing significantly. However, mediation does not always have to involve a detailed reconciliation of all the factual and legal circumstances of the case. The media does not conduct a formalized process, does not call witnesses and experts, and its purpose is not to establish the truth – neither objective nor procedural. In fact, through mediation, people learn to talk to each other in a new way, to listen and understand the other side. Mediation forms a sense of responsibility for one's own behavior and develops dialogue and activity. Thus forms the foundations of public communication and civil society.

In summary, mediation is understood as a voluntary and confidential process, skillfully prepared by an independent and neutral person who, by helping the conflicting parties to deal with the conflict, promotes agreement and understanding between the parties.

Ukrainian legal reality demonstrates the fact that the classical model of justice consists in asserting the position of each party to the conflict, confirming it with evidence, the testimony of witnesses, and in fact, is a confrontation between the parties and their interests. It is very difficult to talk about further normal relations between the parties in such a confrontation. That is why the issue of formation and development of the institution of mediation is quite relevant for our society.

Mediation allows participants to identify the causes and "sharp corners" of the dispute, reduce barriers to communication, develop proposals and solutions, and, if the parties are willing, enter into a mutually acceptable agreement.

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NATURAL SCIENCES

CAUSES OF CLIMATE CHANGE

Valentina Akulenko

Faculty of Chemical Technology

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Scientists have long noticed that the climate has changed. Warm winter, with little rainfall, late spring, cold summer. Glaciers are also melting very intensely now, which could lead to rising ocean levels, which in turn could lead to the flooding of large areas.

Researchers have a large number of views on global warming. One group of researchers believes that global warming is due to changes in space. After taking samples from the great depths of Greenland's glaciers, scientists have studied very well the composition of beryllium isotopes, which are formed under the action of sunlight and characterizes solar activity. Scientists have found that there is a link between the number of sunspots and temperature fluctuations on Earth. As the angle of the Sun changes, the temperature on Earth changes (Shmidt, Yurchenko, 2011).

Another group of researchers believes that there will soon be a quadruple ice age. As temperatures rise, glaciers begin to melt at the poles of our planet. Glaciers - are water that crystallized under the action of low temperatures. With increasing temperatures, the rate of melting of glaciers increases. Water from melting glaciers will not have time to heat up, and water in the ocean will be constantly cooled. Now, in the cold season, our earth is heated by water, which heats up slowly and cools down just as slowly. Gradually, the greatest warm current of the Gulf Stream will become cold. The land area will cool rapidly in the cold season and over time this will lead to the fourth ice age (Berardelli, 2020).

Other scientists believe that global warming is the fault of man himself. Recent decades of oil burning, the opening of factories and plants, and unprocessed garbage all lead to global warming. Every day the number of machines running on natural raw materials is growing, they are cheaper than those running on alternative sources. One of the products of oil combustion is carbon dioxide, which accumulates in the atmosphere and creates a greenhouse effect. Most countries around the world require business owners to install cleaning devices that would prevent the release of recycled products and combustion into the atmosphere. This protects us and the environment from hazardous industrial waste.

People throw out a lot of garbage every day. To date, there are very few industries engaged in the recycling of this waste. It lies for years in these landfills and gradually decomposes. Substances formed as a result of decomposition are harmful not only to human health. These substances linger in the air for a long time and prevent sunlight from reaching the Earth.

All these changes lead to the greenhouse effect and rising temperatures. The expected rise in temperatures will have a negative impact on human health, lifestyle, food production, economic activity, the nature of peoples' investigations, and migration.

Now humanity is struggling with global warming. The amount of waste emissions from enterprises is reduced. A large number of plants are planted, which absorb carbon dioxide.

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RESEARCH PERSPECTIVES OF NET ZERO

Vladyslav Bielik

Faculty of Biomedicine engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Every second an enormous amount of energy hits our planet. Our atmosphere reflects some of that energy, but most of it passes and heats everything. But today is a little different because one day humans began to release enough carbon dioxide to fill billions of greenhouses each day. This greenhouse gas causes heat to escape much more slowly, and as a result, temperatures are too high for our lives.

There is no time to wait. The best time to act was yesterday, next is today! The sooner humanity start to fix this problem, the easier it will be. Humankind should use an approach called net zero.

People release 55 gigatons from the greenhouse each year. Probably not everyone knows that human activities such as burning fossil fuels and others release about 60 times more carbon than all volcanoes on the planet each year. Net-zero utterly means not adding greenhouse gases in general. The need is to get to zero if there is the goal to stop global warming. And the more consequential is the goal to limit it, the sooner people need to reach Net-zero. For our most ambitious goals, men must achieve them by mid-century. Race To Zero is a global campaign to bring together the leadership and support of companies, cities, regions, and investors for a healthy, resilient and carbon-free recovery that prevents future threats, creates decent jobs, unlocks inclusive and sustainable growth. It means that for every greenhouse gas molecule, we put into the air, we also remove one, making our net emissions zero. The aforementioned requires actions now.

Humanity must stop releasing this excess carbon into our air. Since the Earth already reacts strongly to small changes in the amount of air in the atmosphere, emissions of CO₂, methane, and other greenhouse gases must be reduced until the entire system is back in balance. Net zero-emission means that all greenhouse gas emissions must be removed from the atmosphere through abatement measures.

Last year the UK made history by setting a Net-zero target for all greenhouse gases by 2050. The fine print shows that the UK is happy to get others to do the hard work. The goal allows the UK to get other poorer countries to clean up their mess, absorbing the carbon dioxide they are emitting. The whole world needs to get to net-zero as quickly as possible. Therefore, giving other countries the burden of helping others achieve their goals will not help to accomplish this global work.

But reaching this goal means reducing emissions in all sectors. That includes flying, eating, and changing homes. Probably, people have noticed that these changes are not underway in the UK. Indeed, thanks to slow progress in these areas, the UK was already on track to miss its old targets by a wide margin, regardless of its course to Net-zero. Therefore, citizens must be concerned, when a country claims a climate goal like this.

Everyone is interested in the future of fossil fuel companies. British Petroleum, which currently extracts millions of barrels of fossil fuels every day, has announced exactly that. They are aiming for net-zero emissions by 2050. But it is not conclusive, what it means for a company, which is digging and selling oil and gas, to have zero emissions.

Overall, people should understand that the game with the planet is getting over, it would not wait for another 2000 years. Of course, everything is not that clear with Net-zero, but there is no way out. Humans should start changing their lifestyles, values, and habits. Otherwise, we are all going to die very soon, because it will be impossible to live here.

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VIBRATION AS AN ELECTRIC CURRENT SOURCE

Dmytro Blahyi

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

It is impossible to imagine the life of a modern person without electrical devices, home appliances, and IT technologies. All of them need some energy. At present, humanity is looking for many ways to find it. To get it one

needs a source. Scientists have learned to use many sources of energy: the sun, wind, water, etc. However, not all sources are environmentally friendly:

- thermal power plant. The first disadvantage: during the burning, a large amount of harmful substances is released into the atmosphere. It is very harmful to the environment. The second drawback is that the extraction of materials is a very dangerous and costly process that requires funds.

- nuclear power plant. It is cheap to get such energy but it pollutes the atmosphere and it is extremely dangerous because in case of a mistake an explosion may occur and a large amount of territory becomes unfit for life. For example, the Chernobyl nuclear power plant.

- hydroelectric power stations. It is a very cheap alternative way to extract energy, but there is a very big disadvantage of bogging the rivers and destroying their natural course.

Consequently, most methods harm the environment, and I propose an ecological method of energy extraction. This is the topicality of our work.

Therefore, the aim of our project is to find energy using an unusual source. This source in my work will serve as a vibration.

Principle of operation: The main function of the device will be the oscillating motion of plates, which will be fixed coils and magnets. Their main job is to get an electric current, based on Michael Faraday's experiment, which at one time found a method for extracting current by means of electromagnetic induction (Wikipedia, 2020). In my case, when the plates have fluctuated, the magnets will enter the coil, while the induction current will appear. The oscillation will create a vibration that usually occurs when machines or machines with unbalanced or unbalanced parts that are rotating or performing reciprocating motion operate (Vibracii v tekhnike, 1978). Such a system is present, for example: in machine-building, wood-processing enterprises, on a railway, on a place of processing machines, etc. Powerful power plants like pumps, compressors, motors, or railways are all the biggest sources of vibration.

In our device, coils made of copper and neodymium magnets are located on opposite plates in the mesh nodes, so that when oscillating, the magnets enter the coil, and an induced current is produced. The coils will be connected in series, as the serial connected voltage is added. A current of different signs will be created because the magnet will both go into and out of the coil. An AC converter will be used for pulsating (as a diode bridge).

The device will have a universal character, we can change the frequency of oscillations of the device by adjusting it to a certain frequency (to create a resonance).

The best use of the device will be placed with the greatest vibration. I have identified a more appropriate place where you can locate the device. It will be a railroad because there are fluctuations with 1dB / m (Povidaylo, 2004).

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BODY MODIFICATION AND PROSTHETICS

Anton Bondar

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

In the modern world, there is an active development of technologies and robotization of production, but the level of injuries remains. According to statistics, about 12% of people on the planet have violations of the structures of the body, reducing its functionality, which in turn affects the level of physical and social activity of a person, reduces the quality of life, and becomes an obstacle in the implementation of professional activities. More than 50 million people every year become disabled for one reason or another, about 300,000 lose their legs, and 390,000 lose their arms. The loss of a limb not only leads to physical limitations but also brings social problems for the victim. This all affects the quality of human life.

In an effort to reduce the negative impact of trauma, humanity is changing the infrastructure of cities, adapting the environment for people with disabilities, and also resorting to the help of artificial limbs - prostheses. With the development of modern technologies, bioprostheses are increasingly becoming the choice.

Bioprostheses – are limb prostheses driven by miniature power supplies that are able to respond to bio-currents in the human body.

How does a bionic prosthesis work? The answer is simple. Signal sensors of the human nervous system read the necessary impulses and transmit them to the bioprosthesis control system.

In the modern world, bioprosthetics have achieved great success. People are increasingly turning to the need for a lost body part.

The advantages of prostheses are that a person can again perform certain actions, until now impossible due to the lost part of the body.

But still, among all the useful functions of prostheses, a couple of disadvantages can still be distinguished. There are three main disadvantages. The first is a high price, which is justified by the use of expensive materials in the development and a small selection of prosthesis manufacturers on the market. The second is the incompleteness of sensations. Scientists have not yet managed to implement the idea of transferring tactile sensations when using devices. The third and last significant drawback is the short battery life.

Nowadays, prosthetics have achieved notable success. Bioprosthetics can significantly improve the quality of life of an amputated person. Scientific research in the field of bioprosthetics does not slow down; in the future, it can be expected that prostheses will receive a wider range of possibilities, become light, strong, sensitive, energy-intensive, and maximally adapted to the needs of a person, responsive to all his requests. It is also possible that in the near future there will be innovative developments with new capabilities that will allow bionic prostheses to surpass natural limbs in their functionality.

At the present stage of the development of prosthetics, mankind is showing great interest in this technology, and many even welcome its introduction, which indicates the readiness of society to accept this stage of technological progress in medicine. In addition, this interest demonstrates that society is actively preparing for the introduction of artificial organs and the positive adaptation of people with disabilities.

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NATURAL SCIENCE

Daniel Budyshev

Radio Engineering Faculty

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

People have long been thinking about the universe around them. Where did it all begin, who is our creator, what appeared earlier the chicken or the egg, and so on. Beginning to study nature and how to interact with it, people have created new tools for household care, weapons to protect against wild tribes, and get food, medicines based on various herbs. Time goes by, and experience accumulates, and it seemed that until recently a real miracle of technology was created – a locomotive, and in the next century man is already launching artificial satellites, and even more so, the man was able to land on the moon. Ancient people could not even dream of something like this, but all because man has explored and continues to explore the universe and space for unlimited discoveries. The branch of science that deals with such things are called "Natural Science" (Barr, 2006). It is a set of sciences that study living and non-living nature. This class includes such sciences as physics, biology, chemistry, astronomy, medicine, geography, geology, and so on. They can also be divided into a large number of different subclasses. Each of them covers its own field of research, and each of them has somehow affected our lives, made it more comfortable and safer, for example, medicine. You don't have to pull a tooth or amputate a hand in our time because we don't know how to treat it, do you? With the development of

medicine, the variability of methods of treatment of various diseases has increased. In general, I would like to go through some sections separately (Bazhan, 1985).

Physics. Physics studies various natural and physical phenomena, how they interact with each other, classifies them, and tries to explain. All in all, I didn't just start with physics because it is considered a fundamental science because most all other natural sciences use and obey the principles and laws established in this area. The field of physics is incredibly wide and includes a wide range of research, such as theoretical physics, applied physics, nuclear physics, quantum mechanics, optics, and many others. Modern physics is becoming increasingly specialized, where researchers tend to focus on a specific field. Physics is quite closely related to mathematics and most theories are based on some kind of mathematical analysis, which distinguishes physical from other natural sciences. It is this science that has become the basis for the creation of new technologies and tools that help humanity in various fields of work.

Biology. Biology – a science that is related to medicine and chemistry. It is engaged in studying living organisms, their physical structure, chemical processes, molecular interactions, physiological mechanisms, their development, and evolution. Modern biology is a highly differentiated complex of basic sciences of living nature, which are represented by independent disciplines – anatomy, physiology, history, biochemistry, microbiology, and others. The whole world of organisms, depending on the degree of their affinity, is divided into certain groups: classes, types, series, families, genera, species. The distribution of organisms into groups, or their classification, is carried out by taxonomy. In general, you can write about the biology and what it does for a very long time.

Astronomy. Astrology is the science of the movements, structure, and development of the space bodies, their systems, and the universe as a whole. The methods of astronomy are very diverse, some are used to determine the positions of objects in the celestial sphere, others for the study of spatial motions or to determine the structure of celestial bodies and their systems, physical characteristics, etc. However, the main method of research in astronomy is observation. Astronomy has a very long history. There are records of astronomical observations phenomena that were made thousands of years ago (Maran, 2005).

And that's just the tip of the iceberg. There is still a very large number of natural sciences, and their number is constantly growing. And if we are now writing about the first clones of animals, space travel, and so on, maybe in a hundred years our descendants will write about how they grow houses on flowers on other planets or something like that.

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USE OF ZEOLITE IN MEDICINE

Illya Guivan

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Zeolites are a series of minerals with a three-dimensional structural organization that forms systems of cavities and channels occupied by cations and water molecules.

They have a crystalline structure of natural and artificial zeolites, formed by tetrahedral groups, united by common vertices in a three-dimensional framework, pierced by cavities and channels (windows) 2-15 in size. The color is green, light gray.

Zeolites have a unique ion exchange selectivity for radionuclides and heavy metals, which allows them to be used for water purification from radioisotopes, radioactive waste disposal, rehabilitation of radionuclide-contaminated areas. Due to these qualities, zeolites were used after the Chernobyl accident. Effective minerals and concerning organic compounds, for example, against the background of the use of zeolites, the concentration of the most common carcinogen benzopyrene in water is reduced by 260 times.

The largest volume of toxicological research the study of zeolite raw materials was carried out during the study of the Shivyrtuisky deposit. At one time, this ensured the approval of the country's first permanent technical conditions for the use of zeolites in animal husbandry. It has been experimentally found that when using minerals inside acute they did not possess toxicity. When zeolites were consumed in moderate doses, they did not cause pathological changes in the intestines and internal organs. Long-term feeding of rats with zeolite did not reveal any signs of embryotoxicity and teratogenicity.

Zeolite in medicine was first used in surgery in the form of a fine powder for the treatment of purulent-necrotic wounds. It turns out that zeolites have a positive effect on effect metabolic processes associated with supporting enhancing mineral balance, removing from the body toxic substances and metabolic products to the symbiotic microflora. Subsequently, granules of crushed zeolite enriched with a solution of sodium hypochlorite and placed in a container made of synthetic fabric were applied to the wounds, which significantly reduced the time of wound cleaning and suturing. For the treatment of purulent wounds and burns, zeolites were used in packages made of semi-permeable films. The effectiveness of treatment is confirmed by stabilization of blood cell membranes, reduction of leukocytosis, the shift of leukocyte formula, reduction of intoxication, stimulation of T-cell immunity, an increase of hemoglobin and erythrocytes in the blood, reduction of edema. The pronounced bio stimulating, drainage, and lymphoprotective effect allowed the use of zeolite in patients with burns.

Indications for the use of the mineral are hepatitis A, B, C, chronic gastritis, calculous and non-calculous cholecystitis, chronic pancreatitis, biliary dyskinesia, peptic ulcer of the stomach and duodenum, dysbacteriosis.

Against the background of the use of zeolites, there is a decrease in liver size, elimination of asthenic-autonomic syndrome, normalization of liver tests. , gastrointestinal tract, in the intoxication of any genesis, for dialysis in an artificial kidney, in surgical practice.



Img.1 Zeolite

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WAVE–PARTICLE DUALITY

Artem Demydenko

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

For many centuries, humanity has asked itself questions about the structure of the world around it. It did not bypass the theme of light as a physical phenomenon. At the end of the 19th century, it was believed that the answer to the question of the nature of light was found and proved experimentally. Light is electromagnetic waves propagating in space. However, already at the beginning of the 20th century, such

phenomena as the photoelectric effect, the Compton effect, photochemical reactions, and so on were discovered. Explaining these phenomena, in 1905 Einstein put forward a corpuscular theory of light, which, developing Newton's ideas about light corpuscles, considered light as a stream of a large number of particles called photons (Martinson, Smirnov, 2002 (Chapter 1)).

The fact that light is a flux of photons can be explained by thermal radiation and the photoelectric effect. But not diffraction and light interference. Diffraction and interference are indicative of the wave properties of light. Thus, light can be viewed from two different points of view. It has both corpuscular and wave properties, which gives rise to the effect of dualism. Wave properties appear when light propagates. Corpuscular - when interacting with matter. Wave-corpuscle dualism is a general property of matter that manifests itself at the microscopic level.

When emitted and absorbed, light is like a stream of particles with an energy that depends on speed.

Photon energy:

$$E = h\nu ; \text{ where } h \text{ is Planck's constant, } \nu \text{ is the frequency}$$

Energy can also be expressed through the theory of relativity:

$$E = mc^2, \text{ where } c \text{ is the speed of light}$$

$$E = h\nu = mc^2$$

$$\text{From here we will get } m = \frac{h\nu}{c^2}$$

Since a photon does not exist at rest, and at birth, it immediately has the speed of light, we received a formula for the mass of a moving photon, which will be useful for finding the momentum of a photon (knowing the mass and speed).

$$= mc = \frac{h\nu}{c} = \frac{h}{\lambda}$$

Photon momentum: $p = \frac{h}{\lambda}$, where λ is the wavelength

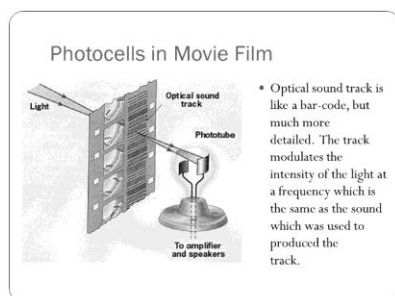
As can be seen from the formula, the greater the frequency ν , the greater the energy and momentum of the photon. And the more the corpuscular properties of light are manifested.

There is also de Broglie's hypothesis, according to which any moving particle with energy E and momentum p corresponds to a wave with frequency $\nu = E / h$, wavelength $\lambda = h / p$, and wave vector $k = p / \hbar$ (De Broglie's hypothesis. Wave properties of electrons. Wave function. Uncertainty relations).

$\lambda = h / p$ - this is the basic de Broglie formula, which sometime after its discovery was proved experimentally (diffraction by an electron and other particles was observed on crystals). It was Louis de Broglie who proved that the propagation of certain waves is associated with the movement of particles, and found the length of these same waves.

The discovery of such a property as the photoelectric effect was of great importance for understanding the nature of light. Cinema and television owe their appearance precisely to the photo effect. A photocell reads an optical recording on film and reproduces it using a speaker and amplifier.

Photovoltaic cells are used in solar panels. When light hits the contact of two semiconductors, an electromotive force arises, due to which the energy of light is converted into electrical energy.



Photovoltaic cells are also widely used in industrial applications. In factories, photocells are used on machine tools that can perform complex technical operations with high precision without human intervention (or with partial intervention). Such devices control the dimensions of products with high accuracy, instantly turn off dangerous mechanisms when a person approaches a dangerous area, turn on street lighting in time and not only. In ordinary life, anyone could come across the use of photocells in the subway (Application of the photo effect in technology, 2011).

Photovoltaic cells have found their place in medicine. They are used in vacuum or semiconductor devices. For example, a photomultiplier tube is used mainly for measuring small radiant fluxes, in particular, they record superweak bioluminescence, which is important in some biophysical studies. In medicine, an electron-optical converter is used to enhance the brightness of an X-ray image, which can significantly reduce the radiation dose to a person. Also, photocells are used in photocolormeters (optical devices for measuring the concentration of substances in solutions) (Application of the photoelectric effect in medicine).

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THE SUN IS NOT ONLY A BEAUTIFUL STAR

Ruslana Hurska

Faculty of Chemical Technology

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Solar activity has been growing in recent years. Very often we hear about it and magnetic storms, but we know little about their impact on people. Everything on

Earth depends on the sun. The planet's magnetic field protects against the solar wind, but there are particles that reach the earth.

Man is affected by many cosmic factors, namely:

1. Infrasound. It is a very low-frequency oscillation. Infrasound is formed at high latitudes, where aurora borealis occurs, then it spreads to all latitudes and all longitudes of the Earth. Infrasound is formed not only during auroras but also during earthquakes, volcanic eruptions, hurricanes associated with magnetic storms.

2. Micropulsations. These are short-period oscillations of the Earth's poles. They act on biological systems, especially the nervous system.

3. Ultraviolet radiation.

During magnetic storms, there is a deterioration in the condition of patients with cardiovascular disease. Studies have found that on the day when the sun erupts, the number of myocardial infarction attacks increases.

Observations of patients with hypertension have shown that some patients respond to pre-storm conditions. The initial period of the storm has the most detrimental effect. It was also found that during the years of reduced solar activity, the number of cancers increased.

During a storm, childbirth begins more often, and at the end of the storm the number of very rapid births increases. The number of injuries and accidents is also increasing.

The energy of even a few particles reaching the earth is enough to inevitably affect all living and non-living things on our planet.

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GLOBAL WARMING

Denis Kadletsov

Faculty of Chemical Technology

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Global warming is one of the main issues of the century. Chasing for advantages of industrialization and developing science, people have damaged our nature.

In the next 50 years, half of our current population will find themselves in a dangerous world with unstable weather conditions, causing horrifying natural disasters (Global Outlook Report, 2019). Regarding the fact that every year our ecology becomes more neglected, it is notable that we require fast and far-reaching actions to avoid this disaster. However, even if we start acting right now, life will not be the same as at the beginning. In most regions, an average annual temperature can rise for more than 5°C.

The main reason for global warming nowadays is the enormous emission of greenhouse gases, produced by us every day more and more. Greenhouse gases,

being produced naturally, play a vital role in the formation of viable weather conditions on our planet. They let sunrays through themselves and keep that incoming heat that these rays bring (Drawdown, 2016). A long time of industrialization in addition to agricultural practices and deforestation have increased greenhouse gas concentration in the atmosphere. Moreover, our growing population and general development of countries will only increase the volumes of greenhouse gas emissions (Kyoto Protocol Reference Manual, 2015).

In October 2018, a special report was published by IPCC (Intergovernmental Panel on Climate Change). This report highlights issues that can be avoided by limiting global warming to 1.5°C. Nevertheless, to reach these results, we should be more responsible and conscious of our nature and ecology.

Thus, it is mandatory to reduce greenhouse gas emissions by more than half in ten years (Global Warming, 2018). To sum up, it is required to mention that global warming is a problem that needs to be solved instantly. People should at least try to maintain the condition we have now and think about improving the situation. Without no doubt, it's another challenge for humanity.

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BIOMEDICAL BODY DATA SENSORS

Ostap Kalapun

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Nowadays, as long as medicine grows its knowledge base, engineers invent brand new technologies and scientists discover recently mutated viruses, it demands

to spend much more money on insurances and time on self-care. The world changed its pace in all meanings. Obviously, people have to adjust their lifestyle to all these obstacles. That's how we came to implementing wearable and pocket-technologies to our agenda.

So, the capabilities of healthcare monitoring devices are extremely beneficial, especially for persons with chronic diseases and in time of local or worldwide viruses spread. For example, during the COVID-19 pandemic, some commercial and non-commercial organizations started developing mobile apps that provide machine learning and remote accessible patient's health indicators using simply phone connected with certain trackers-sensors or simply completing daily surveys respond for body data condition, like it did Duke University with its CovIdentify study.

To classify biomedical devices and their purpose, we need to clarify the measuring system, which can be divided into two categories. The first one is chemical which determines organism condition referring only to the concentration of certain chemical substances. The second is physical. It includes parameters that have physical nature like temperature, pressure, or electric signals. (Zhou, Wang, & Cui, 2015, Section 2)

Classification of sensors bifurcates into invasive and non-invasive. The invasive method obtains information using straight intervention to your body, for example puncturing some organs like biopsy, endoscopy, or bronchoscopy which require even minimal incision. They're not so efficient, because of the frightening condition of a patient that may cause deviation in the result of the test. In turn, non-invasive sensors get information externally, these are extremely popular nowadays. For example, patients with diabetes have to prick their fingers near 8 times every day to check glucose levels (Black, 2018 CNBC). Non-invasive sensors prevent the situation where a person with this type of disease has no aseptic needle.

How does this technology work? Two electromagnetically connected high-frequency split rings one is set to 'in' as a reader, and the second is set to 'out' as an oscillator, also known as a tag, and serves as a power source for the whole micro scheme. Circuitry placed on a metallic trace sized not bigger than a penny (Baghelani, Abbasi, Daneshmand, & Light, 2020, Fig.1(a)). Electrical signals are directed to a muscle, but the highest amount of glucose is located in the basal layer which contains interstitial fluid (Baghelani, Abbasi, Daneshmand, & Light, 2020, Fig.1(d)). That liquid contains around 40% of glucose and the least amount of any other cells like lymph or plasma (Thennadil, Suresh & Rennert, Jessica & Wenzel, Brian & Hazen, Kevin & Ruchti, Timothy & Block, Marshall., 2001, p.357). It's the best measure zone because fringing fields have the highest concentration there as well. As a result, measurements will be the most accurate. Under 'concentration of fringing field' I mean glucose compared with water causes much more frequency shift, that's why there are two resonators – to compare two frequency values. (Baghelani, Abbasi, Daneshmand, & Light, 2020, Fig.6(b))

At the time, cardiovascular and pulmonary biosensors are extremely popular as it becomes to be healthier and train your body. Physical exercises and overload are straightforwardly bounded with heart and lung working rhythm. Different companies use this trend for commercial purposes and implement their products namely

smartwatches. Anyway, it caused evolution and improvements heart-lung directed technologies, for example, sin electrocardiogram, heartbeat sensor and oxygen in-blood concentration which are used in wearable devices.

Heartbeat can be determined in points where arteries are not so deep inside, like our wrist, also it's called a peripheral pulse. That's why it is so convenient to put this measuring system in your smartwatch. An ECG can be determined by using a photoplethysmograph method, which means that the sensor will optically detect changes in blood volume during the systolic and diastolic phase which depends on atrial fibrillation and its concentration by illuminating epidermal layers and comparing light absorption changes. As I said, light beams pass through the skin and then the device's processor records a tachogram that shows irregularity between heartbeat amplitude and photoplethysmograph indicators (Isakadze & Martin, 2019). Sinus rhythm amplitudes include P-R, QRS, and Q-T intervals and each of them responds to the specific cardiac contraction that has its own normal values (Majumder, Mondal, & Deen, 2017). Thus any smart device's processor transfers all this data exactly to an electrocardiogram.

Blood oxygen saturation sensors use very similar technology to ECG because it has a photoplethysmograph method as well. But the micro scheme has to process the light-absorbing information diversity between oxygenated and non-oxygenated hemoglobin. It differs by microwave range – from 660nm to 940 nm, simply talking it differs by red color tone. Saturated with O₂ hemoglobin becomes light-red, comparing to non-saturated dark-red. (Zhang, Gao, Nitzan, & Cohn, 2016)

Non-invasive biomedical sensors have powerful potential. Technologies of measuring body data without any medical incision are rapidly increasing quantitatively or qualitatively their 3 the most important factors: availability – the price mustn't be an obstacle for any wishing person; accuracy – results of the test mustn't have any major oversights; functionality – the device must work widely as it can and include as many organ-related characteristics as it can. The principal idea of biosensors nowadays in terms of the pandemic is to prevent as much as possible face-to-face contact between people in any medical institutions, thus a specific person could measure body data at home. Let's turn our pocket devices into personal doctors!

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IS MANKIND THE ONLY KIND OF LIVING IN THE UNIVERSE?

Artem Kononenko

Faculty of Applied Mathematics

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

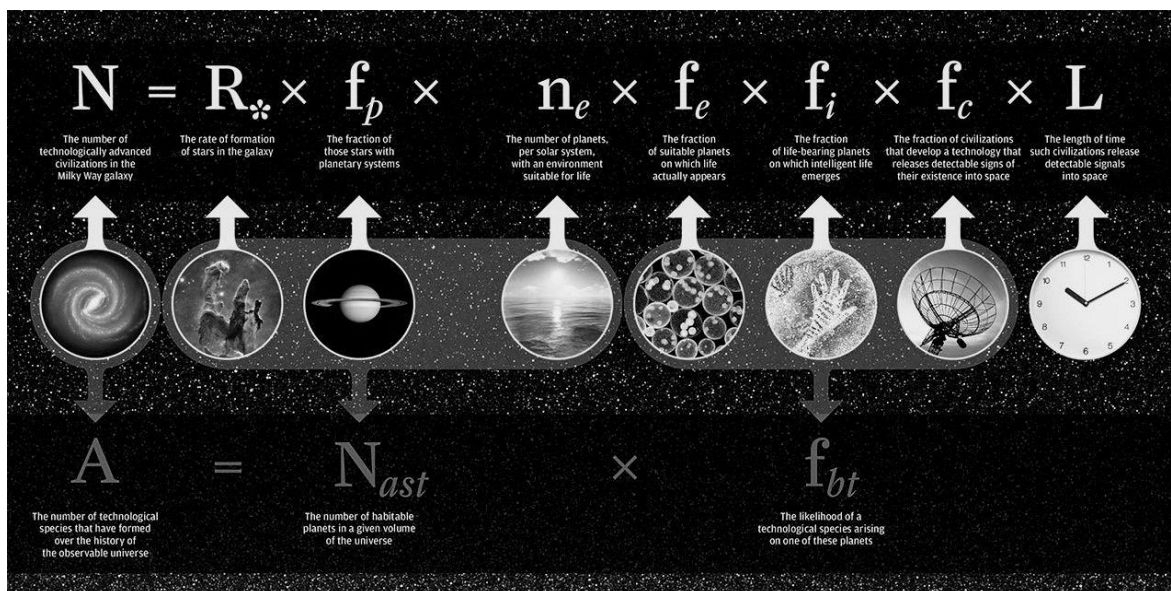
Do you believe in life outside the Earth? How close are we to answer the question "Is humanity the only kind of living in the whole universe?" Don't you find these questions pessimistic ones? Woodruff Sullivan, a professor of the University of Washington stated, "Rather than asking how many civilizations may exist now, we ask 'Are we the only technological species that has ever arisen?'"

The famous Drake equation, which was discussed by experts in West Virginia in 1961, told us about how to know how many technologically advanced civilizations are in our galaxy. But has this number ever been calculated? No. In the 1960s, when this equation was explored, people were not able to say even about the quantity of stars formed in the galaxy, the first multiplier in this equation.

Here this equation is:

To say the truth, now humanity is much more developed than in 1961 and now this equation doesn't look so fantastic.

What's an exoplanet? An exoplanet is any planet beyond our solar system. The first exoplanet was found in the r1990s and since then there were discovered more than 4 thousand exoplanets in more than 3 thousand systems with about 7 hundred systems with two or more planets. Moreover, there are a lot of other space objects



that have resembling characteristics and require confirmation.

So what are we trying to find? Scientists are concentrated on finding water on exoplanets. There is a proviso that humanity is searching for a life similar to ours, it means that this kind of living might look the same as ours in many ways. But what if water and other habitual elements are not needed for life in some system? How would this life look like? Unfortunately, we aren't ready to answer this.

So, are we ready to answer if we are alone in the universe? According to the results of researches about exoplanets we are likely to be alone if the existing civilization develops only once in 10 billion trillion chance.

“Before our result, you'd be considered a pessimist if you imagined the probability of evolving a civilization on a habitable planet were, say, one in a trillion. But even that guess, one chance in a trillion, implies that what has happened here on Earth with humanity has happened about a 10 billion other times over cosmic history!” (Adam Frank, professor of physics and astronomy at the University of Rochester).

Before you think that the chances that we are not alone in the universe are tiny to be real, you should understand how great our universe is. People spend a lot of energy exploring space since the first man looked at the sky at night. How many stars can we see in the night sky? How many more we can't see? It's impossible to imagine how powerful modern telescopes are. And day by day they are helping us to find out new stars, planets, and other space objects. So when you think about our endless universe you realize how small mankind is comparing to space scale. Now the probability that we are not alone doesn't look so low.

But what if another kind of life can be closer than we think. Let's look more carefully at our solar system. Each planet is unique. Jupiter is the biggest planet in our solar system, it has 39 moons and some of them are really big. What if some of them can support life? Europa is one of the greatest moons of Jupiter. The biggest part of its area is covered by ice. Scientists guess that the thickness of this ice shell is about 15-25 kilometers, and there is a liquid ocean under it. It is also possible that Europa was populated millions of years ago, not long after it was formed. The temperature of the Sun was much greater, so Europa's ice shell could be melted. Also, this ocean consisted of much more carbon dioxide, which means that some kind of bacteria could exist.

There are two more of Jupiter's moons that can support life. Titan, for example, is the only object in our solar system, except the Earth, which contains liquid water on its surface. So, these objects need to be furthered explored.

Do you still think that humanity is the only kind of living in the universe? There are a lot of space objects which potentially can support life. And we only have studied the small part of the Milky Way, while life can exist in other arms of our galaxy or other galaxies.

Are there some alternative ways of exploring life outside our planet? People tried to send messages to space a lot of times. But how to create this message to be understood, as aliens don't know our languages. That's why humanity tries to use pictures to describe our kind of living. Messages to extraterrestrial intelligence are being sent as radio signals. These messages have a purpose to inform other forms of life about us so that they could find us. But these messages also have some risks as probably this form of life might be more advanced than humanity. It means they have more power than us, and they can come to us with bad intentions. There are a lot of options for what could happen if our messages were caught by other kinds of living.

But this method of finding alternative forms of life is not really effective as well. Aliens will be able to get in touch with us only if they are much more advanced than we are. Probably the most efficient way to find extraterrestrial life is to explore space objects by space probes. The most popular mission of sending space probes to the open space is the Voyager program. Voyager-1 and Voyager-2 started their trip 43 years ago, and they are already 22 billion and 18 billion kilometers far from us. They helped humanity too much to explore space objects in our solar system, but they are not really good to collect knowledge about furtherer objects. People don't have so good technologies to use this method of finding other forms of life.

Why humanity is so interested in finding extraterrestrial life? Will it bring some positive consequences for our life? Will this kind of living become our friends, or they won't be so kind to our planet? Only time can help us to answer these questions.

I am young enough and I hope that when I become older, I'll be sure there is someone else living far away from us. I find astronomy as one of the most interesting and perspective sciences nowadays.

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WHAT DO DIABETES AND LACK OF SLEEP HAVE IN COMMON?

Yelyzaveta Kopieikina

Institute of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

In recent years, people's lives have become fuller. Every adult spends about 9 hours a day only at work and 3 hours to get to work and back to home, to eat and cook food takes about 3 hours, it takes another 1.5 hours to shower and toilet, not counting women who spend time on makeup. It also takes about 2 hours a day to spend time with your relatives. It is all is true only if you do not consider critical situations such as traffic jams, doctor visits, and shopping. And this all leads to the fact that the time for sleep remains catastrophically short.

44% of 30-49-year-olds sleep less than 6 hours per day. For normal life, adults have to sleep for 7-8 hours per day (Fiorenzi, 2020).

Therefore, our body's reaction to sleep loss can resemble insulin resistance, a precursor to diabetes. Insulin's job is to help the body use glucose for energy. In insulin resistance, cells fail to use the hormone efficiently, resulting in high blood sugar (Mann, 2020).

The level of blood sugar is not the only problem that causes our temp of modern life. The hormone ghrelin is synthesized in the stomach and is responsible for appetite and satiety. Its excess can lead to a constant desire to eat and the development of obesity. However, when we sleep not enough time ghrelin starting to synthesize in our bodies in large quantities. The feeling of hunger pushes people to eat more and more food and the feeling of unsaturation makes them eat large portions in addition to everything, due to the lack of free time, people are more likely to eat fast food since cooking in large quantities will take much longer. Accordingly, the

consumption of fast-dissolving carbohydrates in unstandardized quantities will lead to obesity. The risk of developing diabetes is increased significantly in people who are overweight.

Unfortunately, scientists have not yet found a way to replace sleep or cure-all people from diabetes. Therefore, in order to take care of yourself and maintain your figure, it is better to sleep 8 hours instead of meaningless arguments in the comments under the next post on Twitter.

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HOW MUCH NICOTINE DO WE GET FROM DIFFERENT SOURCES?

Kostiantyn Hlomoza

Faculty of Biomedical Cybernetics

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

People always use nicotine by smoking cigarettes, electronic cigarettes or even chewing nicotine gums and using patches. Let us say that you know the amount of nicotine in the cigarette or in the liquid for vape. But what does it mean? How much is this harmful for a person? How much nicotine can you use before the consequences will be lethal and how much do you really take by the day if you smoke or use other ways of taking that substance?

We hear lots of stories that nicotine is a new type of narcotic and it is as toxic as potassium cyanide. In addition, vapers are dying early age. The lethal dose of nicotine is just 60 mg for a human (Mayer, 2014), but it can be up to 18 mg of nicotine in one bottle with liquid for vape.

Why is the lethal dose of 60 mg? Why do we speak exactly about this quantity? The experiments of finding the dose were conducted with live animals, especially rats because a scientist cannot involve people in the experiments which can cause death. Thus, there was set an LD₅₀ dose (it causes death for 50% of people in 100% cases) in the 20th century (Mayer, 2014). But soon, there was found out that the cases of dying because of nicotine intoxication of 60 mg are very rare and there are records of people who have survived after taking nicotine in amounts far higher than 60 mg (Larson & Silvette, 1971). Once there was an attempt of suicide consumption of 4 grams of pure nicotine. It caused vomiting and intoxication without death. Therefore, there was a suggestion that the fatal oral dose of nicotine is about 0,5-1 g. This dose is toxic for dogs, which means that it is also for humans (Malizia et al., 1983; Smolinske et al., 1988).

How much nicotine can you take from different sources? The amount of nicotine in a cigarette differs from the amount absorbing by your organism because you are not taking nicotine simply by injecting it. It can be absorbed by the lungs,

mucous membrane, and skin. Patches keep up the level of nicotine during a day (Institute of Medicine, 2001).

To know, how much nicotine absorbs in a body, the participants of experiments chew the gum or smoke the cigarette. After the process finishes, the scientists measure the level of nicotine and cotinine (a metabolite of nicotine) during the day. It turns out that in 20 minutes of chewing gum a person in common receives the amount of 30-40% nicotine from the gum to the blood. So, if you have gum with 2 mg of nicotine, you will receive about 0.85 mg of nicotine. For cigarettes, we receive only 10% of the number that is written on a pack (Institute of Medicine, 2001).

But there is one problem with smoking. Scientists were getting the amount of received nicotine from special smoking machines (by that method manufacturers write the amount of nicotine on the packs of cigarettes), but it turned out that people don't smoke like machines. When the cigarette is being smoked for a long time, it has an increased time of smoldering that called tar titration or self-titration. The smoking "habits" depend on the amount of nicotine in the cigarette. With the high-yield cigarette, you can chew the filter or wet it with saliva. But with the low-yield cigarette, you can do a puff faster and deeper, decrease the time between puffs, and smoke more frequently during the day. Everybody knows that nicotine is not the main toxin that people receive from the process of smoking. It means that people who smoke low-yield cigarettes do not receive less nicotine. On the contrary, they receive more nicotine due to more frequent smoking during the day, while smokers of usual cigarettes receive less nicotine, but more other substances that cause dependence (Benowitz et al., 1983).

How much nicotine can you receive from electronic nicotine delivery systems (ENDS)? In medicine, electronic cigarettes are regarded as the replacement for conventional cigarettes. Firstly, there are 3 generations of electronic cigarettes. In all experiments, the participants were smoking cigarettes in 10 puffs during the first 5 minutes and the residual hour at their discretion. The experiments have shown that the 1st generation of ENDS gives the least amount of nicotine due to the small amount of steam compared to cigarettes. People were filling the 1st generation with a liquid that included 18 mg, 24 mg, or even 50 mg of nicotine. But even 65 minutes were not enough to take the amount of nicotine that could be taken by 5 minutes of smoking the cigarette (Farsalinos et al., 2015). The 2nd generation of ENDS was quite better. If you use a good system with 18+ mg of nicotine, you will receive nicotine as from a cigarette (Farsalinos et al., 2014). But the big changes came with the 3rd generation. If you have the liquid with 3+ mg of nicotine, you will have in blood such amount of nicotine as if you have been smoking an ordinary cigarette.

In one investigation there was taking the data from YouTube to see how long people were puffing the cigarettes compared to ENDS. In general, the puff duration for smokers in videos was 2,4 s, but for ENDS users it was quite long (mean = 4,3 s). Men outnumbered women by about 5:1. The age of smokers was between 19 and 35. Also, the puff duration for somebody was up to 8,3 s (Hua et al., 2013).

If you want to "jump out" from cigarettes, the vape will be a good alternative, because it does not have substances like resin, hydrogen cyanide, formaldehyde, lead, arsenic, ammonia, benzene, etc. And the good decision will be to choose high-quality

vape with the high-nicotine liquid. Because when you have a little nicotine, your puffs will be deeper and faster, so that will call more dependence and less nicotine receiving.

To sum up, systematically, in 5 minutes you can obtain about 1-2 mg of nicotine from the gum, from a patch – 5-22 mg, from a cigarette in 10 puffs in 5 minutes – 1-2 mg, and from the 3rd generation of ENDS with a liquid that contains 3 mg of nicotine – 1-2 mg of nicotine. Also, there are other ways of getting nicotine like spray or snus, but the sources that were mentioned previously are the most popular nowadays.

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**BONE BIOMATERIALS: CLASSIFICATION OF MODERN SPECIES
AND FUTURE PERSPECTIVES**

Polina Kovalchuk

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Bone biomaterials play a vital role in bone repair and regeneration. Due to the latest data over 2 million surgeries are registered in the USA (Ishack et al., 2017). We face an increasing need for different types of biomaterials. Currently, biomedical engineering can suggest various methods of creating bone tissue substitutes, which are far from perfection, but there are a lot of new directions of development in this sphere.

Nowadays, a huge number of different materials are being developed, and we can take a closer look at some of them. The first one is silk–silica. Silk fibroin has unique mechanical properties and possesses good biocompatibility, elasticity, and toughness, which make it a good candidate for bone repairing (Mieszawska et al., 2010). The addition of silica to the silk films greatly affected gene expression. Evidence for early bone formation in the form of collagen fibers was obtained on the silk/silica films. The other one is a hydrogel. Dubrov et al. (2019) found out that new hydrogels from agarose (a polymer made from sugar molecules derived from seaweed) mimic many aspects of the environment surrounding human cells in the body and can serve as a framework that helps organize cells in the tissue. Scientists modified agarose gels in such a way that their physical properties approached the properties of the natural extracellular environment.

There is a huge number of varieties of bone biomaterials. Gao et al. (2017) classified the most basic groups, they got: allografts, autografts, xenografts, and synthetic grafts. If we look at them, each type has its own disadvantages or difficulties in working with such material. A perfect graft can be defined as bio-comparable to the host environment, has perfect mechanical properties, and does not trigger an immune response. For example, autografts have primarily been the material of choice to replace lost bone, but this method has several drawbacks, including both surgical complications and its limited supply. That is why science should continue to develop and create new types of biomaterials.

So, there are two most perspective approaches in the development of bone artificial and natural tissues. They are silk-silica, which is brand-new material, and hydrogel, which can adapt to our tissues and become the basis for their growth in the long run. Such a variety seems promising in terms of the creation of biomedical materials that can effectively replace the natural structures of the body.

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**INVESTIGATION OF THE QUALITY OF THE URBAN ENVIRONMENT
AFTER NUCLEAR CONTAMINATION BY INSTRUMENTAL AND
BIOINDICATION METHODS**

Viktoriiia Lutchenko

Faculty of Biomedical Engineering

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

At the beginning of the XX century, our ingenious compatriot V. I. Vernadsky developed the concept of the Noosphere, the main idea of which was the knowledge and harmonious usage of natural laws by men, but the development of civilization went the other way. As a result, there is a deep transformation of the natural environment, which occurs under the influence of anthropogenic factors, aggravation, and actualization of problems of preserving ecosystems and the biosphere as a whole.

To get out of this situation, new approaches and methods are needed. They should be based on a deep and thorough study of such features of ecosystems as heterogeneity, stability, and dynamics; also they should be presented not only in the form of a system of mathematical formulas but also reflect real dependencies, patterns, and prospects for the development of a particular ecosystem. This is exactly the essence of bioindication – the assessment of environmental factors and their changes by using their signs or properties of Biosystems.

Therefore, each species can be considered as an inexhaustible source of diverse and rich information. Since the diversity on the planet is represented by almost two million species of organisms – the source of information is almost limitless.

Currently, bioindication issues are quite widely discussed all over the world, in particular, while monitoring the effect of small doses of ionizing radiation on living systems (Borisova, 1998). However, it is important to note that the reactions of organisms to adverse factors are not strictly specific, because different factors can cause the same reactions. Therefore, bioindication should include a set of studies

conducted at different levels of life organizing – from the cell to the coenosis. At each level, there are "critical" elements that can become objects of bioindication.

In my work, I relied precisely on the accident at the Chernobyl Nuclear Power Plant, which caused mosaic nuclear contamination of territories, which will last for a long time, which makes the issue of constant monitoring of such territories relevant. Research on Chernobyl problems has been going on for more than 30 years and is International in its nature, and there is a hard disagreement among understanding and assessment of the consequences of nuclear contamination for biota (Shcheglov, Tikhomirov, Tsvetnova, Kuchma, 1996; Kartel, 1991). Research on the problems of the Chernobyl accident is widely reflected in scientific publications and almost all of them are geographically connected with the 30-kilometer exclusion zone. No studies of the condition of the ecosystem were conducted outside this zone. This explains the relevance of this work, which examines the problems that are in the center of attention of modern radiobiology: the effect of low doses of radiation on living organisms and the assessment of the quality of the environment contaminated with radionuclides (Dragan, 2003; Borisova, 1998).

The scientific novelty of the study is that for the first time an attempt to compare the results of assessing the level of pollution of a city affected by nuclear contamination was made with instrumental and bioindication methods.

In the course of this work, it is concluded that the use of bioindication for monitoring areas contaminated with radionuclides is a significant addition to instrumental methods of Environmental Control since it allows you to obtain an integral characteristic of the environment, evaluate the entire set of active factors that also interact with each other.

The practical significance of the work lies in the fact that its results can be used to monitor the general and radioecological situation of areas affected by the Chernobyl accident and nuclear contamination in general.

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HOW GLOBAL WARMING AFFECTS ANIMALS

Kateryna Olenchuk

Faculty of Chemical Technology

National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

“Climate change and biodiversity are interconnected. Climate change is reshaping global biodiversity. Unsustainable human activities that increase the accumulation of greenhouse gases and hinder the natural balance of atmospheric greenhouse gases aggravate the effects of climate change on biodiversity. Rising seas-levels could inundate coastal habitats and stem the flow of nutrients from the ocean to the terrestrial ecosystems. Altered climate regimes directly affect wildlife, their behavior, migration, foraging, growth, and reproduction.” (Harding, 2010).

Global warming is responsible not only for shrinking ice caps but also for a surge in extreme weather that is causing heat waves, forest fires, and droughts.

The problem of global warming is very important. Every day it is becoming more and more dangerous.

I want to show some examples:

- Sea levels are rising at the moment, so many islands are destroyed and maybe some disappeared.
- Natural disasters are occurring more frequently, so soon the world is in destruction.
 - More animal species are going extinct every year due to changing ecosystems and animals can't survive in a new habitat.

Animals can't help themselves. Some wildlife species that suffered from global warming include caribou arctic foxes, polar bears, penguins, gray wolves, and salmon.

Global warming affects animals in the following ways:

- They have to adapt to the changing climate, and they sometimes can't do this, because each animal has its own habitat.
- Air pollution has become the main problem these days. Clean air is important to humans, but we can live in cities full of pollution (and the person knows about it). In contradistinction to humans, animals can only live in the wildlife.
- Some animals have to alter their breeding and feeding patterns in order to survive.

I think people should protect animals because we are the problem with everything. Humans do it every day, we ruined our planet. You have to start with yourself, what do you do for animals every day? You can plant a tree to reduce global warming, use gas fuel or help animals if there are in danger. If you want to help save animals, then give up the car. Maybe it will be inconvenient, but it will be useful both for you and for nature. The emissions from the car pollute the air and cause global

warming. A bicycle will help you keep fit and is a more ecological way of getting around. You can reduce your meat intake. Don't need to become a vegetarian, just reduce the dose. Your every action affects nature.

All in all, global warming is advancing, all societies have therefore evolved strategies to cope with some intrinsic level of climatic variability — for example, flood prevention, building design, weather forecasting, early warning systems, and the weather-hedging industry are all forms of human response to the variability of climate or the extremes of weather (Green & others, 2003).

To conclude, people should try to help animals and other people. We can do everything if we want it. I am sure that our help will be important and will be appreciated in the future. We must preserve our planet as it was, and don't destroy the ecosystem. If one person will be rescuing one animal, it will greatly help preserve the population of some species. We should be kinder to animals, they deserve it. We can stop global warming. For this, it is necessary to prohibit some things that a person does. Nothing will change for us, but nature will be alive. Perhaps in a couple of years, we will see the harmony between nature and people. At the moment, many people are beginning to defend nature and refuse those things that develop global warming. I hope our country will be among those supporting the idea of nature protection. Global warming is the main problem and unfortunately unsolvable problem. A lot of things affect this phenomenon, but still, these are the consequences of human actions. Should animals suffer because of us? Nature is a separate world, and we should not try to destroy it. Every time we cut down trees or kill an endangered species of animals, we kill ourselves. We must stop. There are no people without nature. The main goal to reduce global warming is to reduce the use of fossil fuels such as oil, carbon, and gas, and replace them with renewable and clean energy sources while increasing energy efficiency. People must start using natural sources of energy. Then we can save the ecosystem. It is also worth merging with nature and not trying to ruin it. We should protect endangered animals, and don't be happy to use oil, because it is killing them. Let's save nature together!

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EVOLUTION OF ANTIBIOTICS

Oleksandr Rybka

Faculty of Sociology and Law

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The modern world cannot imagine a safe existence without the use of antibiotics. It is impossible to cure a person with a severe infectious disease without the use of antibiotics. Their discovery can truly be considered epoch-making as they

have opened up new, effective ways to fight infections that have claimed countless lives.

Nowadays everyone knows penicillin. This event is the first drug, thanks to which humanity has entered a period in which they were able to resist disease.

It was discovered in 1928 by the British scientist Alexander Fleming. Penicillin was first tested on a 1941 man who was infected through scratches, but they were unable to save his life due to a lack of awareness of the proportions of the drug. Only a year later, they still managed to achieve the desired proportion.

A few years later, A. Fleming, G. Flory, and E. Cheyne were awarded the Nobel Prize in Physiology or Medicine. Since then, more and more antibiotics are being discovered and studied. Fewer people began to die. The world thought it had defeated infectious diseases, but the reality was different. Over time, microorganisms have developed immunity to antibiotics. Many deadly diseases have become difficult to treat. In the near future, humanity may face the fact that common infections and trams can kill people on a large scale (2017).

However, humanity continues to move forward, researching antibiotics to overcome the existing problem. In recent decades research by scientists on antibiotics has been futile. However, in 2015 American scientists made a sensational discovery in this area. They discovered a new method of growing bacteria, thanks to which they got 25 new antibiotics. The most intensive research on antibiotics was conducted at the beginning of their formation, but after 1987 their attempts were in vain, they could not invent an effective device. Since then, microbes have become more resistant to antibiotics. Today, there are no drugs that act on tuberculosis bacteria.

Researchers at Northeastern University (Boston, Massachusetts) conducted a study using the soil with the highest number of antibiotics. They created a special structure - an "underground hotel" for bacteria. One bacterium was placed in each "room" and then buried in the ground. Unique soil chemical processes took place in such an environment.

Subsequently, they dug the structure out of the ground and investigated the chemicals producing by microbes. The group's leader Professor Kim Lewis said that with this method they have already obtained 25 new antibiotics.

Tests of teixobactin in mammals have been successful. It was used to cure experimental mice of a lethal dose of methicillin-resistant staphylococcus. The next stage is to test it on people. Scientists believe that bacteria will not be able to develop resistance to it because it affects the fats that needing to produce the cell membrane of bacteria.

This discovery caused a sensation among scientists. After so many years, scientists have managed to develop an effective drug in conditions of bacterial resistance to antibiotics. The researchers said that you do not need to stop there, you need to produce more drugs using soil (Gallagher, 2015).

In conclusion, humanity must develop more medicine, including effective drugs, for deadly diseases that humanity has not yet overcome.

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ANALYSIS OF LASER THERAPY AS ONE OF THE METHODS OF PHYSIOTHERAPY IN DIABETES MELLITUS

Iryna Semenyuk

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Diabetes mellitus is one of the first non-communicable diseases in the world (after cardiovascular and oncological). According to the WHO, in 2019, one person dies from this disease every 8 seconds in the world. According to the IDF forecast, by 2030 the number of patients with type 2 diabetes will be up to 552 million (Shishkina, Suntsov, 2005). About 1,300,000 diabetics are registered in Ukraine and more than 100,000 new cases are registered annually. The number of people with impaired glucose tolerance is growing extremely fast. Of these, 15-20% eventually suffer from type 2 diabetes. (Tronko, 2012). This type of diabetes is more common and accounts for 90% to 95% of all types of diabetes. Type 2 diabetes is characterized by insulin insensitivity, resistance to insulin, further decreased insulin production and end-stage cell deficiency.

An important place in the complex treatment of diabetes is occupied by methods of physiotherapy, the use of which helps to increase the effectiveness of treatment, support sustainable compensation, prevention of development and progression of laying, subsequent diabetic angiopathy. Of course, a significant role in the treatment of patients with diabetes belongs to the spa stage, during which the regime of conventional methods of treatment of diabetes (diet, medication) affect the natural and reshaped physical factors. The purpose of the literature: to analyze the method of physiotherapy such as laser therapy for type 2 diabetes.

Laser therapy for diabetes is carried out using various methods of exposure (monotherapy) and their combinations, which significantly increases the effectiveness of therapy. To achieve a therapeutic effect, you can implement different methods of laser therapy: non-contact, contact, contact compression. The following methods of laser therapy can be used in sanatorium practice: through the skin, intravenous, hydro laser shower with different ranges of action: red, infrared, ultraviolet.

The purpose of laser therapy is to normalize the functional state of the vascular system, improve the rheological properties of blood, restore bioelectrical activity, reduce the tone of peripheral arteries. Low-energy laser radiation (NELV) is of major

importance because it has a direct and indirect effect on various links in the pathogenesis of vascular lesions of the lower extremities in diabetes. The action of NELV is based on the activation of cellular enzymes, increased energy metabolism, and synthesis processes in cells. This leads to a decrease in the phenomena of asthenia, pain, and paresthesia in the lower extremities increased tolerance to exercise.

It is proved that the action of laser radiation has immunocorrective, anti-inflammatory, anti-edematous, analgesic, desensitizing effect, causes improvement of microcirculation and tissue tropism.

Methods of external irradiation of zones of necrosis and trophic ulcers of extremities at a syndrome of a diabetic foot became widespread. Under the influence of local laser therapy accelerates the cleansing of wounds from necrotic tissues and microflora, there is a restriction of the area of necrosis.

Laser exposure to acupuncture areas of the lower leg and foot provides significant microcirculation due to the functioning of new capillaries and acceleration of the intravascular circulation. Helium-neon laser radiation stimulates the processes of repair and epithelialization, normalizes blood parameters, and significantly accelerates the healing of trophic ulcers. Infrared laser radiation significantly improves microcirculation in the affected limb. Positive clinical results of laser therapy of patients with diabetes are confirmed by the improvement of peripheral blood circulation and microcirculation of the lower extremities. Changes in rheovasography of the vessels of the extremities after one procedure and course of treatment are unidirectional but more favorable in the course of exposure. Thus, a single procedure of NELV causes an increase in blood supply to the legs mainly as a result of normalization of the tone of the vascular wall on the legs, and after a course of treatment due to normalization of vascular tone and improvement of venous outflow. This increases the rheographic index on the legs, there is an increase in volumetric circulation. The improvement of peripheral blood circulation and microcirculation is confirmed by thermometry: the skin temperature of the big toe increases, the distal proximal difference decreases. The use of NELV affects both hyper- and hypercoagulable blood potential. It has been proved that plasma tolerance to heparin and fibrinolytic activity is normalized under the action of laser radiation, which indicates a decrease in blood coagulation capacity (Goncharuk, 2017).

An analysis of the feasibility of laser therapy in diabetes was performed. This method of physiotherapy improves the patient's condition and partially reduces the symptoms.

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CLIMATE PROBLEMS AND SOLUTIONS

Dmitry Slyusarev

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Climate is the most pressing question nowadays. Hundreds of years of consumption of Earth's resources led to the exhaustion of our planet. What today causes a lot of failures in nature like droughts, ice melting, destruction of the ozone layer, and many others. Therefore, I want to tell you about the biggest climate problems and the ways to reduce the harmful effect on nature.

The main reason for almost all problems in our climate is global warming and, unfortunately, the reason for all changes in our planet's temperature is human activity. Greenhouse gases are gases that absorb and emit heat and make our planet warmer. The most widespread greenhouse gases are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. All of them are responsible for the greenhouse effect on our planet. Since the Industrial Revolution, which happens in 1750 human activity has led to a 45% increasing in GHG emission in our atmosphere, specifically, carbon dioxide: from 280 points to more than 400 in 2019. The largest sources of greenhouse gas emissions from human activities are from burning fuels, heat, land usage, forestry, industry, electricity production, and many other factors. Speaking about carbon dioxide (CO₂), which percentage is the largest among all GH gases (something about 81%) the main sources of its emission are burning fuels like oil, natural gas, and coal and biological waste like plants or trees. CO₂ can be removed from the atmosphere. This process can be done by plants due to their possibility of absorbing carbon dioxide and turning it into oxygen. It's called photosynthesis or simply the biological carbon cycle.

But what can be done by each of us to save Earth? We just need to become more eco-friendly in our everyday life. Try to recall the last time you left your table lamp turned on while you were away or when you left your tape opened while you are brushing your teeth and don't use the water. I guess that all of us do this thing from time to time. Now suppose that, for example, half of the residents of a multi-story building are doing this every day. Can you even imagine how much energy and water are just wasting to nowhere, while factories and water pumping stations continue to produce it, polluting air? So, I guess, that looking after your unnecessary lighting and running taped are turned off is a good first step in becoming more eco-friendly (and of course it will save your bills).

However, global warming is not the only ecological problem on our planet. Looking for the cheapest way to produce bags has led to discovering polyethylene, which is the main raw material to produce all bags that we use in supermarkets and shops. Did you know, that this bag will dissolve in the soil for approximately 700 to 1000 years, and it's not a joke? This happens because there are no bacteria, which will be able to decay polyethylene. Of course, today we have accelerated decomposition bags, but they are not actually 'decomposed'. They are just 'shredded'

into tiny pieces by bacterias, but they are still dangerous to animals and the environment.

I bet that now I will surprise you: there is a thing called the Great Pacific garbage patch or gyre. It can be described as some kind of “island” but it consists of plastic waste and other trash drifting into the ocean. The appearance of this phenomenon was predicted back in 1988, due to researches about the amount of plastic drifting in the ocean, which then was “collected” in some areas due to underwater currents. Today, the approximate area of the Great Pacific garbage patch varies from 700 000 to 1 million sq. kilometers, which is 0.41-0.81% from all Pacific Ocean square.

What can we do? A lot of people already go shopping with reusable bags and many brands have refused polyethylene and make paper bags instead. Moreover, even in Ukraine, more and more people start sorting their trash, which then goes to the recycling factories, where almost every material can be refurbished and used one more time.

By the way, environmental problems became extremely popular in our days. You’ve heard about Tesla cars that use only electricity, and have almost zero emissions in the atmosphere. But Elon Musk’s company is not the only one! For example, Nissan Leaf is the most popular electro car in the USA, furthermore, even on the streets of my town, I see more and more these automobiles. Such huge companies as Mercedes, BMW, Chevrolet, and plenty of others now are working on electric cars that are doing less harm to our planet, comparing with the gas engine cars.

Of course, the list of environmental problems is much longer than I’ve listed. But I hope that after finding out about these one’s you became more aware of them and will try to live more eco-friendly to our planet. Earth is our home, so it’s up to everyone to make it a more pure and healthier place to live!

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3D BIOPRINTING AND ITS POTENTIAL TO PRODUCE TISSUES AND ORGANS

Pavlo Smovzh

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Currently, there are above 100,000 people that are waiting for vital organs but are not able to find donors (Organ Procurement and Transplantation Network, 2020). Due to the limited availability of donor tissues for clinical application, a lot of efforts have been put into creating artificial tissues and now with three-dimensional (3D) bioprinting technology, we can have such an opportunity.

3D bioprinting is a manufacturing method in which bio-ink is deposited in a layer-by-layer manner, producing fully functional complex tissues and has a great perspective to create organs for transplantation. The main advantage of bio-printed organs, besides the absence of a donor, is that the artificial tissues are grown from the patient's own cells, so the chances of rejection are minimum. Furthermore, bioimplant grows with the patient's body, which is especially important for children and young people. With this method of printing, scientists were able to create a heart, converting human fatty tissue into bio-ink (Noor et al., 2019). Unfortunately, the constructed organ does not beat on its own and too small for the human body due to the incomplete technique of printing.

There are several techniques of bioprinting that have their own pros and cons. Inkjet printing or drop-based bioprinting uses a mechanical print head which deposits the bio-ink in droplets that can then combine and form polymeric structures. This method has high speed and resolution but unable to print highly viscous matrix. Extrusion bioprinting utilizes a mechanical extruder to continuously deposit the bio-ink with the movement of the extruder or platform itself. This method has lower printing resolution, however, it is easier to fabricate 3D constructs due to the continuous extrusion of fiber and relatively high mechanical integrity (Zhang et al., 2019). Stereolithographic 3D bioprinting uses the design of structures that was previously created by computer software. After that controlled laser creates 2D patterns of that structure. Eventually, those patterns will be fused into 3D structures by overlaying them. This technique is able to achieve the high viability of printed cells (Bajaj et al., 2014). Material is an important factor for fabricating and designing 3D constructs that fulfill specific demands. Materials suitable for 3D bioprinting must fit a wide range of criteria, one of the primarily is being bio-comparable. In 3D bioprinting, bio-inks refer to cell-laden biomaterial solutions (Zhang et al., 2019). These biomaterials can be classified as natural or synthetic bio-inks. Overall, compared to synthetic bio-inks, natural ones have better biocompatibility in terms of cell viability and growth.

So, 3D bioprinting is a promising branch of biomedical engineering which can greatly impact future medicine and save the lives of millions of people. There are

different printing methods that depend on organ/tissue needed and the material that will be used. Bio-inks are divided into synthetic and natural. Although the second one is harder to make it is more preferable.

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PHYSICS OF THE USA IN THE 20TH CENTURY

Sergey Smovzh, Vitaliy Smorodinov

Faculty of Informatics and Computer Science

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Physics is the foundation of the majority of natural sciences. It spreads from the microworld and ends with star galaxies. The overwhelming majority of day-to-day technological inventions exist through discoveries in physics. Physical laws are universal, but the area studied by the science is so tremendous that most of its sections are considered exclusively as separate sciences.

The founders of physics are considered the Greeks, who did not conduct any experiments, only observed changes in nature. Unfortunately, physics subsequently fell into hibernation for a long time until the 17th century, when Galileo Galilei and Isaac Newton began to use mathematics as the basis for research in physics.

In the 1800s were developed highly important laws of electricity, magnetism, and electromechanical waves. In addition, were made many researches in optics and thermodynamics.

Modern physics originated at the beginning of the 20th century, with many important discoveries: X-rays by Röntgen in 1895, radioactivity by Becquerel in 1896, the quantum hypothesis by Planck in 1900, relativity by Einstein in 1905, and atomic theory by Bohr in 1913.

The discipline of quantum mechanics, which appeared in 1926, was another breakthrough in the physical environment. It was hard to imagine that she would bring so many positive changes. Quantum mechanics supplemented the already existing knowledge in chemistry and solid-state physics, which entailed the creation of new materials and improved the conditions for subsequent research. The foremost

fields of research have become physics of elementary particles and nuclear physics, which subsequently stimulated the emergence of cosmology and astrophysics.

The 1920s were the most fruitful decade which gave rise to the formation of quantum theory. At the same time, took place the protracted debate over Einstein's special and general theories of relativity, which demolished the usual concept of space and time. Moreover, the first experiments in rocket science began on a farm in Massachusetts.

However, quantum theory was not only of interest to scientists. In 1919, engineer Robert Hutchings Goddard published his book *A Method for Achieving Extreme Altitudes*, where he described a rocket reaching the moon. In addition, in 1919, American astronomer Edwin Powell Hubble discovered that our universe is expanding and irrevocably alters settled perception of space.

The discovery of quantum physics - the theory behind atomic and nuclear phenomena - played a significant role in the development of physics as a science. It thoroughly changed the perception of the world and enabled the development of new technologies such as nuclear power, the atom bomb, lasers, superconductors, and solid-state electronics for computer chips. The events that led to the quantum revolution were a combination of titanic theoretical work performed by European scientists and a huge number of experiments carried out in the USA.

The discovery of how light scatters off electrons in atoms made by American physicist Arthur Compton (1922) was the following prime event. While working at Washington University, St. Louis, he found that high-energy X-rays acted as particles, rather than waves, when they collide with electrons. This effect leads to the invention of photons and the emergence of the main ideas in quantum theory: that light is able sometimes to act like a wave and at other times act like a particle.

At the start of the 20th century, scientists were beginning to comprehend that the earth is being strafed by high-energy radiation from outer space, called cosmic rays. Austrian-American physicist Victor Hess discovered this radiation type between 1911 and 1912. By placing detectors in balloons, he showed that radiation became stronger at higher altitudes and thus was likely to come from outside the atmosphere. During the 1920s American physicist, Robert Andrews Millikan was working on his most important research about cosmic radiation. At the time he was the most famous scientist in the United States and had achieved a Nobel Prize in physics for an innovative measurement of the charge of an electron. His experiments confirmed Hess's original discovery, which most of the physics were stumbled at. Millikan also thought of the name 'cosmic rays'.

At the end of the 1920s, the American physicist Ernest Orlando Lawrence devised the cyclotron – a circular device where charged particles such as electrons and atomic nuclei are accelerated to extremely high velocities and then collided. The cyclotron works by having two D-shaped electromagnets that guide the charged particles in semi-circular paths; between the Ds is a thin gap over which a strong electric field accelerates the particles. The particles used to circle around the cyclotron, gaining higher and higher speeds. Such accelerators became the foundation for 20th century nuclear and particle physics research. The dominant majority of discoveries used devices based on Lawrence's original cyclotron. Furthermore, the

device used to electromagnetically separate uranium-235 for the atomic bomb was also of a similar design.

At beginning of the 1920s, people all around the world were still bemusing by Albert Einstein's breakthrough. Einstein's theory of general relativity published in 1916 suggested that gravity – the force that makes objects fall and planets orbit the sun – is actually caused by mass distorting space and time. In 1919 his theory received undeniable confirmation from the British astronomer Sir Arthur Stanley Eddington who found that the positions of stars were near the sun in exactly the way predicted by general relativity. From the 1920s Einstein spent a large amount of his life in the United States working on his unified theory of gravity, which led nowhere. Between 1922 and 1924 the astronomer Edwin Powell Hubble showed that the universe contains galaxies other than the Milky Way. Then in 1927, he discovered that the universe is expanding.

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GLOBAL WARMING

Olha Suprun

Faculty of Informatics and Computer Technology

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

In the beginning, the term "global warming" should be defined.

Usually, by global warming, people understand a situation where it is equally warmer around the globe. In fact, this is not the case. It gets warmer in different ways, and in some regions, it can even get cooler. In a scientific sense, global warming means an increase in the average annual surface air temperature, also averaged over the entire globe and several decades (Krakovskaya, 2019).

The causes of global warming, that is, an increase in the concentration of greenhouse gases in the atmosphere, according to environmentalists, are the actions

of humanity over the past centuries. Of course, greenhouse gases were formed throughout the existence of the planet Earth, but recently we can observe an increase in its formation many times, which is manifested in the change of climatic conditions and distortion of the atmosphere of all layers.

After conducting search operations, we found out that the most harmful are industry, factories, production facilities, using of equipment and vehicles running on petroleum products, some, but not all types of electricity and heat.

And what are the consequences of global warming, what does it affect?

The first consequence is climate change, in some parts of the world it has become warmer, and somewhere colder (Consequences of global warming, 2020). For humans, this is possible and does not have a big impact, we can just buy clothes for the new climate and that's it, but for animals and plants, it is a huge problem. It is sometimes difficult for them to adapt, and it is not easy for them to migrate to places with a better climate in our time. As for humans, it is not so difficult to do so.

The second consequence is the melting of glaciers. Yes, that's right, some penguins and polar bears may lose their "homes", which threatens the extinction of entire species. But in addition, it provokes an increase in the level of the world's oceans, being threatened to flood the coastal areas of the seas and oceans, become a big problem for people.

The third consequence is that as a result of such changes, some territories may also become uninhabitable, with constant hurricanes or droughts, which can lead to migration of people to more suitable territories for life.

Most likely, you have already heard about the causes and consequences of global warming hundreds of times. But why are most of humanity still doing nothing to save the planet? Perhaps they think that they will not change anything. But this is an erroneous opinion, each of us can make our own, albeit small, contribution to preventing this process.

What can a single person do? Use fewer things that are made from petroleum products, and those that are still used are not just thrown in the trash or burned, but given away for recycling. First, it will reduce the demand for such things, and therefore reduce production volumes if people do it en masse. The benefit is that the factories that produce them will produce fewer emissions and reduce emissions from their disposal (more people, especially in rural areas, burn garbage).

If you are going to buy a car, give preference to electric vehicles because this way you can reduce exhaust emissions.

Use less electricity if you don't use alternative types of energy.

If you had a dream to put solar panels at home, fulfill it, so you will make a contribution to saving the planet.

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ACTIVITY OF THE SUN IN A NEW PHASE

Natalia Svystiur

*Faculty of Sociology and Law. Institute of Printing and Publishing,
National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"*

The weather forecasts that we constantly receive from meteorologists warn us about rain, snow, high or low temperatures, and much more. But besides the usual weather, there is also space weather. These are phenomena that begin in the solar atmosphere, when the Sun, throwing out charged particles, from which, like other things, we are protected by the Earth's magnetic field. Space weather and these are flows of charged particles, X-ray bursts, magnetic storms, primarily affect the technical infrastructure, that is, the operation of satellites, aircraft, the accuracy of GPS navigation, radio communications, and other phenomena and events, where the balance of currents and magnetic fields. If earlier they did not pay much attention to this, then with the development of technology these issues became relevant.

In addition, it raises questions and the degree of their influence on a person. There are also many different points of view here. According to Vyacheslav Burov, the human population for hundreds of thousands of years has adapted to endure the strong influence of magnetic fields, magnetic storms. He also noted that the impact of space weather primarily affects the polar regions of the Earth and, accordingly, has the greatest impact on people living in high latitudes. Hence, by the way, and power failures, radio communications, and others. True, only strong magnetic storms and proton flares really affect. But it is not dangerous to watch the northern lights, the scientist assured. According to the expert, the impact of space weather on the average person is small. The flow of solar heat from cycle to cycle does not change, it is not associated with the cycle of solar activity, therefore, scientists do not yet have an unambiguous answer about the effect of solar activity on climatic changes.

However, it is unrealistic to completely deny the impact of solar activity in terms of the effect of space weather on normal weather. The supporters of the theory of influence, as an argument, talk about the events of 1645-1715, when the activity of the Sun was very small and there was a severe cooling in Europe, the paintings of this period depict ice skating on the rivers of Holland and Belgium, which is surprising now. This was the maximum of the Little Ice Age, which lasted from the 14th to the 19th century. At the same time, opponents draw attention to the fact that in the past cycle there was no solar activity, and we are constantly threatened by global warming (Lashko, 2019, p. 24).

Summing up, we can say that only in 2024-2025 the Earth will pass the maximum of the upcoming cycle, which means there will be strong magnetic storms and flares, which can lead to certain problems. And now we do not need to worry, since everything that happens in space does not always affect us strongly globally.

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SPIRAL PATTERN?

Diana Tryhub

Faculty of Informatics and Computer Science

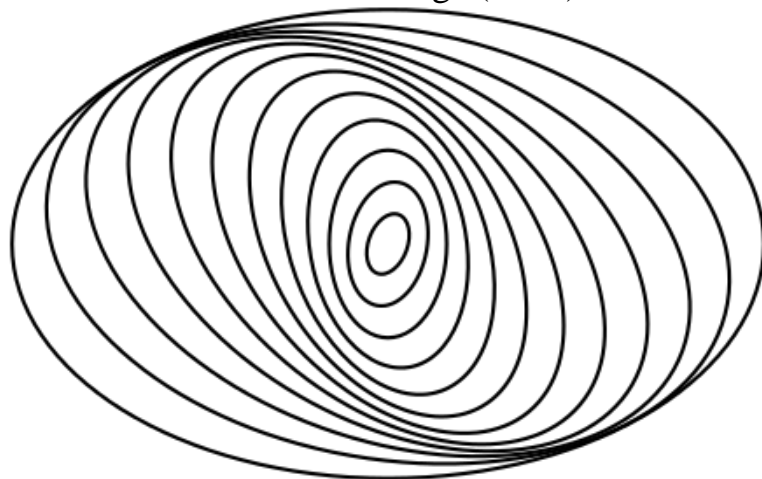
National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Everyone has seen a lot of breathtaking photos of galaxies. Large flattened disk with a beautiful spiral pattern on it and a bright bulge in the center. But why does it have this strange picture? In astronomy, this picture is called spiral arms. Only spiral galaxies have this picture and more about those galaxies will be described.

To start with, galaxies consist of three main components: bulge (central part of the galaxy), disk, and halo (spherical structure located around the bulge and some of the disk). (Mishenina, 2017) So, what are those spiral arms?

At first sight, we can think that that's because of the rotation of stars around the galaxy center (The closer the star to the center, the smaller orbit it has and the faster this star will pass the circle). But if that was true, all this structure would be very unstable. Because arms will twist more and more and at some point that wouldn't be a spiral anymore. In fact, we know exactly, that the shape of a spiral hardly changes over time. (Mishenina, 2017)

Tomorrow many scientists will consider that spiral arms are density-waves. The density-wave theory of spiral structure in disk galaxies was proposed in the mid-1960s by C.C. Lin and Frank Shu. (Hamed Pour-Imani, 2020) To explain what density-wave is, the example was used with a traffic jam on the road. Orbits of stars are like roads, and spiral arms are like traffic jams. Sometimes roads merge and if there are a lot of cars, there can be a traffic jam. The same thing happens with stars. At places where orbits of stars merge (Pic.1) we can see spiral arms.



Pic.1.

Well, now we know that stars are not located only in spiral arms. They move around the center of the galaxy. Density-waves theory explains why the disk of the galaxy pattern but that doesn't explain why this pattern is so bright. We need to know that stars born in regions with high levels of gas density. The spirals arms are those regions. That means that most stars are born there. The brightest and biggest stars have a blue color, but also they can't live as long as yellow stars (they are much

dimmer than blue stars), for example. So, after birth in the spiral arm, the yellow star will get out of this arm and will start to move around the galaxy center. But the blue star will die before getting out of the spiral. That's why we don't see bright blue stars between spiral arms (Strobel 2019).

How this beautiful pattern was formed? Scientists have many theories but still don't know exactly. But that means only that we still have many things to learn about our world.

So, the spiral arms are density-waves, where most stars are born and it is so bright because of blue stars, which life starts and ends in spiral arms.

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AUTOMATED NALOXONE DELIVERY SYSTEM FOR TREATMENT OF DRUG ADDICTION

Anastasia Vinichuk

Faculty of biomedical engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays the treatment of drug addiction focused on the psychological side, which is a source of a problem, nevertheless, there are a group of drugs that couldn't be cured without medical intervention. Therefore automated naloxone delivery system is proposed.

Initially, it's highly significant to understand substances we work with, and how could it affect an organism. Drugs could possibly change the way person minds, feels and behaves, disrupting neurotransmission, the process of communication between neurons in the brain. There are two types of obsession: psychological and physiological. The last one will be considered in this. Psychological dependence, as it was mentioned before, can be cured without medical intervention, which is not possible in the case of physiological. Physiological dependence is an adaptive state that manifests itself in intense physical disorders: the body adapts to the intake of drugs. What is more, the drug becomes part of the metabolic chain. (Sherman, 2017)

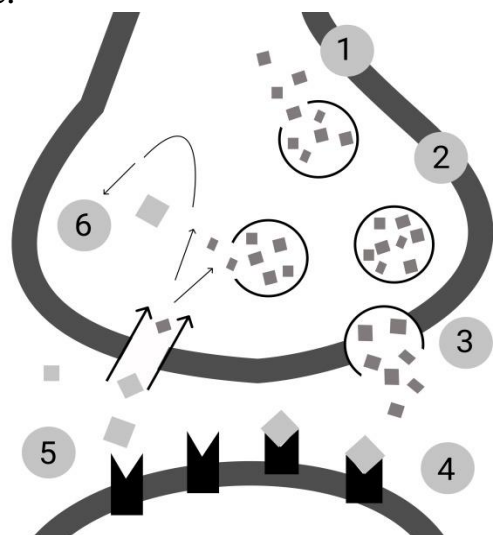
Diamorphine, morphine, or heroin, is a narcotic analgesic, belongs to a class of drugs called opioids, which also includes the painkillers codeine and morphine.

Heroin comes from a natural substance extracted from the seedpod of the Asian poppy plant, usually appears as a brown or white powder.

Subsequently, diamorphine is an opioid agonist. It acts on endogenous opioid receptors, which are distributed in discrete packets along the cephalic, spinal, and intestinal tract. Heroin, along with other opioids, is an agonist of four endogenous neurotransmitters. These are dynorphin, beta-endorphin, met-enkephalin, and leu-enkephalin. The body responds to morphine in the brain by reducing (and sometimes stopping) the production of endogenous opioids, such as endorphins, when heroin is present. Endorphins are secreted in the brain and nerves to shrink pain. Therefore the presence of them in an organism is highly important for health, sometimes even existence. (DrugBank, 2020)

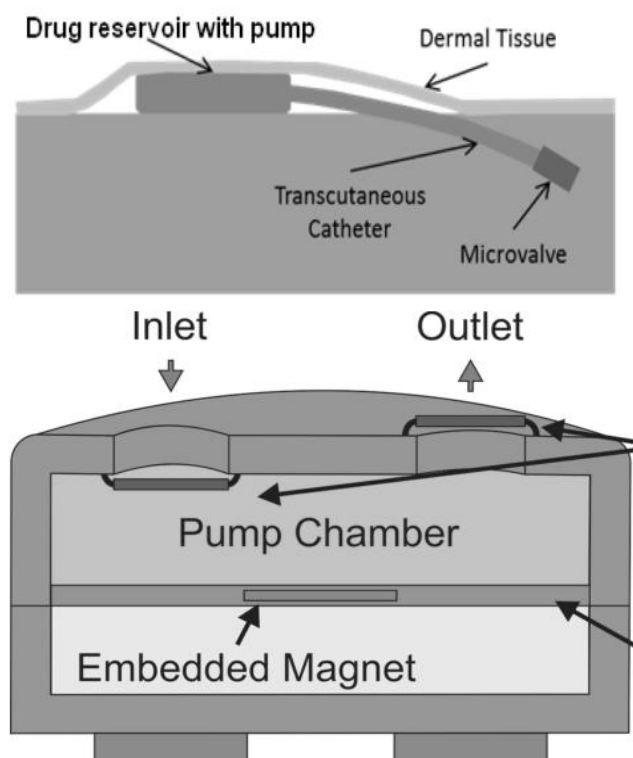
For each agonist exists antagonist. Naloxone is an opioid antagonist drug that is used to reverse or block the effects of opioids drugs, especially in drug overdoses, for instance, heroin. (DrugBank, 2020)

In a normal state, in the healthy organism, endorphin is synthesized; all this 'storage' is transported into vesicles, then vesicles release endorphin into the synaptic cleft. Activation and clearing occur on the postsynaptic neuron (dendrite). The next step is reuptake and metabolism: endorphin either breaks down or reloaded into a vesicle.



On the other hand, the situation in neurotransmitter after heroin use, opioid become the part of the metabolism and block the release the endorphin from the vesicle.

Automated naloxone delivery system for treatment of drug addiction on the example of heroin addiction – the mechanism based on the technology of bioMEMS. A similar concept is used in an insulin pump: there is a drug reservoir with micropump under dermal tissue; a transcutaneous catheter comes out of the pump at the end of which the microvalve is located. All of that provides controlled and dosed drug delivery. (diaTribe, 2020)



Oddly enough, naloxone will be placed in a tank, which will need to be filled at regular intervals. The dosing itself will be encoded on a chip located in the pump, which can be adjusted from a separate device. Thus, we will provide automated replacement therapy, which will greatly facilitate the lives of drug addicts.

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WHY BACILLUS CAN NOT ONLY KEEP ALIVE YOUR MICROFLORA BUT ALSO SAVE HOSPITALS FROM A REAL CATASTROPHE?

Ludmila Volkova

Faculty of Biotechnology and Biotechnics

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Imagine a world in which a person can die from a simple cut and blood infection or in which doctors have no way to fight the pathogenic bacteria. In our mind could appear the ancient dark times of the Middle Ages. But it will be our future if antibiotics are used as often as now and its spreading poses a real threat.

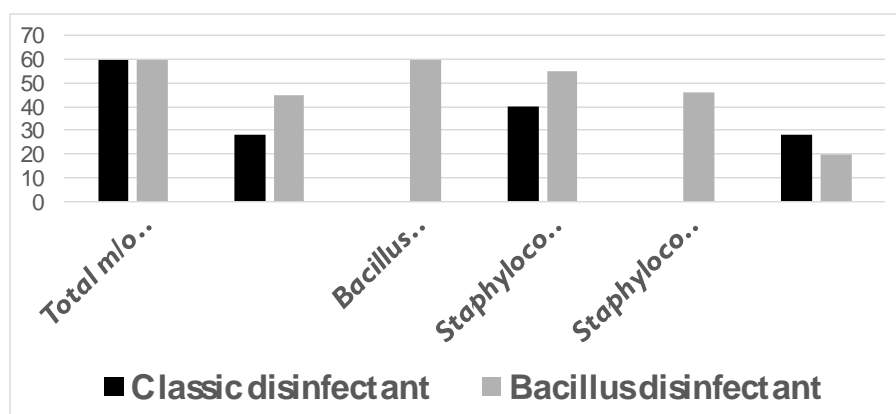
But no less important is a problem of distribution nosocomial infection of infections, about the methods of the decision of that there will be this work.

The incredible amount of antibiotics used today has become so because of the ability of bacteria to mutate (causing drug resistance) and very quickly transfer beneficial plasmids to other cells. As a result, humanity is in a constant "arms race" with these pre-nuclear organisms, and the improvement of our methods of control only gives impetus to improve the protection of bacteria. After all, the better the weapons of scientists, the more dangerous the pathogens become. It is worth mentioning at least *MRSA*, which is resistant to most known antibiotics, and therefore the treatment of infections is extremely difficult. The situation is so serious that some countries have declared *MRSA* resistance as a major threat to national security.

Such dangerous strains of bacteria remained in the hospital, a place where a person must recover, becomes a place where he can get a deadly resistant strain just by being treated for pneumonia. This dangerous phenomenon has been called nosocomial infection (or ILI). ILI poses a threat not only to patients but also to hospital staff and the environment. They try to solve this problem with the help of classic chemical disinfectants, which are not very effective. This is due to the property of microorganisms to form bio pellicle, in the state of which it is almost impossible to fight them (Bezrodny, 2014). It is due to ineffective ways of cleaning by traditional methods, which cannot give completely sterile conditions and spreads to 80% of nosocomial infections. In Ukraine, according to experts, in recent years only officially, registered up to 4 thousand cases of nosocomial infections per year, and the estimated number of relevant patients is about 350 thousand so that the prevalence of nosocomial infections in Ukraine is second only to cardiovascular and cancer disease (Ustinov, 2016). The necessity to solve this issue is also evidenced by a large financial loss to eliminate the consequences of infections. Thus, according to experts, postoperative early infections increase the hospitals costs for patients by almost 2 times; infections during surgery - by 119%, due to the spread of pathogens through the air conditioning system, increase the hospital costs by an average of \$ 40,000; infections caused by *Staphylococcus aureus*, *Klebsiella pneumonia* ("antibiotic killer"), *Pseudomonas aeruginosa* are the most costly because they increase hospital costs by 3 times (Bezrodny, 2014).

So how is it possible to solve the problem? It has already been learned that conventional disinfectants in hospitals only increase the resistance of bacteria (as well as antibiotics) and over a long period of time only increases the size of bio pellicle. This problem is finally solved by genus *Bacillus*, which is known to most or as a component of probiotics, or as a causative agent of anthrax. But *Bacillus* is also well known for the strongest antagonistic properties against pathogenic microorganisms so their representatives are often used as a component of antibiotics. Therefore, the aim of the work was to study the effectiveness of decontamination agents based on genus *Bacillus* (*Bacillus licheniformis*, some strains of *Bacillus cereus* and *Bacillus subtilis* which were the objects of study) compared to classical disinfectants (Katz, 1977). The subject of the study was the unique antagonistic properties of these representatives only against pathogenic microorganisms used in the disinfectant PIP Interior Cleaner. This new method of disinfection can be called a «method of bio-stabilization».

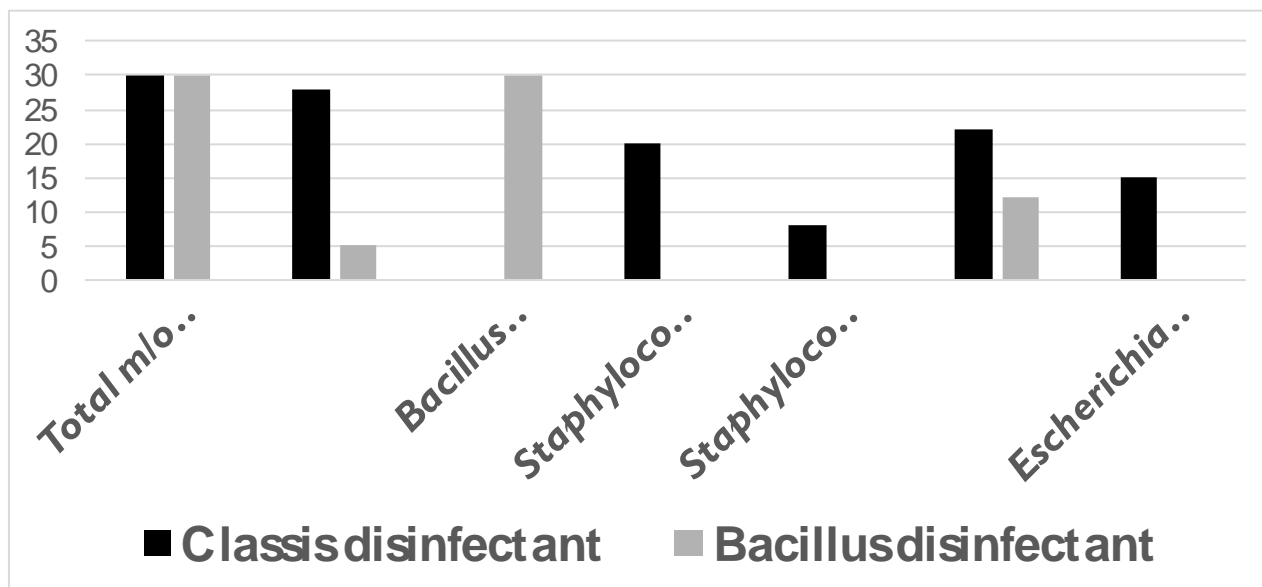
Comparing the results, the data obtained during the microbiological analysis shows that the use of detergents based on microorganisms of the genus, *Bacillus* leads to a quantitative predominance of target bacilli on the treated surface and a significant reduction in the number of pathogenic and opportunistic strains of microorganisms. The duration of action of the studied product significantly exceeds



the duration of action of existing disinfectants and cleaners, and thus the duration of the effect, which we seek to achieve. It can also be assumed that after the application of probiotic preparations on the surface, there is

no recovery of biofilms, which significantly reduces the likelihood of recontamination of pathogenic microorganisms, and hence subsequent infection of staff or patients (Al-Marzooq F, 2018). It should also be noted that the studied products are chemically harmless and non-toxic (based on probiotic microorganisms of the genus *Bacillus*, which are used in the correction of pathological conditions - correction of dysbiosis, treatment of wound infection, etc.) and therefore do not harm the environment and do not require special expensive disposal rules. 1-st day:

10-th day



Therefore, I believe that the results will be of interest to specialists in biological, epidemiological, and medical fields and open up greater opportunities for understanding the biology of microorganisms of the genus *Bacillus* and using them to fight various pathogens, including infections associated with medical care.

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METHODS OF SCIENTIFIC PSYCHOLOGY

Anastasia Zakrevska

Faculty of Sociology and Law

National Technical University of Ukraine 'Igor Sikorsky Kyiv Polytechnic Institute'

The method of legal psychology is very popular for people in this field, that is why it is necessary to consider it in detail.

Methods of legal psychology can be divided into two groups: methods of scientific research and methods of psychological influence on the individual.

Research methods. The basis for the study of psychological relations in law, optimization of professional activities are the methods of scientific research. They include such techniques as improving the professional skills of the employee, knowledge of the characteristics of suspects and witnesses.

Methods of psychology influence the individual. Regarding this technique, it is aimed at detecting crimes, establishing the causes, adaptation of convicts to appropriate conditions. It is also useful for law enforcement officers because it helps to form and develop professional skills. Observation, experiment, the study of products, testing, and expert evaluation - basic methods for studying the psyche.

Let us consider each of the above-mentioned methods.

Observation is a method, which consists of the active and deliberate perception of the object, during which knowledge is obtained about the external aspects, properties, and relationships of the object under study. An important criterion is that the person being observed does not know about it, because then he can specifically behave in an atypical way.

Experiment-method of carrying out such actions that lead to the detection of true mental behavior. That is, for the suspect, there are certain conditions under which a lawyer or psychologist can determine the causes of mental phenomena due to the influence of some created condition.

The study of products (results) of the activities-a method by which a lawyer or psychologist can study the results of psychological behavior without addressing the person. And can compare them at any time under different conditions.

Testing (questionnaire) is a method that allows you to fully understand the human psyche, with the help of so-called tests. Questions given to the suspect can also be considered a method of questionnaires.

The method of expert assessments is a method that allows you to learn more about the psyche, qualities, character, actions of people who can either see the crime or from relatives and friends of the accused.

We can also say that the legal and psychological characteristics of the objects of study are quite similar, although considered differently. Therefore, it causes some difficulties, because there are different terms for one concept. For example, "legal behavior" and "obedience to the law". very original and unique to his concepts.

These attributes are very important and should be guided by the conceptual apparatus. If we talk about legal, they reflect such human manifestations that require

legal regulation. ("Crime", "tort", "agreement"). In criminology, for example, "Group of persons who committed a crime by prior agreement" and "organized group", although the latter cannot exist without prior agreement.

Therefore, it is clear that if psychological concepts are transferred to legal activity and vice versa, it will only complicate the work (Zhalinsky, 1995).

All in all, we can conclude that a systematic view of legal psychology is a psychological and legal aspect that is studied as a whole. The main goal is the practical application of the acquired knowledge. The theory should provide this knowledge through the development and transformation it of other branches of psychological science. The intermediate and necessary link between the use of these sciences is legal psychology.

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AUTOMATIC ANALYSIS OF SCIENTIFIC TEXTS FOR THE CREATION OF SEMANTIC NETWORKS OF PROTEINS

George Zatulovsky

Faculty of biomedical engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Increasing the number of scientific articles in the field of Biomedicine makes it increasingly difficult for researchers to find the information they need. The difficulties are especially obvious when it comes to analyzing information about the functions of proteins and genes since these data are presented in free form in natural language and are difficult for structurization. The need to perform a large-scale analysis of published information about protein functions becomes particularly relevant in the study of molecular interactions in the cell.

The aim of the work was to develop a method for presenting information about the connection between proteins in the form of a semantic network based on automatic analysis of scientific texts. For each of the proteins in the sample, which consists of five randomly selected metabolic pathways, to form a specific semantic profile of relevant publications and to supplement the obtained profiles with related publications found as a result of automatic assessment of semantic similarity of documents.

This study considers a method of comparing the results of high-performance proteomic experiments with the information presented in the form of multiple abstracts of scientific publications in the MEDLINE database. The paper uses both publications found by a contextual search for the protein name (relevant) and those closest to them in meaning (related). The proposed method is based on the estimation of semantic connectivity between proteins, which is calculated as a function of the

number of identical relevant or related publications found for two proteins. The calculated values of semantic connectivity were entered into a semantic similarity matrix, which was then displayed as an undirected graph. The isolated subgraphs obtained as part of the semantic graph were compared with the distribution of proteins by sections of the KEGG database and by categories of the GO system (Al-Shahrour, Diaz-Uriarte, Dopazo, 2004).

Using nomenclature designations from the UniProt database, relevant semantic profiles specific to each protein are obtained automatically. The relevant semantic profile was a set of identifiers of publications from the MEDLINE resource, found by a contextual search in the texts of abstracts by protein names (Azuaje & Dopazo, 2005).

The capabilities of postgenomic technologies allow us to identify groups of genes and proteins that respond in a coordinated manner to changes in experimental conditions in a highly efficient model. At the same time, it was not very easy to explain the biological effects resulting from the work of an ensemble of genes from the point of view of functional features of biomacromolecules. Interpretation of experimental data containing identifiers of hundreds or thousands of genes requires painstaking work on expert analysis of information in biological databases and electronic libraries.

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BIOPRINTING AND TISSUE ENGINEERING: A COMBINED APPROACH IN TREATING CARDIOVASCULAR DISEASE

Sofia-Stefaniia Zhylinska, Alina Maksimova

Faculty of Biomedical Engineering

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

In a world where heart failure and cardiovascular disease pose an increasing risk to the global healthcare system, humanity faces a drastic lack of novel solutions to address the problem of regenerating and substituting organs and tissues that fail to carry out their functions with healthier counterparts. As the U.S. Government Information on Organ Donation and Transplantation report, every 9 minutes a patient is added to the transplant waiting list, giving rise to over 100,000 patients with an immediate need for transplantation in the U.S. In recent decades, cell therapy has employed an innovative approach to reducing the mortality rate. In these theses, we discuss the technology, application, and prospects of 3-dimensional (3D) organ printing and stem cell tissue engineering.

Additive manufacturing (also known as 3D printing), is driving groundbreaking innovations in cardiovascular regenerative medicines. 3D printing is a set of processes that builds layers to create a volume physical object from a digital model. It gives access to the internal side of the object during the printing, allowing complex channels or structures to be made. 3D bioprinting offers great precision and control over the internal architecture and outer shape of a scaffold and allows copying advanced structures found in biological tissues.

Recent advances have assisted 3D printing of biocompatible materials, cells, and supporting components into complex structures. The preparation, manufacturing, and implementation of the organ can be divided into three main stages:

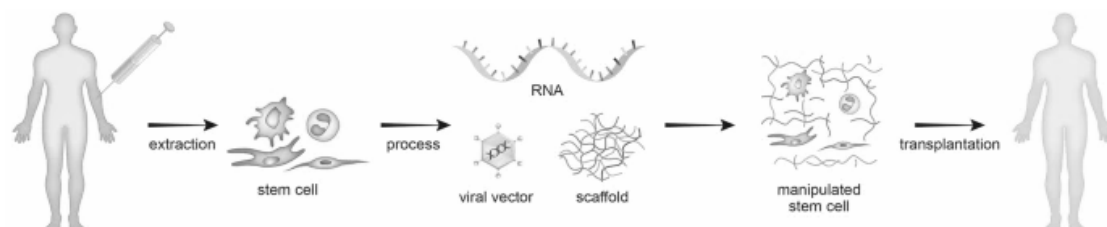
Table 1

The three stages of 3D bioprinting

Stage	Description
Modelling	The development of a digital project of three-dimensional tissues and/or organs using clinical imaging methods. This is a step-by-step instruction for a robotic bioprinter to print a 3D structure of a tissue or organ.
Bioprinting	Bioprinting, which includes preparing bio-ink based on self-assembled tissue spheroids, creating bio-paper (a biocompatible hydrogel), and using a robotic bioprinter (a robotic dispenser). Layer after layer, cellular spheroids are applied on top of each other, growing together to obtain a voluminous structure.
Transplantation	The object is transferred to the bioreactor, where the cells fuse into the natural diverse combination of tissue development factors and mimicking the real environment of the body.

Another groundbreaking technology to regenerate tissue is stem cell differentiation in biomedical engineering. Stem cells are the ancestors of all cell types in the body. They are capable of renewing themselves and dividing to form specialized cells of various tissues. A variety of stem cells, including mesenchymal, embryonic, and induced pluripotent stem cells, have been shown to regenerate damaged tissues.

With this in mind, researchers derive stem cells from the human organism or embryo and process them by using a viral vector, RNA, and scaffold techniques. Once manipulated, the stem cells are then ready for transplantation into the body. The image below summarizes the key milestones of stem cell engineering.



Stem cell engineering strategy

Fig.1 Stem cell engineering process breakdown
[biomaterialsres.biomedcentral.com]

Scientists have successfully combined both methods in regenerating human heart muscle from pluripotent stem cells in the cell-free matrix of an entire human heart. To obtain heart cells, they reprogrammed adult skin cells using messenger RNA factors and transplanted about 500 million cells into the wall of the left ventricle of an organ previously devoid of heart cells. The resulting pluripotent stem cells were differentiated into cardiac muscle cells. After that, the heart was placed in an automated bioreactor system for two weeks. During this time, scientists supplied the heart with a nutrient solution and influenced it with various stress factors. As a result, the cells were transformed into immature cardiac tissue that responded to electrical stimulation.

In conclusion, bioprinting technologies and stem cell engineering have the potential use in regenerative medicine to create a variety of transplant tissues, including skin, cartilage, and bone. These methods still have technical difficulties in depositing cells, controlling distribution, vascularization, and innervation in complex tissues. Similarly, they face challenges regarding tumor genesis, cell death, immune rejection, and arrhythmogenesis. However, a combination of the two cutting-edge technologies provides an invasive yet precise method to arrange cells for wide applications in biomedical engineering. Both 3D bioprinting and tissue engineering have a long way to go to become affordable and safe for *in vivo* usage, but the results researchers reveal promise to save lives (or regenerate them) with increasing efficacy in the near future.

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