

NEWS / NEWS OVERVIEW NEUROTECHNOLOGY 20.05.17-26.05.17

NEWS

05/26/2017

NEWS REVIEW OF NEUROTECHNOLOGY 20.05.17- 26.05.17

Metapoverhnost improved the quality of the MRI scan

"Flexible and compact hybrid metasurfaces for enhanced ultra high field in vivo magnetic resonance imaging" | Scientific Reports | doi: [10.1038 / s41598-017-01932-9](https://doi.org/10.1038/s41598-017-01932-9)



noninvasive imaging

Engineers from the Leiden University Medical Center in the Netherlands and the Laboratory of Applied Radiophysics ITMO University, St. Petersburg created a material for accelerating the procedure MRI brain scan. Flexible metapoverhnost 8 mm thick is placed under the patient in the scanner head and the sensitivity of the device increases. So you can get the MRI images in half the time or in the same time to take pictures of a higher quality.

Metapoverhnost consists of copper strips 25 micrometers thick, 17.5 cm long, including a matrix and a 3 × 3 short strips of length 3 cm. Copper strips are placed on a flexible plastic sheet and a dielectric layer of a perovskite slurry. This pad comes in a narrow space between the head and the receiver MR coils apparatus, raising a half times the signal-to-noise ratio in the scanned area. Today, low signal-to-noise ratio limit the MRI method, and to distinguish between the useful signal to the background noise, the scan is repeated many times. Due to the new material increases the amplitude of the magnetic field and the electric field amplitude decreases.

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BILLIONS FOR BILLIONS

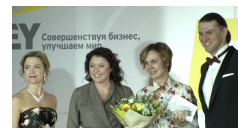


As in the accelerator GenerationS it looks creative industries

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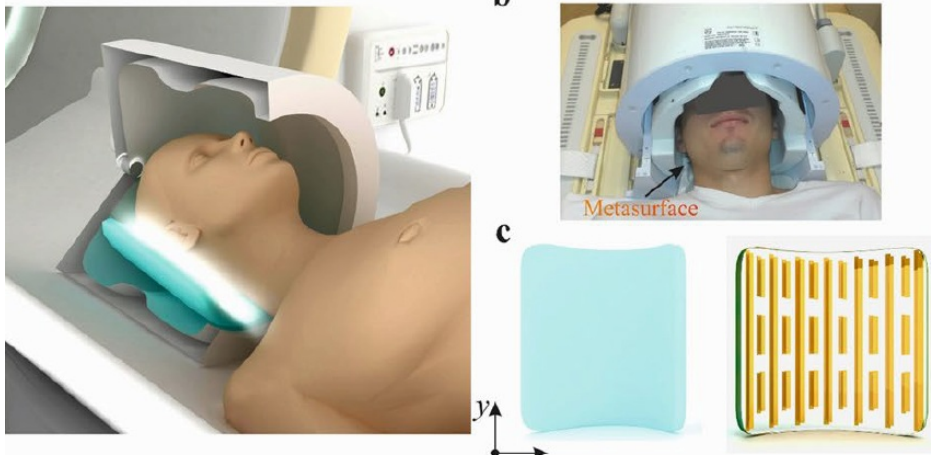
NATALIA GALKINA, HEAD OF THE INDUSTRIAL UNION NEYROKOMMUNIKATSII "NEYRONET" WON IN THE CATEGORY "HIGH-TECH" COMPETITION ERNST & YOUNG "BUSINESS WOMAN 2017"



Natalia Galkina, head of the branch union NeyroKommunikatsii
NeyroNet

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Top right experiment image, comprising transmitting (external) and a multiple receiving coil (internal). Bottom right surface of the hybrid circuit including a dielectric substrate having high dielectric constants (on the left), in combination with its metal structure (right).

Since each scan resolution becomes higher, it is possible to achieve more cost reduction of clear images voxel size, three-dimensional pixel. Or reduce the scan time with a standard capacity that is dependent on the purpose of the procedure. The authors believe that their material will allow to serve more patients in the same time and more accurately diagnose the pathology in the brain. The paper tested the material on the MRI scan of the occipital cortex, but a flexible surface can be applied to any area of the head and to take pictures of the selected area of the brain.

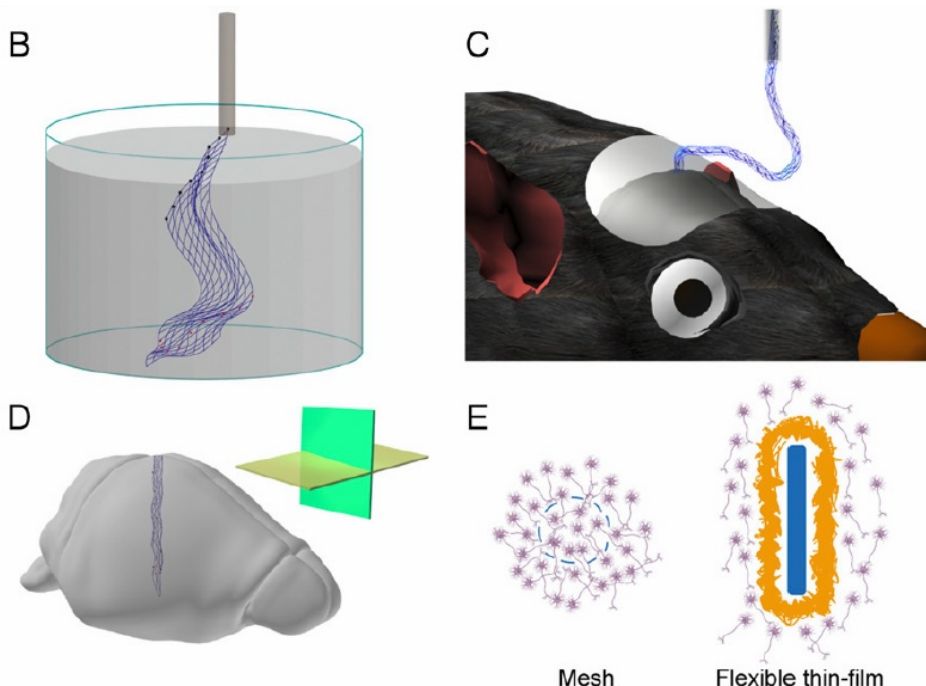
Net electrode probe grows into the brain

"Syringe-injectable mesh electronics integrate seamlessly with minimal chronic immune response in the brain" | PNAS | doi: [10.1073 / pnas.1705509114](https://doi.org/10.1073/pnas.1705509114)



invasive interfaces

The network of electrodes perfectly embedded in the nerve networks in the brain. The engineers and chemists at Harvard University have studied how cells get on with their probe of soft electrodes in the form of very fine mesh. A couple of years ago, scientists have found a new way to remove the signals from the deep areas of the brain. They have created an array of extremely thin conductive fibers for softness close to the brain tissue. The network itself is twisted in the water, it was taken up in a syringe needle and then were injected into the brain. Inside the brain, she straightened. So the authors read the signals the brain of live mice for eight months.



SECTORAL UNION "NEYRONET"
SIGNED A MEMORANDUM OF
COOPERATION WITH THE HSE
BUSINESS INCUBATOR



Through the partnership,
"Neyroneta" and HSE Business
Incubator planned projects selected
for implementation of the National
Technology Initiative,

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CONGRATULATIONS TO PAUL
MILOSLAVOVICHA BALABAN
WITH THE PUBLICATION IN THE
JOURNAL NATURE
COMMUNICATIONS

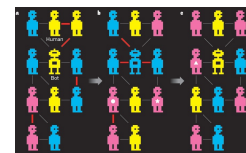


The article is devoted
termogenetike - a new direction for
Brain Research

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20.05.17



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05/12/2017

NEWS OVERVIEW
NEUROTECHNOLOGY 06.05.17-
12.05.17

The grid is taken by syringe from the aqueous solution through a glass needle, then injected into the mouse brain. Fig. E schematically shows a reaction cell on a continuous mesh and electrode array. Yellow marked glial scar.

Unlike one-dimensional network of electrodes provides a three-dimensional picture activity. It captures adhesions in different locations at different times, and may be computed as the signal passes between the cells. In a network there and stimulating electrodes, which turns it into a useful tool for the interfaces. In the new study, the authors conducted a histological analysis of brain tissue in order to understand how the probe affects the cellular environment.

They studied brain slices of mice taken after two, four and twelve weeks after the introduction of the probe. Using fluorescence microscopy found on body sections neurons, axons, astrocytes, microglia and elements of the electrode array. The analysis showed that the processes of neurons and even the neurons included in the cell between the network fibers, and microglia responded weakly to a foreign body. Three months later, the electronics completely grown into the tissue, without destroying its structure.

To control have thin flexible electrodes, which are often used in research and checked brain tissue reaction in the same manner. Single electrodes caused a strong immune response, in place of neurons, astrocytes came, and the signal from the neurons became weaker. The authors conclude that the soft electrodes network better integrated with the brain and is more profitable for the implants, interfaces and in experiments with animals cyborg.

Robot parasite manages alive "host"

" **The Parasitic the Robot** the System for the Navigation of Waypoint Turtle" | Journal of Bionic Engineering | doi: [10.1016 / S1672-6529 \(16\) 60401-8](https://doi.org/10.1016/S1672-6529(16)60401-8)

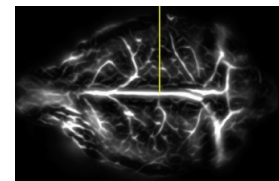


robots

Robots still clumsy and poorly adapted to the natural environment. Outside the laboratory, they will not last long and even simple tasks are helpless. Animals live in this environment, they are effective, and their millions of years of evolution. Engineers from the Korean Advanced Institute of Technology (KAIST) have decided to overcome the weaknesses of the place robot with the help of fauna. They created parasitic robot that does not move himself, but gets to the destination on the animal by controlling "master" movement, as sometimes do these parasites.

The robot is mounted on the shell of a turtle. Combining incentives and rewards, it directs its desired path. The incentive is an array of LEDs, which hangs down in front at eye level. Turtle object is selected because it is an amphibian with good vision and long-term memory. She already has a platform that is ideal for the installation of the parasitic device. In addition, slow animal, it is easy to monitor and control.

Two weeks before the turtles experience fed next to the LED indicator light red, and they have learned to associate food with LED. Then we put on the armor of the robot with external frame forward in an arc with five diodes. Since turtle associated with food red diode, the inclusion of one of them causing them to move in the direction of light. So "parasite" changed the route of the "host", prompting the animal to turn in the right direction. For the right choice of the robot feeding a turtle, forcing a portion of the food gel syringe from a container.



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[SCIENCE GUIDE INVITES YOU ON A JOURNEY TO THE WORLD'S EXPERTS IN ARTIFICIAL INTELLIGENCE](#)

Science Guide

Scienceguidepriglashaet June 1-4 to take a trip to London for AIMeetupteh who are interested in investing in high-tech projects and the ability to qualitatively assess the potential of developments in the field of AI.

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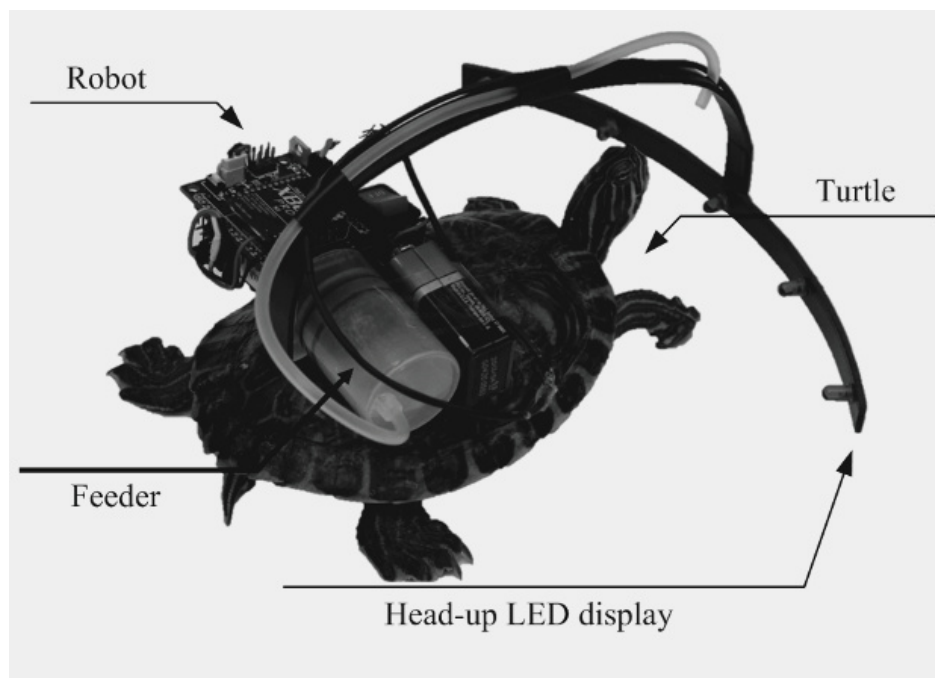
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[RUSSIAN SCIENTISTS HAVE CREATED A NEW BRANCH OF SCIENCE, TERMOGENETIKU: NEURAL NETWORK CONTROL VIA INFRARED RADIATION](#)

Molecular biologists from the Institute of Bioorganic Chemistry in collaboration with neuroscientists from IVNDiNF RAS and physicists from MSU. MV University have developed a new technology to



Turtle and parasitic device with the container and the display of the LEDs.

Experiments in a water tank with a group of five turtles for five weeks demonstrated that the parasitic robot guided turtle on control points in the pool, going 5-meter route on the average for 75 seconds. In addition, reinforcement learning, which asked the robot, led to an increase in results. By the last day of the turtle experiment took the path to the deviation from the ideal route just above 3%. The next generation of parasitic robots learn to work with other species, such as birds or fish. They will have sensors and more cunning devices augmented reality. And robots, as befits the parasites can get energy directly from the owner.

Tactile stimulation helps the deaf

"Electro-Tactile Stimulation Enhances Cochlear Implant Speech Recognition in Noise" | Reports Scientific | doi: [10.1038 / s41598-017-02429-1](https://doi.org/10.1038/s41598-017-02429-1)



neuromodulation

People are better at detecting it through the cochlear implant, if they feel on the index finger weak electrical impulses. A new way to enhance the action of the auditory prosthesis offered neurologists at UC Irvine, Johns Hopkins University and the US Army Center for Public Health. They have transformed the sound of voice pitch in electro-tactile vibration, then applied them on the finger sensor. Ten subjects who can hear with the help of implanted hearing devices, to better distinguish it when stimulating the finger.

In a series of experiments deaf people came in a soundproof booth and stood up in front of the speaker. First, they listened to the recording only after a cochlear implant, then the new test they added stimulation. Computer removed the basic frequency of the sound and converts it into tactile vibrations, duplicating the low frequency audible speech (below 500 Hz). So participants raised their threshold for distinguishing speech by an average of 2.2 dB and a maximum of 7 decibels.

stimulate nerve cells to infrared radiation, genetically embedding neurons in the mammalian proteins thermoreceptors snakes

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05/04/2017

[RUSSIAN SOC. NETWORK DISABLED NEYROCHAT GOES TO THE INTERNATIONAL LEVEL.](#)



NeuroChat project team began talks with US counterparts on joint demonstration of communication between Russian clinic patients and the University of Southern California medical school (USC, Los Angeles)

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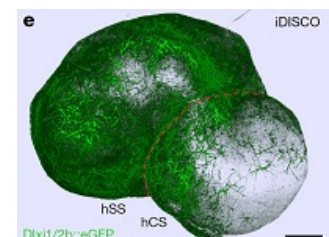
[THE LEADER OF THE WG NEURONET ANDREY IVASHCHENKO PARTICIPATED IN A PANEL DISCUSSION SKOLKOVO ROBOTICS](#)

The fifth consecutive year the robotic conference brings together on one platform prominent international experts in robotics, representatives of venture funds, research and scientific groups, start-ups and many of the other participants

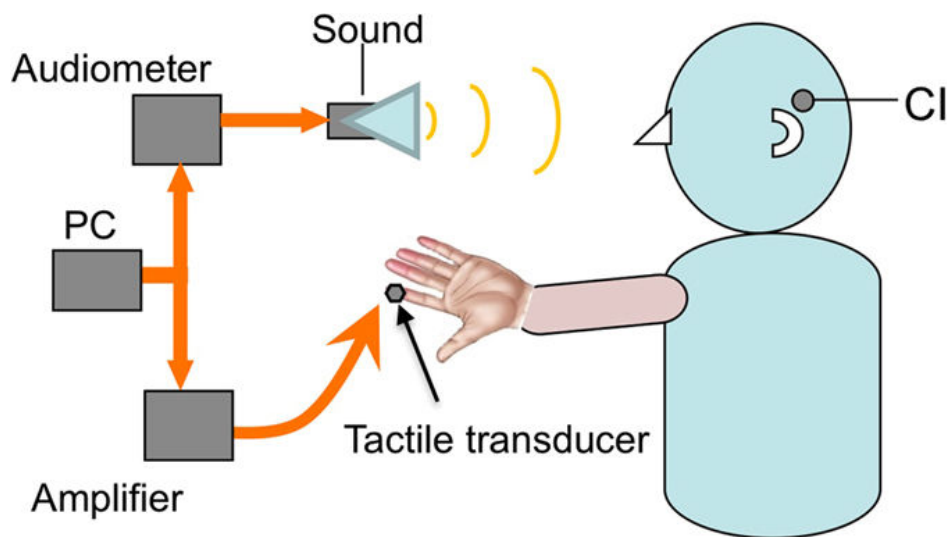
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Computer (PC) controls the sound and tactile stimulation. Electrical stimulation is supplied to a cochlear implant (CI) through audiometer and speaker. Tactile stimulation is applied to the finger through an amplifier and a tactile transducer.

Of the other works it is known that in healthy people tactile stimulation affects the auditory perception of sound within the range of detection to speech recognition, the intonation contrasts and even tinnitus generation. Anatomically, the tactile information is integrated with the ear all the way from the cochlear nucleus to the auditory cortex. Therefore, there was a chance that this relationship has remained deaf and can be activated. And so it happened. We add that the test records were deliberately noisy as a cochlear implant deaf hear speech in noisy places particularly difficult.

The authors believe that the method of tactile hearing supplement may be useful for healthy people, and for the speech recognition engine. And the work itself - an argument in favor of the hybrid systems in the Neuro.

Termogenetika catches optogenetics

"Thermogenetic neurostimulation with single-cell resolution" | Nature Communications | doi: [10.1038/ncomms15362](https://doi.org/10.1038/ncomms15362)



neuromodulation

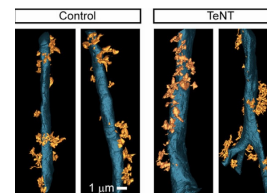
Russian scientists from the Institute of Bioorganic Chemistry, Russian Academy of Sciences and Moscow State University IVNDiNF proposed a new cell stimulation method, accuracy is comparable with optogenetics. Instead sensitivity to light cells impart sensitivity to heat by introducing therein proteins taken from snakes with termozreniem. These snakes have a nose at authority of night vision, there have neurons of TRPA1 receptors, and they are sensitive to thermal infrared radiation. By embedding these receptors in mammalian cells and fishes, selected cells were activated neuroscientists infrared laser beam.

Femtosecond series of short IR pulses of different durations locally heated tissue to the site of passage of the beam. To pick up optimum wavelength, the beam intensity and the degree of heating scientists conducted complex experiments. They are using a diamond quantum thermometer found the laser power, which increases the cell temperature by one or two degrees Celsius. This is enough to turn on the receptor and do not damage the fabric. Next, using a measurement electrode, they have shown that neurons from TRPA1 receptor after lighting the infrared light generated action potentials. So short laser heating leads to cell activation.

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[NEUROTECHNOLOGY 15.04.17-21.04.17](#)

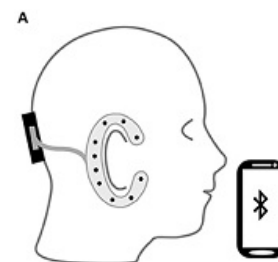


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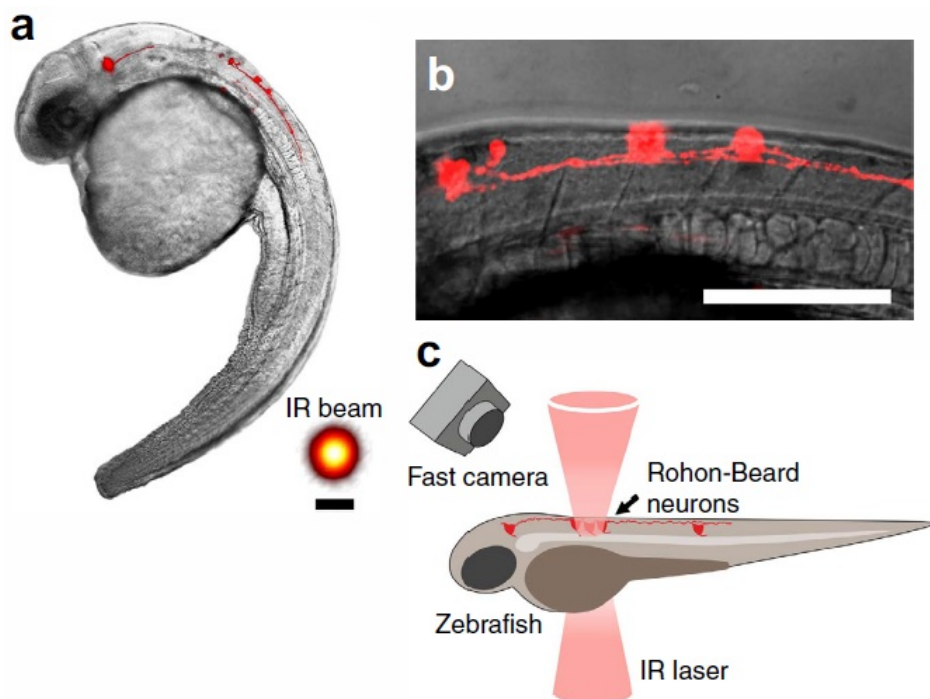
[APRIL 12, 2017 LOBACHEVSKY NIZHNY NOVGOROD STATE UNIVERSITY TOOK PART IN THE TENTH ANNIVERSARY ALL-RUSSIAN FORUM "THE DIGITAL WORLD IN 2020"](#)



As the exhibits were presented to leading the development of scientists and engineers of UNN.

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(A) Fluorescent image and *caTRPA1* *tdTomato*-expressing neurons superposed on the image-zebrafish fish larvae. The inset shows the laser beam; range 60 micrometers. (B) Larger image neurons. (C) activation of neuronal circuit and detecting a behavioral response in fish larvae by flash camera.

Compared with visible light that is used in optogenetics, infrared light penetrates deeper into the biological tissue. The thickness of the laser beam 60 micrometers is comparable to the size of the neuron, and it is possible to stimulate a cell without affecting the others. You can choose the pulse parameters and to receive a cell action potentials at frequencies up to 50 Hz, not yielding to the temporal resolution optogenetics methods.

The authors worked with two types of receptors, they are active at 27 and 35 ° C, which is suitable for experiments with live fish, zebrafish, and nerve cell cultures. To work with live mice and other mammals it is desirable to find proteins on threshold which is closer to 40 ° C. The authors plan to change the ion selectivity of thermal receptors to using termogenetiki not only encourage but also inhibits the activity of neurons.

Author: Denis Tulinov

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[NEUROTECHNOLOGY 01.04.17-](#)
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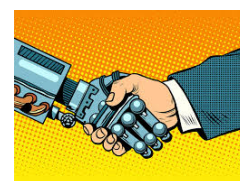


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A review article with variants of answers to basic questions about the chat-bots

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grant amount - up to 20 million rubles. Extrabudgetary cofinancing (due to own or borrowed funds) - at least 30% of the grant; Applications will be accepted from 15:00 (MSK) April 4, 2017 23:30 (MSK) May 15, 2017.

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[31.03.17](#)



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SETS "VIDERETREK" AND
"NEYROTREK" TOOK SECOND
PLACE IN THE CONTEST CHOICE
OF RUSSIAN TEACHERS IN 2017



Ltd. "Brain Development" took
second place in the "Educators
Choice" competition.

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