



# PHLburg Technologies, Inc.

1275 Drummers Lane  
Suite 101  
Wayne, PA 19087

Telephone: 610-688-6800  
Fax: 610-975-5800  
Website: phlburg.com

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## MESSAGE FROM NEIL B. GODICK

Russia votes next week for its Parliament and in March for its President. Historically, Russia's elections have not been much an election as known in the EU and US. This time will probably not be any different but *independent public opinion polls* are saying something different. What follows is a news report from a Russian press service.

MOSCOW. Nov 10 (Interfax) - The prospect of Vladimir Putin's re-election as president and Dmitry Medvedev's premiership following the election 2012 weakens the tandem, experts from the Strategic Research Center said in a report titled "Locomotive Forces and Prospects for Political Transformation in Russia."

The report was drafted jointly with the Academy of People's Economy and Civil Service under the Russian President. Interfax received a copy.

The influence of this decision on public opinion should be determined through sociological testing, but "its asymmetric consequences are already obvious," the report said.

"The consequences do not correspond to the mathematical rule that says the sum does not change no matter the order in which you add the numbers. It seems the reshuffle caused irreparable damage to the tandem political brand."

President Dmitry Medvedev proposed on September 24 to nominate Prime Minister Vladimir Putin as president in the March 2012 election. The president agreed to become the top United Russia candidate in the State Duma election on December 4 and to become the prime minister after the expected March election victory.

"The tandem developed natural specialization, in which Putin and Medvedev appealed to opposite social poles," the experts said.

"The brands of the tandem members were mutually supplementary and camouflaged the mounting conflict of interest between the two poles. Medvedev's personal brand mostly appealed to the citizens

awaiting accelerated modernization. The Putin brand appealed mostly to the traditionalist portion of the Russian electorate," they said.

The report referred to a focus group opinion and said, "Although the modernization brand of Medvedev weakened rapidly it still retained a certain consolidating potential for modernization supporters in the elites and the society, which enhanced flexibility of the power vertical against the backdrop of social polarization and slowed the erosion of its political foundation."

"The tandem reshuffle bared Medvedev's political dependency and stripped him of qualities expected from a nationwide consolidating leader. One may presume that the personal brand of Medvedev lost its independent value as a political asset and is weakening rather than strengthening the authorities," the report said.

"The image losses of the reshuffled tandem are irreparable because support lost by Medvedev cannot be added to Putin and this weakens the aggregate political foundation of the tandem," it said.

The effects are particularly obvious in the right-wing electorate, which is not represented by a personal political leader as compared with other groups of voters.

"The reshuffle did much less harm to the Putin brand, but he faced the problem of political aging and the impossibility of simultaneously appealing to both public poles. The tandem reshuffle weakened prospects for the self-transformation of the authorities and the possibility of a dialogue with society," the report said.

*We do not intend for the following reports to solve any need our readers may have. We do intend to keep everyone current on technology developments in Russia. If you would like any additional information on any of the developments reported – send us a note.*

### A new test for lung cancer therapy

The Vanguard of Knowledge competition organized by AstraZeneca focused on chemistry, biology and pharma R&D project proposals. The project *Identification of somatic mutations in EGFR gene in lung cancer patients' blood to predict response to gefitinib and erlotinib (BioLink)* was one of the eight winners. If the project is successful, a blood test will be sufficient to diagnose lung cancer. Those patients diagnosed with cancer will then be treated with selective action drugs.

If the cancer cells' nature is accurately determined, effective drugs can be prescribed that can help even when cytotoxic drugs are unable to. If all indications for use are observed, these drugs will help extend a patient's life for a year or more. The drug is effective if the tumor carries certain activating mutations in EGFR (epidermal growth

factor receptor) gene. New target drugs such as gefitinib and erlotinib significantly enhance non-small-cell lung cancer patients' survivability . About 10 % of lung cancer patients have these mutations. **BioLink Company (Novosibirsk)** has ample experience in developing its own diagnostic test sets based on real-time PCR. Among the company's developments are test sets that identify activating mutations in EGFR gene. This technique detects mutations directly in tumor tissue samples. Sometimes it is impossible to take a tumor tissue biopate for the EGFR test from many lung cancer patients. These are patients with inoperable tumors or whose tumors are localized in a difficult to access place. If it is too late for biopsy, there is a chance to determine activating mutations' presence in EGFR gene using a blood test. Further research under this project will make it possible to develop new laboratory tests giving hope for effective treatment.

#2011-10-191

### Optic tweezers for microobjects

Today's biotechnologies need more and more devices that can move single biomolecules, cells and other microobjects in space. **Saratov State Technical University and NII-Tantal** (Saratov) designed a micromanipulator that can simultaneously retain and mix up to 7 microparticles.

Light wave pressure force draws polarized dielectric microparticles into a focused laser radiation region and enables displacing them after the light focus. For initial particle capture, these systems require an extremely accurate match between the focus and the microobject position. Therefore, to facilitate capture, the manipulator design includes *axicons* (optical elements). They focus laser radiation not on a point but on a straight line section that is several millimeters long.

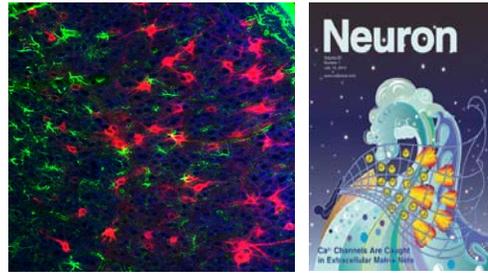
Based on a phase modulator and a powerful IR laser, optic tweezers were designed. As a result the system captures and moves 5–7 microobjects simultaneously. This is its key advantage as current industrial manipulators handle each particle separately. This device is used in biophysics to study cells. Its LC matrix provides independent control over objects' positions without any mechanical intervention and enables obtaining complex microstructures.

#2011-10-192

### Searching for a material nature of insanity

Mankind's age-long dream is to comprehend and control what is going on in the brain. In recent years, advances in molecular biology and noninvasive investigation methods made it possible for neuroscience to come close to achieving this goal. A **Lobachevsky Nizhni Novgorod State University** (Nizhni Novgorod) project uses a substance that biologists considered functionally secondary for a completely formed brain – extracellular matrix. If neurons and synapses are acted upon via it, the effect can be enhanced. The extracellular matrix and neurons interact. To comprehend its nature and learn to control it is an important problem to solve. The

challenge is to identify causes for the gravest mental diseases, epilepsy, and schizophrenia, and to look for new approaches to treat them.



This large-scale project's results provided data on experiments on mice whose brain lacked certain cellular adhesion molecules. These mice are known to have memory and sensory information processing impairments similar to schizophrenics. Schizophrenics have fewer cellular adhesion molecules than healthy people. This study showed that these molecules' presence or absence affects synaptic plasticity. Using pharmaceutical substances, the researchers succeeded in restoring the synaptic plasticity level that is typical for *normal* mice. They achieved this normalcy in spite of cellular adhesion molecules' shortage. The mice's learning ability and memory returned. These experiments discovered a new molecular mechanism via which cellular adhesion molecules affect synaptic plasticity.

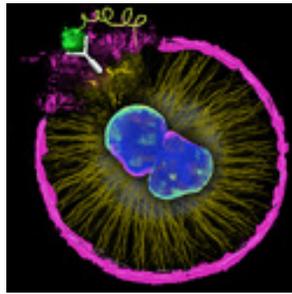
The laboratory's current focus is identifying the exact mechanism by which matrix molecules affect epilepsy development. A specialized vivarium is set up and necessary equipment is acquired for experiments aimed at solving this problem.

Over the last few years, scientists have accumulated a huge primary data array on genes and functions of the proteins they encode.

#2011-10-193

### Anticancer preparations delivered to destination

Photodynamic therapy is a treatment method based on the same principle as chemotherapy. But photodynamic therapy has an added *physical element*. When exposed to light at certain wavelengths, photosensitizers cause photochemical reactions in the surrounding solution. Among other things, the photosensitizers promote oxygen molecule transition to an energy excited (singlet) state. These excited oxygen molecules destroy other adjacent molecules. This results in a higher free radical concentration in the solution. If all these processes occur within a living cell, they can kill it. If a photosensitizing agent has a selective affinity to cells to be killed (e. g., tumor cells), it can be used as a medicine. However its action must be supported by illuminating the damaged tissue.



**RAS Institute of Biochemistry and Physiology of Plants and Microorganisms, Saratov State University and Moscow State Academy of Fine Chemical Technology** developed a new composite nanoparticle type where the gold-silver base is coated with a porous silicate shell. These particles' size is about 40 nm. They are effectively used to deliver porphyrins (key photosensibilizing agents) to tissues. Further, these particles luminesce when exposed to light in the visible spectrum. First, luminescence helps control nanoparticles' distribution in living tissues. Second, if the right distance between the reactant's molecules and the metal base is selected, it can strengthen the photodynamic effect. This strengthening enhances the cancer treatment.

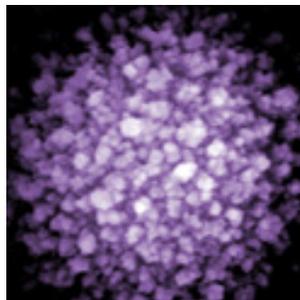
#2011-10-194

Using fields to  
synthesize  
nanostructures

There are many nanoparticle production methods. Synthesis often produces particles that vary in structure. Science-intensive industries need standardized nanoparticles.

**Vladimir State University and NT-MDT Company** discovered a method to control nanoparticles' structure obtained by evaporating a target exposed to laser. For this purpose, a pure graphite sample to be evaporated was placed in electrostatic and inhomogeneous magnetic fields.

The deposited layer was examined under an electron microscope and the examination confirmed carbon nanofiber formation. By decreasing the armature voltage it was possible to control the deposition process. This resulted in changes in the deposited particles' structure – fractal-structured nanoclusters were formed that were characterized using fractal geometry methods.



To synthesize the same pure graphite sample in an inhomogeneous

magnetic field, it was placed between two magnets. The target's atoms evaporated under laser action and were deposited on the substrate above it.

Studies of the deposited layer showed that nanostructured carbon layer formation is similar to dendrite growth. At first, *nuclei* were formed on the substrate. From the *nuclei*, tree-like dendrite structures grew and branched out.

Changes in the magnetic field can change the deposition mode. This change results in desired *nuclei* formation. In its turn, the *nuclear* structure is responsible for further dendrite growth.

This results in the electric field appropriately orienting propagating particles along its power lines. This orientation enables chemical bonds between atoms leading to directed nanofiber formation. This is also typical for the particle propagation process in a magnetic field. This occurs as the field is inhomogeneous, dendrite structures are formed.

#2011-10-195

### Herpes virus kills cancer

**RAS Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry and RAS Institute of Molecular Genetics** (Moscow) developed a genetic construction (vector) containing two genes. One selectively kills cancer cells, while the other stimulates the body's antitumor immune response. This vector is useable as a base for developing genetic therapy drugs to treat cancer.

The cancer cell killer is the herpes simplex thymidine kinase gene (*HSVtk*). In ganciclovir's presence, protein HSVtk triggers an enzymatic reaction chain, which stops DNA synthesis in dividing cells. Since, as a rule, healthy cells do not divide and DNA within them is not synthesized, protein *HSVtk* kills mostly cancer cells. If as little as 10 % of cells in a tumor contain gene *HSVtk*, the tumor can be completely eliminated.

The killer gene efficacy can be enhanced by stimulating the antitumor immune response. A protein that can handle this problem is the granulocyte macrophage colony-stimulating factor (*GM-CSF*). *GM-CSF* synthesis in tumor cells enhances their immunogenicity. *HSVtk* and *GM-CSF* protein genes have been experimented with in various world laboratories. It was a team of Russian scientists that were able to combine them in a single vector. This solution increases the probability of these genes' joint delivery to tumor cells. The vectors were first tested on cell cultures.

Two vectors were developed, one containing murine and the other human protein *GM-CSF*. They are intended for animal tests and for treating humans. These vectors were introduced into cancer cell cultures of human embryo kidneys and epidermoidal lung carcinoma

cells. In both cultures, proteins *HSVtk* and *GM-CSF* (murine or human) were functionally active. Vector-containing cells released considerable *GM-CSF* amounts into the culture medium. On that medium, murine marrow precursor cells turned into mature immune system cells. Seventy-two hours after adding ganciclovir into a vector-containing culture, massive cancer cell destruction was observed.

In a construction that contains killer gene *HSVtk* and gene *GM-CSF* (human or murine), both genes work. In the future it will be possible to use the vector for cancer therapy.

#2011-10-196

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