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MESSAGE FROM NEIL B. GODICK

From one extreme to the other

#1 - The Russian Orthodox Church – from banishment to leadership

Endorsed by Kremlin leaders as Russia's main faith, the Russian Orthodox Church has grown increasingly powerful since communism fell 20 years ago. Its role has drawn criticism from human rights groups who say it undermines Russia's constitution.

"The Russian Orthodox church is the largest and the most respected social institution in the modern Russia," President Medvedev stated.

The Church said it had made some exceptions allowing clergy to enter the political arena in cases where the Church encounters hostility from other faiths and factions. It did not elaborate.

Although Russia officially separates church from state, Medvedev said the two should work more closely. "In order to strengthen social stability today ... (the state and the Church), probably like never before, need to act together," he said.

Russia is home to around 20 million Muslims, around half of whom live in the volatile North Caucasus, where an Islamist insurgency is bubbling.

The Church's activities in society have surged in recent months. It launched its own YouTube channel as it seeks to lure youths to the faith, and it sparked ire from feminists in January when it said Russian women should dress more modestly.

#2 – Russia is searching for its *middle class*

Russia, a country of social contrasts, has:

- the third highest number of millionaires in the world, after the United States and Germany.
- 80 percent of the population earning a monthly income of less than 25,000 rubles ($860).

Such disparity is potentially dangerous, and could lead to social unrest. Authorities are resting their hopes for social stability on

developing a stronger middle class. The government is hoping the middle class will grow 60 to 70 percent of the population by 2020. Experts are not that optimistic.

Most people in Russia are still poor. The number of people with a higher income, who would meet the middle class criteria in the West, is very limited. Some researchers believe that these people account for no more than 7% the country's population. But even those people with relatively high incomes still behave like their poorer countrymen. They spend their money on food and clothes, but do not invest in education or services. They are very loyal to the authorities and are not interested in politics.

Historical circumstances have created a very specific "post-Soviet mentality" in Russia. This mentality does not encourage long-term future planning, investments, saving, or even living an active life. Most high-earning Russians are fully dependent on the state. Most of these people are employed by the state or work for large state-owned corporations. The number of independent professionals who work for themselves is very limited in Russia.

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.

Using table salt for water treatment at Balakovsky Vodokanal plant

Balakovsky Vodokanal water treatment facility (Balakovo, Saratov oblast) stopped using poisonous liquid chlorine and installed Russia's only water treatment system working on table salt.

A DC current is applied across two electrodes in the sodium chloride solution, resulting in electrolysis. The electrolysis results in releasing chlorine gas at the anode. Balakovsky Vodokanal specialists replaced the liquid chlorine method favoring a revolutionary new technology to obtain pure water. The entire process is fully automated. What is most important – it is now safe for humans and the environment. Table salt circulates through many rubber pipes and chemical processes cause chlorine gas to form. It is this gas that purifies water.

Under a modernization program, 60 similar plants were installed at the facility. Now 350 kg of active chlorine is produced daily from 1.5 t table salt. This is quite sufficient for providing an entire town with potable water. Every hour water samples are sent for analysis. The laboratories test the samples almost 50 different indicators – from heavy metal presence to residual chlorine content. Four water tanks with purest potable water are buried five meters deep. It is from there that pipelines carry water to the consumer
#2011-02-144

Russian scientists develop a potential LTE substitute

Popov Radio Works developed a new wireless communication standard. The new mobile communication standard is an alternative to LTE technology. It is expected to reach the market within five to seven years.

Earlier this year, at the Asian Financial Forum in Hong Kong a Hong Kong private investor pool paid US$30M to the Russian works for the exclusive right to promote HPIP (Hybrid Public Intellectual Product) standard in China, Malaysia, Indonesia, India and Hong Kong. The A.S. Popov radio works will further develop the technology and transfer the operating rights by the end of 2012. The newly developed HPIP standard is similar to LTE technology but with enhanced parameters. In particular, it provides broader coverage from a single base station while retaining up to 10 Mbit/s traffic-carrying capacity. To use this new communication standard, base stations will have to be changed, and GSM-chips in phones will have to be replaced with HPIP-chips. The latter are not yet produced on an industrial scale, but their prototypes have been developed and can be easily integrated in standard mobile phones.

#2011-02-145

A Stavropol professor invents new drug delivery system

Prof. Igor Bazikov (Microbiology, Virology and Immunology Department Head; Stavropol State Medical Academy) has designed an organosilicon nanocapsule.

Prof. Bazikov, jointly with his colleagues Blanka Rzhigova and Pavel Omelyanchuk, developed a drug delivery technology using auxiliary particles. The underlying idea is that: if capsules are used, the body will not reject the drug and so healing will be accelerated. Some drugs are oxidized and, at peroral and intramuscular administration, they pass through the gastrointestinal tract and liver causing allergic reactions. To avoid these negative consequences, microencapsulation can be used. The capsule is less than 100 nm in diameter. Thousands of the nanocapsules are placed in an ointment or gel. So far doctors use this invention only for skin regeneration (in dermatology, stomatology and gynecology). The development is protected by a patent (**RU2361382**).

#2011-02-146

Russian scientists study silicon nanoparticles action on cells

Lomonosov Moscow State University Physics Department jointly with the RAS Institute of Theoretical and Experimental Biophysics, Sechenov Moscow Medical Academy, Kulakov Research Center of Obstetrics, Gynecology and Perinatology and Russian Scientific Center *Kurchatov Institute* have studied nanostructured silicon surfaces and silicon nanoparticles that inhibit stem and cancer cell division. Their findings can be used in medicine, in particular in oncology.

Silicon nanoparticles have several valuable properties including biocompatibility, biodegradability and high penetrability. They raise cellular membranes' permeability, and so lower drug doses can be administered. Silicon particles can be used as an additive in tooth pastes: they softly remove bacterial plaque without damaging teeth enamel. Silicon particles also interfere with pathogenic microorganisms' development in foodstuffs.

Scientists worked with nanostructured silicon surfaces and silicon nanoparticles. They obtained structured surfaces by electrochemical etching the crystal silicon plates. As a result, a 15 micron-thick layer was formed on the plates. Ledges and hollows 10 to 100 nm high comprise the layer. The researchers placed these plates in Petri dishes

with a nutrient medium and tried to grow human spinal cord stem cells on them. The cells remained viable for 10 days, but virtually did not divide. At the same time and in the same medium, but without plates, they multiplied perfectly. This effect could be related to both local electric fields on the structured silicon surface and to purely chemical action of orthosilicic acid formed as the plate partially dissolves in water. Since silicon films inhibit stem cell growth, they can be used for cellular preservation.

The second experiment was devoted to polycrystalline or porous silicon nanoparticles' properties. They were added to a nutrient medium in which human larynx tumor cells or murine fibroblast cells were grown. In the experiments, at concentrations above 3 mg/ml, nanoparticles inhibited growth in both normal and tumoral cell types.

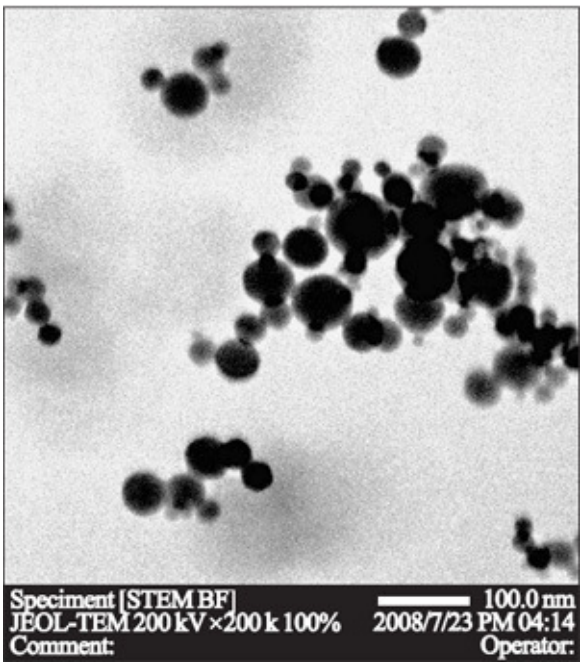
It is known that ultrasound can increase the nanoparticles' damaging action. High-power radiation (2 W/cm^2) can itself destroy up to 30% of the cells. Nanoparticles can reduce the live cells' number 4 times in comparison with the controls (ultrasound without nanoparticles) within half an hour. Particles from porous silicon are more effective than from polycrystalline and destroy practically all cells. At low ultrasound intensity (0.2 W/cm^2), cells with nanoparticles did not perish, but completely stopped dividing within 80 hours.

Nanoparticles probably serve as formation centers for cavitation bubbles that destroy cells. It cannot be ruled out that, as they oscillate in the ultrasonic wave, they damage cells mechanically. Depending on the ultrasound power, the damage results in complete cancer cell annihilation, or in division-inhibiting defects in the cells.

#2011-02-147

Industrial laser provides for efficient nanopowder synthesis

Researchers from the **RAS Ural Branch Institute of Electrophysics (Yekaterinburg)** are using industrial fiber ytterbium lasers for producing functional nanopowders. They compared the productivity and power consumption for obtaining nanopowders by using a fiber and a carbon-dioxide laser and verified the advantages of the fiber laser.



Nanopowders are used to develop structural ceramics and applied in hydrogen power engineering. Many nanopowders are luminescent. A promising nanopowder production method is target evaporation using laser radiation. Carbon-dioxide lasers, earlier studied by the Yekaterinburg researchers, can produce particles sized about 20 nm. With carbon-dioxide lasers, differences in nanoparticle size are insignificant. However, these lasers' technical disadvantages (power instability, low electricity-to-radiation conversion efficiency, large dimensions) are inconvenient and stimulate researchers to look for better solutions. A research team decided to use fiber ytterbium lasers in the same process. Lasers manufactured by NTO IRE-Polyus were used in the experiments. They are more efficient than carbon-dioxide lasers. However, their wavelength is 1.07 μm (10 times less than in carbon-dioxide lasers). Therefore their potential application in nanopowder production required additional experimental confirmation. The target (billet formulated to obtain the desired composition) was made from compacted micronized yttrium (Y) and zinc (Zn) oxide powders. Laser radiation was transmitted through a fiber cable to an optical system and focused on the target. The billet had a drive for target horizontal displacement and rotation to ensure uniform surface treatment. Molecules evaporated from the surface were carried away with an inert gas flow and condensed on specially prepared substrates. During continuous 17-hour laser operation, the powder yield was 390 g. This is three times the amount obtainable using a carbon-dioxide laser. Additional analyses confirmed that the nanopowder obtained is homogeneous and its composition is similar to the target. Experiments producing optical ceramic nanopowders also showed that, if an ytterbium laser is used, the final mix composition is distorted to a much lesser degree (compared to the source target composition) than with a carbon-dioxide laser. The scientists explain this effect by the ytterbium laser's higher

monochromaticity. They paid special attention to select the optimum laser operation mode. The experimental productivity's dependence on the pulse duration at fixed pulse energy has a characteristic peak in the 100 μs region. The researchers concluded that fiber ytterbium lasers use to obtain nanopowders is a promising area for development.

#2011-02-148