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MESSAGE FROM NEIL B. GODICK

Russia has long had a problem with corruption. Immediately on taking office President Dmitry Medvedev declared that he will change what has been pervasive in Russia for centuries and he has promised legislative steps to do so.

However, most Russians are convinced that nothing can be done to deal with this entrenched problem.

Here are some comments from a recently published interview with a Moscow retailer:

To keep the doors open I have to pay bribes.

I think that uncorrupted business is impossible in Russia unfortunately. You encounter so many obstacles on your way that you can't overcome them without paying bribes.

No matter how well I run my shop, officials find something wrong and they have to be paid.

They are extorting of course, so why do they come then? They can afford luxury on their salary. They live on their salary but luxuriate on bribes, that's the system.

People from the streets of Russia, of any city, of any village, can face the need to pay a bribe if they need to access medical services and even educational services such as kindergartens, schools or universities. But it also is found in the top cabinets of government and in large business.

Earlier this month a senior investigator from the Prosecutor General's office estimated that corrupt officials were pocketing the equivalent of one third of Russia's annual budget. The investigator told the Interfax news agency that bureaucrats were receiving more than $34-billion in bribes from businessmen each year, and that didn't include what he called "everyday" bribes. Transparency International releases an annual corruption perceptions index, ranking 180 countries between 0 and 10. Russia ranked 143 with an index 2.4.

The main hope of Russia's populace is that the President's promise is not going to be another campaign against corruption but will be a systemic application of tough action on preventing corruption and punishing corrupt offences.

We do not intend for these 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.

Solar Cells

Russian physicists from Ioffe Institute developed a new type of cascade solar cell. This cell provides efficiency of over 35% with 1000-time concentration of solar radiation. These cells together with inexpensive echelon lenses are the basis for concentrator solar modules and solar power units. These units are promising as energy providers for autonomous users. This development is the basis for commercial production of terrestrial solar modules with radiation concentrators with overall production of 75 MW per year. The project is to be financed by Vneshekonom Bank and several large Russian companies. The factory for the power units will be built in St. Petersburg.

Health Sciences-Bio Chip

Engelhardt Institute of Molecular Biology continues to add applications to its Biochip genechip. The latest application is a biochip with an internal calibration curve for quantifying two forms of the prostate-specific antigen. The development work was completed in cooperation with the Blokhin Cancer Research Center. Three-dimensional gel-based biological microchips were developed for simultaneous quantization of total (PSA_{tot}) and free (PSA_{free}) forms of the prostate-specific antigen in human serum in the "one patient, one biochip" format. A method not demanding construction of calibration curves prior to the assay was applied to quantization of PSA_{tot} and PSA_{free}. In addition to gel elements with immobilized antibodies against PSA_{tot} and PSA_{free}, the biochip contains elements with immobilized PSA at different concentrations, forming an internal calibration curve. Data are processed and interpreted with the special-purpose ImaGelAssay program. The sensitivity of the assay is 0.3 ng/ml for PSA_{tot} and 0.2 ng/ml for PSA_{free}. The variation coefficient for measurements with one biochip series does not exceed 10%. The correlation coefficients between the estimates obtained for human sera by the biochip assay and by conventional ELISA were 0.988 for PSA_{tot} and 0.987 for PSA_{free}.

Bone Implants

Russian stomatologists have developed and introduced a new method of growing implants with the effect of memory form on specially prepared jaw.

Currently, the implantation of artificial teeth is widely used in orthopedic stomatology. However, the bone, to which they are attached, is some times weak. Usually, the alveolar bone serves as the

support for the roots. But after the extraction of bad teeth, the alveolar bone is subjected to atrophy. The bone volume reduces and atrophy continues. This combination reduces the possibility of using inter-bone implantation. In these circumstances bone grafting may be necessary. This is a painful and long operation. A fragment is being cut from the patient's shinbone, is transplanted on the jaw, and fixed with screws. Tissues are stitched. Then the patient has to wait until the fragment grows.

The developers patented a new method for tooth implantation, implant with shape memory. To grow bone, stomatologists use biocompatible materials with thermal and mechanical stability based on nickel-plated titanium.

The author of the discovery, Leonid Gurfinkel explains how the new surgery method is performed:

- A narrow canal is drilled in the jaw's microscopic surgical area.
- A patented biocompatible gel is injected through the canal.

The gel is a nano-structured amorphous material with high concentration of active matter, up to 80%. Particles of nickel-plated titanium in the gel serve as a network for growing new bone cells.

This combination of materials provides a structure for bone growth. Consequently, a bone crosspiece is formed. Now, any artificial tooth can be implanted on this reinforced jaw. This method is quite universal. It paves the way for increasing the volume of bone tissues in any sector of the jaw and at any age of the patient. When implant and increasing the volume of bone tissues are produced using nickel-plated titanium both operations could be done at the same time.

Quite complicated illness, paradontosis, could be cured using the biocompatible gel that penetrates in the bone around the upper part of the tooth's root. Originally, a protecting membrane is formed there and then the illness ends when bone crosspiece grows.

The new materials have significant multi use properties, such as elasticity, durability and resistance to temperature changes. Considering these properties, surgeons could use the gel in cranial surgery, spinal implantations, and treating joints.

Iodination Inhalator

INGATEK, jointly with scientists of Kurchatov Institute, has patented a new device: a 'generator of sea air for iodination inhalation. This device enriches air with submicron sodium or potassium iodide salt aerosols. The device is able to maintain an iodine concentration of 10-30 micrograms per cubic meter in a room.

It is approximately the same iodine concentration as sea air. A standard daily dose of iodine can be received by breathing air from the generator for a night. This device, according to its authors, is very quiet, requires little energy (the power consumption is 140-160 W) and has a long life - one capsule is enough for 18 months.

Aviation

Ural scientists develop a new aircraft. The unique aircraft called BARS (Russian abbreviation for *no-aerodrome airplane with aerostatic unloading*) was developed by Ural scientists will considerably reduce expenses in developing natural resources in remote areas of Russia. The vehicle is an airplane-dirigible hybrid. Helium, pumped into the rigid toroidal shell raises the aircraft; additional vertical thrust is provided by a high-power engine inside the toroid; a cruising speed up to 300 km/h is provided by mid-flight engines. According to the developers' estimates, the cost of passenger and freight transportation by BARS is 8-10 times lower than that by airplane, 15-20 times cheaper than by helicopter, 3-5 times lower than by rail, and 1.5 times lower than by water. BARS has passed flight tests and has an official permit to fly. The project is protected by patents filed in Russia, Germany and the USA.

Materials Sciences

Despite the sharp interest in nanodiamond technologies and rapid development of this industry, Russian scientists still remain trendsetters in growing tiny diamonds.

Scientists started industrial synthesis of diamonds in the mid 50s. This initial synthesis was performed by means of graphite transformations in chambers, which provided very high pressure - tens of thousands of atmospheres - and very high temperatures - about 1500 degrees C.

Today innovation technologies are shifting from micro to nanosizes. First nanodiamonds were synthesized in the Soviet Union, and commercial production of these carbon treasures was launched in late 80s. Initially material chemists chose carbon explosive substances, thus high pressure and temperature, necessary for forming diamond structure from atoms of carbon, were generated during an explosion. The shorter an explosion was, the smaller diamond crystals appeared. Sometimes they were as small as one billionth part of meter.

As the topic was top secret for a long time, no scientific work on explosive synthesis appeared in the open Soviet Union records. This is probably the reason why the technology of nanodiamond synthesis from carbon of explosives was invented in Soviet Union several times by different independent teams of inventors. In 1988, these papers were published in Russia and the United States and were widely citated. Since that time inventors have come a long way. Scientists have learned that detonation nanodiamonds showed some unusual properties. Latest research revealed that nanodiamonds could be a great basis for nanocompositional materials, coatings with unique

mechanical properties, elements for nanoelectronics, selective sorbing agents and catalysts and objects for medical and biological applications. Nanodiamonds significantly improve quality of microabrasive and polishing materials, lubricating oils, various rubbers, magnetic recording systems and allow growing diamond films on various carrier materials.

Nanosize diamonds, when heated under certain conditions, change their structure and form nested carbon spheres - nanomatreshka or carbon bulb. This bulb can again form a nanodiamond (a structure with diamond lattice) after being treated by electronic beam. Well, a hollow carbon nanosphere, is nothing but a recently discovered and very popular now fullerene molecule.