

# Possibilities on the edge of fantasy

Nano-materials and nano-tubes allow strength and endurance to be raised

By Vladimir Yakovlev

To date, it has been too expensive to use nano-tubes in mass production. However, the Belarusian National Academy of Sciences' Institute for Heat and Mass Transfer is preparing a breakthrough, having developed several devices to generate nano-materials. One aims to produce multi-wall nano-tubes, boasting great energy efficiency. The Russian Academy of Sciences' Siberian branch has created the necessary catalyst, so manufactured products could be supplied to Russia to make high-tech products — such as space craft.

The project is an example of Belarusian-Russian scientific collaboration in nano-technologies — under the *Nano-Technologies — SG* Union State programme, which was launched in 2009 and runs until late 2012. It covers 35 major projects, opening the doors to many fantastic possibilities and inspiring international interest.

Work on nano-materials and nano-technologies began at the beginning of this millennium, with some results achieved accidentally through intuition — as often occurs. Since then, the sphere has taken off,

with a laboratory of nuclear-power microscopy set up and expensive diagnosing equipment purchased.

The Deputy Director of the Institute for Heat and Mass Transfer, Kirill Dobrego, guides us to the laboratory of high-speed processes, where senior researcher Yevgeny Prikhodko shows us a stand for covering silica solar batteries with super-thin protective covers, via a plasma discharge. Unlike previous methods, this Belarusian approach halves the working temperature of the process, while requiring no vacuum. "Such films can be placed on polymers and many other materials," states Mr. Prikhodko, adding, "We offer high speed and relative cheapness."

Another laboratory is involved in producing membrane filters for separating gases, liquids and biological molecules — via super-thin coverage of micro-porous materials. Properties of coverage can be managed, allowing a filter to be self-cleaning, distinguishing certain materials.

Many of the Belarusian scientists' developments are likely to enjoy demand in other high-tech branches — such a watch making and the electronic and optical industries. Diamond-like carbon fields can be



At Institute of Heat and Mass Transfer, experiments conducted by researcher Yevgeny Prikhodko

used as a universal protective covering, resistant to aggressive environments and mechanical influence, while being current-conducting or dielectric, lustrous or anti-glare.

Many Belarusian developments focus on the space sphere, as co-operation between Belarusian scientists and the Russian Space Agency is already a tradition. Nano-additives to fuel space craft have great prospects, improving the combustion of fuel and enhancing efficiency. However, these technologies also have application on Earth, being

able to enhance the quality of off-grade fuel (used for ordinary energy facilities and engines), yielding great economic results.

"Our Russian colleagues are supervising their part of the programme," explains Mr. Dobrego. "Of course, we exchange information, 'trying out' their results in our conditions. Meanwhile, we jointly oversee some aspects: our Institute produces a special facility to polish optic elements with high accuracy, while super-accurate lenses (curvature measured in Angstrom units)

are being supplied by the Russian Academy of Sciences' Institute of Chemistry of High-Purity Substances.

Over the course of time, a complex of functional equipment for space craft should launch, using absolutely new technologies to help reduce the satellite's weight 2-3-fold, and improving possibilities of remote Earth sensing, while reducing costs. Both Belarus and Russia are interested in such co-operation, with their liaisons in mastering space ever expanding.

## Independence skills formed in childhood

Some Minsk schools install terminals for bank transfer payments

A branch of Belagroprombank has joined the Department of Education at Minsk's Central District Administration in implementing the launch of payment terminals at secondary schools #180 and #48 (named after Malyshkev); they are the first educational institutions to receive the innovation.

Special cards are to be issued for students. Those aged 6-14 are to be issued supplementary cards to the accounts of their legal representatives (parents, adoptive parents or guardians). Those aged 14-18 years will be able to apply for a basic card independently, as well as a complementary card to that of their parents. To control children's expenditure, parents can set spending limits (of Br10,000 to Br60,000 per day), with SMS-

info texts.

Each card for children aged 6-14 years costs Br5,000 to produce, compared to Br15,000 for students of 16-18 years. Students at participating schools, alongside members of the bank-

ing programme *Grow Big*, will receive a new card for free.

In addition, the bank has developed a number of special products for its young customers.

The purpose of the project is to teach youngsters efficient money management, developing their financial independence and creating future banking customers.

The project aims to promote non-cash payments while increasing the financial literacy of plastic card users.



## Secrets unveiled through knowledge of physics

By Darya Ilyina

Belarusian scientists unsurprised by American illusionist David Blaine

The do-or-die stunt on a New York pier saw illusionist David Blaine standing on a specially installed platform, within a coil filled with seven artificial lightning bolts: each contained a million volts of electricity. Wearing a chain-mail outfit and a mesh helmet, he easily dispersed the bolts with his hands, while talking to the audience.

*The Electrified: One Million Volts* was viewable online live, fulfilling Mr. Blaine's hope to inspire schoolchildren to study physics. "The secret of this trick is understandable to all those aware of Faraday's cage," explains Doctor of Physics and Mathematics, Yevgeny Tolkachev. "This device was invented by physicist and chemist Michel Faraday in 1836, to protect against external electro-magnetic fields. The external static electrical field of the cage causes electric charges to redistribute themselves, cancelling the field's effects in the cage's interior: there



David Blaine during his 'fatal performance'

is no electric field inside the cage." However, Mr. Tolkachev views the stunt as slightly hazardous, since alternating currents can penetrate the body. Saying this, we open ourselves to the same risk when travelling by trolley bus, using our mobile phone or sitting in a room containing numerous electric wires.

Mr. Tolkachev is the Deputy Chairman of a working group as-

sessing innovative proposals received by the Belarusian National Academy of Sciences. He admires the American illusionist not only for his advertising of physics but for helping refute false scientific theories. Several years ago, one stated that gravity was of electrical origin. If he had been correct, anyone within the Faraday cage would have flown.