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From the Publisher

You may have heard the story before: a foreign company learns about a patent held by two Polish universities. A product manufactured on the basis of this patent has sensational properties and is sought-after on international markets. The foreign company makes a fact-finding trip and comes to the patent holders telling them the following: there are many potential buyers who are asking about the price. The reply is a curious “We don’t know.”

This story illustrates the approach of many Polish scientists and academics, who until recently believed that research should be kept separate from business. Today, everyone’s talking about a knowledge-based economy—a buzzword that has caught on in this country and is the driver of many new ideas. Some people are not even talking about knowledge-based economy: they are working to make it happen.

One of these individuals is Prof. Jacek Golikowski, the vice-president of the Adam Mickiewicz University (UAM) in Poznań and co-founder of the Poznań Science and Technology Park, who is a special guest of this issue of The Polish Science Voice. He tells us about the Filipino Science and Technology Park, a new park run by the UAM Foundation to support businesses set up by students, PhD. degree holders and professors, he talks about people and their work and achievements. Golikowski says the Adam Mickiewicz University promotes enterprise and supports talented young people, helping them enter the market.

This is good news. I hope that when they are asked the price question, their response is different than the one cited earlier. Polish scientists, following in the footsteps of their counterparts in other countries, are learning not to get rattled when the question about the price is asked; they are actually waiting for such a query. We are leaving an era when scientists behaved like aloof aristocrats who insisted that their talents were not for sale and were actually asking for such a query. We are leaving an era when scientists behaved like aloof aristocrats who insisted that their talents were devoted to pure science—meaning science without a commercial twist. Today pure science is also beginning to mean a road to business and profit. Without a doubt, companies and institutions operating as part of the Polish Technology Platforms for Innovative Medicines (PTTIM)—yet another research and development consortium funded in The Polish Science Voice—are convinced of this. Medicine and pharmaceuticals are among the sectors that display the greatest development potential in the Polish economy, according to market analysts, and many innovative Polish medical products and pharmaceuticals are successful abroad.

Innovative medicine takes center stage in The Polish Science Voice. In this issue, we report on an impressive range of projects and designs from modern nickel-titanium implants that are used in surgical procedures instead of sutures, to a new method for reconstructing eye socket walls using a fabric made from polypropylene and polyester yarn. We also report on a tissue bank and an extraordinary antibacterial fabric that does not allow germs to proliferate and is used to make sterile clothing for medical personnel.

In another regular column, dedicated to Polish universities, we describe the Silesian University of Technology in Gliwice, one of the oldest technical universities in Poland and an institution that focuses on innovation and the development of new technology. The university is a key scientific and educational institution in Upper Silesia, Poland’s most industrialized region and one of the most industrialized areas in Europe.

The Polish Science Voice

No. 24

Special Guest: Prof. Jacek Golikowski, vice-president of the Adam Mickiewicz University (UAM) in Poznań and co-founder of the Poznań Science and Technology Park

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The Adam Mickiewicz University in Poznań is known for its policy of supporting academic enterprise and innovation. How is that done?

The Poznań Science and Technology Park, run by the UAM Foundation, supports businesses set up by students, Ph.D. degree holders and professors. Several dozen businesses founded on ideas originating from the university have received grants under European Union programs, and another two business incubators are in the pipeline. The Adam Mickiewicz University promotes enterprise; it carries out information campaigns and provides advice to talented young people, who are offered support as part of the Science and Technology Park. We have been building a system to help new entrepreneurs who come from the university to enter the market.

How do they cope with the tough rules of competition?

The business incubators prepare them to deal with the realities of the market, which is best evidenced by the successes which companies operating within the park have scored. One of our enterprises, the Center for DNA Research, established by Michał Kaszuba and Jacek Wojciechowicz, was named an Academic Enterprise Leader last year, an accolade accompanied by a large sum of money and promotion on markets abroad. The laboratory takes external orders for services such as analyses of the risk for lyme disease among foresters. This biotechnology company has 18 on staff and while its offices are based in the park, its laboratories extend beyond it. The founders of the Center for DNA Research gave up their brilliant careers in science in favor of technologically advanced business. Two years on, their business is flourishing, which is no means an easy feat in natural sciences. It is much easier to set up a consulting, training or translation company, whereas chemistry or biotechnology necessitate an appropriate technical base, cleanroom standards and so on. The Center for DNA Research conducts research of its own and works with science and diagnostics centers in Poland and abroad. It has contributed to the latest developments in molecular biology. It provides services to patients, physicians, clinics and laboratories.

You are a chemist by education. Why did you decide to pursue a career as a manager responsible for applying research results in industry?

Twenty years ago, I joined forces with Prof. Bogdan Marciniec and a team of colleagues to establish a spin-off company based on our own chemical technology. Our research concerned organosilicon compounds. Our company, called Przedsiębiorstwo Innowacyjno-Wdrożeniowe Unisil Sp. z o.o., was established in May 1989 and has been the only Polish producer of organofunctional silanes and organosilanes ever since.

We lease production facilities from the Nitrogen Plant in Juggling Research with Business
Tarnów and use the plant’s technological infrastructure and raw material resources. Relying on patent rights and silane production technology developed by Prof. Marciniec’s team at the Chemistry Faculty of the Adam Mickiewicz University, a few years ago we started producing amino-functional silane. Today our company sells a range of products including organofunctional silanes, organosilanes and derivatives of orthosilicic acid. Unisil continues to work with the Nitrogen Plant and the Adam Mickiewicz University to steadily expand its range of products.

Would you agree that practice is the best of all instructors?

It definitely is. My own experience shows that it is possible to use one’s own research achievements to set up a company to manufacture products that meet market demand. The company pays for itself, and its operations benefit both the patent holders and the university, which receives license fees.

Does this mean that it only takes an innovative idea to be successful in business? Why is it, then, that so few scientists in Poland are actually successful businessmen?

Academic staff members are first of all expected to do research and teach, while work on applying their ideas in practice is not seen as a priority. If they choose to pursue a business project, they need to know that this is a very demanding process, because you enter the uncharted waters of marketing, prices, taxes, logistics and so on. Building a company from scratch, you have to learn things that are completely unrelated to what you specialize in. It is nevertheless possible, and once you achieve it, you feel successful and satisfied.

In your capacity as vice-president of the Adam Mickiewicz University, you are in charge of patents, commercial projects, technology transfer and academic entrepreneurship. What has changed in these areas since you were a budding businessman yourself?

Procedures are now radically different for setting up start-up businesses, and EU programs provide significant help in founding spin-off and spin-out companies. However, the work of each company is still saddled with legal doubts and nobody knows for sure if institutions of higher education are allowed to contribute their capital to such projects.

What could be a better environment than a university to foster the development of a knowledge-based economy?

For example, the Adam Mickiewicz University is not a co-owner of Unisil, because a few years ago it turned out that the law did not permit such ownership. Consequently, the university sold its shares in Unisil to the UAM Foundation, because foundations are allowed to hold shares in companies. And it is perfectly clear that the foundation has direct ties to the university.

You have coordinated many national and international projects that deal with ties between science and business, innovation and business incubators. Why do you think Poland is still a poor performer in innovation, especially in league tables that rank countries in terms of the number of registered patents?

More patents will not remedy the problem of innovation, although they are an important thing as well. It is more important to create mechanisms to put these patents in use in business and persuade scientists that it is possible to write research papers and patent inventions at the same time.

“It is necessary to persuade scientists that it is possible to write research papers and patent inventions at the same time.”
The air we breathe is full of bacteria: it contains millions of bacterial colonies per cubic meter. If a cubic meter of air contains one bacterial colony, this means it features a class-A biosafety level, the highest air cleanliness standard achievable on Earth.

The Tissue Bank Department of the Regional Blood Center in Katowice is the most modern facility of its kind in Poland and one of the most sterile places in the world. The facility meets the most stringent European Union standards and is among the cleanest places on Earth. More sterile conditions can only be found in outer space.

Dr. Henryk Bursig, head of the Tissue Bank Department in Katowice, says, “In terms of sterility and graft production standards, we are on a par with tissue banks in the United States.” Bursig says, “We are the most sterile place on Earth.”

As Clean As It Gets

The Tissue Bank Department in the southern city of Katowice is among the cleanest places on Earth. More sterile conditions can only be found in outer space.

Subsequently to zone B, in which it can contain up to 10 bacterial colonies per cubic meter, in the super-sterile zone A, the air is wholly exchanged 40 times per hour, or every 90 seconds. In such a zone, pressure is 10 Pascals higher to block more contaminated air from other zones. This kind of ventilation and air filtration system is crucial for the bank. The roof of the Regional Blood Center groans under 30 tons of equipment that makes air exchange possible. A dedicated recuperator recovers thermal energy from the exhausted air, which is a state-of-the-art method for saving energy in buildings.

Access to the Tissue Department Bank is restricted. Only 11 staff members can enter the facility. They must use disposable sterile suits, complete with a mask, gloves and glasses. To avoid paper dust, all notes and records are made on touch-screen monitors built into the walls. Communication with those staying outside the clean zones is through videophones and provided with automatic temperature, humidity and pressure controls.

These rigorous standards are necessary to ensure the highest possible safety for patients.

“The Tissue Bank Department provides 92 percent of the bone graft material available nationwide,” says Bursig. “Before it reaches patients, this material must be tested in appropriate, standardized conditions.”

The facility produces about 50 graft types of bone tissue, tendons, fasciae and ligaments, which come in a frozen, lyophilized or
freeze-dried form—in addition to artery and vessel grafts. At the same time, the center conducts research to develop new technologies and products.

**Lab culture**

The first method successfully applied at the facility involved chondrocyte—or cartilage tissue cell—cultures for autologous implantation. The method, available from the state-of-the-art medi-
the art Cell Culture Laboratory since 2005, helps treat knee articular cartilage defects.

The process of culturing chondrocytes is based on collecting fragments of the patient's knee joint cartilage during an operation, sending the cells to the laboratory and having them proliferate in the patient's own serum, which lasts from two to four weeks. Over that time, from several hundred to more than 10 million cells are obtained in 1 ml of a solution. The final graft, which takes the form of a transparent, elastic disk formed by chondrocytes suspended in tissue glue, is placed by the surgeon on the patient's cartilage defect. Surgeons here already performed about 100 operations of this kind. The autologous chondrocyte implantation method has proved to be effective clinically. It involves no risk of complications for the patient, as their own cells are used in the graft.

“We would like to deal not only with chondrocytes; other cells are also fit for laboratory culture conditions,” says Bursig. “We will take up further work soon, but this must be something that could be quickly applied in clinical treatment. Our chief task is to prepare grafts to meet the patients’ needs as they appear. We follow whatever new appears in print internationally and, if a method is promising in terms of quick clinical application, we strive to make the procedure available to Polish patients as soon as possible,” he says. Recently the Tissue Bank Department has focused on tests with fibroblasts, or skin cells that can be used in the treatment of hard-healing wounds. The idea is to create a kind of bioactive dressing in which the patient’s own cells will do the job of healing the wound. The research is promising, but it requires further work.

Biological dressing is another field in which the Tissue Bank Department has been successful. In 1999 and 2004, the bank’s researchers, working together with the Łódź Institute of Chemical Fibers, developed the ChorioChit and ChitoFib innovative dressings, which won gold medals at the Eureka World Exhibition of Innovation, Research and New Technology in Brussels. ChorioChit (Chorion/placenta + Chitosan) is a biological wound dressing based on chitosan, a natural polymer with excellent absorptive properties, combined with a human placenta extract. The dressing is extremely effective in the treatment of hard-healing wounds, its researchers say.

In turn, ChitoFib (Chitosan + Fibrinogen) is a surgical biological dressing that combines the biopolymer chitosan and tissue glue developed on the basis of fibrinogen. The dressing enables surgeons to replace wound stitches with glue. These two new-generation dressings are waiting for an investor to apply them in hospital practice.

As far as chondrocyte cartilage cells are concerned, the Tissue Bank Department says it has the capacity to culture chondrocytes—even for several hundred implantations a year. In addition to the Cell Culture Laboratory, the facility includes two other laboratories: the Biostatic Graft Laboratory, which deals with the processing and preparing of bone, tendon, fascia and ligament grafts, and the Arterial Allograft Laboratory, which produces allogenic arteries and veins.
Medicine and pharmaceuticals are among the sectors that display the greatest development potential in the Polish economy, alongside information technology and telecommunications, according to one of the country’s largest business organizations, the Business Centre Club. Market analysts agree that Polish medical products and pharmaceuticals can be successful on the global market.

The Polish Technology Platform for Innovative Medicine was established in 2005 under the auspices of the ministry of health and the ministry of scientific research and information technology. The consortium brings together research institutions, organizations, scientific and clinical centers, hospitals and medical companies aiming to build an extensive base for developing research on innovative drugs and treatments.

The consortium wants to increase the availability of modern treatments and turn the pharmaceutical market into a driving force behind Poland’s economic growth. Consortium members are working to overcome bureaucracy and reduce the costs of innovation in medicine, which are higher in Poland than in other countries in the European Union. Under a strategic action plan adopted by the platform, the PPTIM is tasked with creating a basis for research on innovative technologies, pharmaceuticals and diagnostic methods. The consortium aims to make sure that advanced biomedicine based on Polish technology is introduced into the healthcare system. It is working to create a system for promoting innovation in medicine and data and information exchange standards at companies and medical centers.

One of the PPTIM’s main objectives is to work closely with its counterparts in other EU countries and be an active participant of the EU’s 7th Framework Program. The ultimate aim is to take part in competitive programs under the European Innovative Medicines Initiative (IMI). According to research businesses and institutions working as part of the platform, the greatest problems in developing innovative medical and biomedical technologies are impractical regulations and bureaucratic snarl-ups that make it difficult for those interested to obtain government funding for medical research. Bureaucracy additionally makes it hard for research centers to undertake long-term research programs, consortium members say.

Innovation in medicine and medical technology is expected to be one of the pillars of the EU economy, according to strategic documents of the European Commission and the European Parliament. At the end of May, the European Commission published information about projects that are eligible for support under the IMI joint technological initiatives. These are 15 projects with a total budget of 246 million euros. That includes 110 million euros from the 7th Framework Program; the remaining 136 million euros will be contributed by pharmaceutical companies. This will be not just loans and cash, but also the value of clinical trials, laboratories, staff and materials provided to the IMI. The total IMI budget for 2008-2013 is 2 billion euros, half of which will be provided by the European Commission and the other half by the businesses involved.

The IMI is one of five community tech-
technology initiatives launched so far under the 7th Framework Program. Its aim is to facilitate joint work and research by scientific organizations and institutions and pharmaceutical companies in the development, testing, monitoring and patenting of new chemical compounds that could lead to the development of new medicines and treatment technologies. The tools that will be created under the IMI program will help researchers speed up the screening of future pharmaceuticals in terms of efficacy and patient safety. Other tools will serve to promote the internal exchange of information, training and sharing of treatment results.

The first stage of submitting applications to the IMI ended last July. A total of 150 joint documents were received from consortia formed by institutions, small and medium-sized enterprises, patient organizations and public administration bodies. After a year of checking and testing, mainly in terms of compliance with EU medical standards, 15 projects were selected for financing as the first group. The selection was made by a panel of independent experts based on test results and scientific criteria as well as the strength of the consortia in the sense of their ability to overcome barriers to introducing new medicines and technologies into the market.

According to Arthur Higgins, CEO of Bayer Healthcare and president of the European Federation of Pharmaceutical Industries and Associations (EFPIA), the IMI will be a benchmark for future systems of exchanging experience and knowledge as well as joint projects at European medical companies. "The aim is to provide the necessary framework for future systems of exchanging experience and knowledge as well as joint projects at European medical companies. Negotiations on individual projects are expected to conclude by the end of this year. A second call for applications under the IMI is scheduled for October. Preference will be given to projects related to cancer, contagious diseases, asthma and chronic obstructive pulmonary disease (COPD). All of these disorders have the status of social diseases in the EU, making their treatment a priority.

Janez Potocnik, the European commissioner for science and research, says the IMI is an opportunity for Europe to become a leader in biopharmaceutical research. Of the 15 projects, most are related to diagnostics and developing new pharmaceuticals: four focus on training, while three deal with drug safety and efficacy. The new pharmaceuticals will be used in treating diabetes, cancer, pain, mental illnesses, neurodegenerative diseases, asthma and chronic obstructive pulmonary disease (COPD). All of these disorders have the status of social diseases in the EU, making their treatment a priority.

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Marek Majster
Clips Instead of Sutures

Scientists at the southern University of Silesia have invented a state-of-the-art nickel-titanium implant that can be used in surgical procedures instead of sutures.

Called a “clip” by surgeons, the implant has been used by a surgical team at the Gastrointestinal Surgery Clinic of the Central Research Hospital in Katowice to connect two sections of an intestine in Europe’s first surgery of this kind.

The clinic and its head Prof. Paweł Lampe are working with university researchers on new surgical procedures in which the clip is used to connect sections of the intestine instead of sutures or expensive staples.

The researchers who have designed the clip, Prof. Henryk Morawiec and Zdzisław Lekston, D.Sc., of the university’s Institute of Materials Science, have conducted research into the use of nickel-titanium alloys in medicine for years. But the idea to develop a compression anastomosis clip for gastrointestinal surgeries came from a clinician, Prof. Lampe.

Shape memory

The clip is the product of collaboration between University doctors and researchers. It has the form of a double elliptical ring and works by utilizing the shape memory effect—the unique property of the nickel-titanium alloy of which it is made. A shape memory alloy “remembers” its original shape and can be returned to this shape after being deformed.

The clip used in the pioneering surgery was first cooled in normal saline and deformed. After incisions were made in the intestine in two places, the surgeons inserted the implant into the punctures and heated it up with gauze dipped in boiling saline. Under the application of heat, the clip returned to its original shape, closed and brought the two sections of the intestine together. The compression of the intestine walls caused by the closed clip leads to the necrosis of the tissue within five or 10 days. During this time, a new natural scar is formed and a perfect uniform anastomosis of the intestine is created as a result. The clip is biodegradable—after it has performed its job, it comes off the tissue and is excreted with the stool.

The research work on the clip was funded by the Ministry of Science and Higher Education.

Clean and easy

“I am delighted with this method,” says Lampe, who has been director of the clinic since 1997. “First of all, it is exceptionally clean and easy to use. Thanks to the clips, we are able to avoid many complications, like the splitting apart of the sutures or the leakage of intestine content during the operation. Additionally, the clip may find application in 80 percent of gastrointestinal procedures, especially cancer surgery.”

When he approached the Silesian researchers with the idea to develop a compression clip of this kind, Lampe was inspired by a Russian surgeon from the city of Tomsk who had visited his clinic for a training period. The surgeon had told Lampe about compression clips used by surgeons in Tomsk for some procedures instead of sutures. Later, this technique was introduced in hospitals in Israel and the United States. Poland was the first country in Europe to use such clips.

Permission from the Bioethics Commission was needed to perform the pioneering surgery in Katowice. Further clinical trials showed that shape memory clips are easy to use in various gastrointestinal procedures. They make it possible...
Thanks to its unique structural design, special raw materials and weave, the fabric does not allow germs to proliferate. It is consequently used to make clothing for doctors and other medical personnel.

The fabric was invented by scientists from the Textile Research Institute in Łódź, who developed the technology together with specialists from the Andropol company. This model collaboration between science and business won the inventors money for their project from European Union coffers.

Clothing made from the new fabric, specialists from Andropol say, transfer less electrical charges. This polyester and cotton fabric is used to make protective clothing for workers producing electronic devices.

Andropol’s latest product is Poland’s first fabric made from pure cotton with a luminescent finish. The fabric, called NEON 150, is designed to make protective clothing for people working in limited visibility. Previously, such clothing was made from synthetic fabrics. Using cotton means greater work comfort and a level of hygroscopicity comparable to that offered by natural fibers, company executives say. Clothing made from the NEON 150 fabric was exhibited at the A+A Safety, Security and Health at Work International Trade Fair in Düsseldorf, Germany, last year.

Andropol says it uses advanced production technology and chemicals to manufacture durable protective fabrics that are resistant to light, dust and sweat. In the work clothing segment, Andropol offers fabrics based on cotton and mixtures of cotton with synthetic fibers. They are designed mostly for work clothes and specialist protective clothing for the health service, chemical and fuel industries, firefighting, construction and road building. The quality of Andropol’s fabrics is confirmed by numerous certification of compliance with European standards. The company is also a certified NATO supplier.

Ewa Derwalski

**Bacteria-Killing Fabrics**

An extraordinary antibacterial fabric invented by scientists from the Textile Research Institute in Łódź and produced by the Andropol company in Andrychów in southern Poland, is a dream come true for healthcare professionals and a model example of his between science and business.

Thanks to its unique structural design, special raw materials and weave, the fabric does not allow germs to proliferate. It is consequently used to make clothing for doctors and other medical personnel.

The fabric was invented by scientists from the Textile Research Institute in Łódź, who developed the technology together with specialists from the Andropol company. This model collaboration between science and business won the inventors money for their project from European Union coffers.

Clothing made from this special fabric helps minimize hospital infections resulting from disease-spreading microorganisms and prevents the spread of infections from patients to medical personnel.

In making the new fabric, specialists from Andropol used materials that combine protective properties with utility value. Clothes made from the fabric do not lose their properties even after several dozens cleaning cycles.

The antibacterial and antistatic fabric is the latest in a series of new products developed at Andropol. Earlier, the company developed a fabric that does not transfer electrical charges. This polyester and cotton fabric is used to make protective clothing for workers producing electronic devices.

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Ewa Derwalski
BIOTECHNOLOGY

Can “ghost cells” filled with anticarcinogenic substances help win the battle against cancer?

Together with his students and associates at the Institute of Genetics and Biotechnology at the University of Warsaw, Prof. Piotr Stępień is working on a research project entitled “The Trojan Horses.” In the project, erythrocytes, or red blood cells, obtained from patients play the role of the Trojan horse. Stępień hopes that by using the natural process of programmed cell death (apoptosis), scientists will learn to suppress the growth of malignant cells. Genetics has been developing rapidly and scientists are learning how to block genes that are responsible for individual body functions. Will they be able to stop cancer growth some time from now?

Live torpedoes

Research in nanotechnology to develop treatments targeted directly against the source of a disease in patients’ bod-
Stéphane and his team have been working on one of such projects, with the aim of designing “live torpedoes” to get straight to cancer lesions and destroy them.

“The idea is to load erythrocytes with anti-cancer substances,” Stéphane says. “The erythrocytes come from the patient and so they are completely tolerated by the patient’s body. It is possible to use simple manipulation techniques to reach whatever we inside them, turning the cellular shad-ows, or ‘ghosts,’ that can be filled with different substances.”

The first project phase is to design the “live” torpedoes, although the name is somewhat misleading, as the modified erythrocytes are no longer living cells and are only used as vessels for substances. The project will be carried out together with researchers from the Physics Institute of the Polish Academy of Sciences and the Oncology Center in Warsaw. The tests will be run on mice, and the scientists hope that, by inducing cell death, they will be able to block cancer cells.

“The suppression of individual genes is a flourishing technology,” says Stéphane. “A. Fire and C.C. Mello received the Nobel Prize in 2006 for discovering the process. A gene gets suppressed when a short, synthetic molecule of double-stranded RNA with a specified sequence is introduced into a cell. The new RNA destroys the RNA of the target gene and thus effectively deactivates it. We will also synthesize siRNA and put it into erythrocytes that we will subsequently target at neo-plasms.”

This is not a completely new technology, as pharmaceutical companies and other research groups have been conducting similar experiments for some time. Several treatments based on gene suppression are efficient in people. One example is age-related macular degeneration, where siRNA is injected into the vitreous body of the eye and stabilizes sharpness of vision.

Nanomachines to the rescue

Both physicians and patients have dreamed about nanomachines for years. One of the most recent discoveries has supplied a method to link carbon atoms into materials that can be rolled to form nanotubes and other ultra-thin structures in which quantum phenomena occur. These new materials find a wide range of applications in biology and medicine. Still, before they can be used in practice, the materials have to be safe. “Nanomachines” must not spontaneously reproduce, they have to be eco-friendly, and the products of their decomposition cannot pose any health risks. All of this is the subject of a new branch of science called nanotoxicology.

“Nanomachines can, for instance, be used in cancer imag- ing,” says Stéphane. “If we suspect remission in a patient, we could use nanomachines to simply run regular checks to see where new lesions are and if there is any cancer at all. The task would be to identify the spots where cells multiply uncontrollably.”
Prof. Piotr Arkuszewski, a surgeon from the central city of Łódź, has developed and patented a new method for reconstructing eye socket walls with the use of a fabric made from polypropylene and polyester yarn.

Over the past few years, Arkuszewski has performed around 400 operations using his innovative method.

Surgeons dealing with the reconstruction of the eye socket, or orbit, usually use expensive titanium meshes or bone grafts taken from the skull cap, lower jaw or hip. But the use of bone grafts requires performing a second operation and often involves complications. Arkuszewski, who heads the Maxillofacial Surgery Clinic of the Medical University of Łódź, was the first surgeon in Poland to use the polypropylene and polyester fabric in the facial region. He was inspired by biotextiles invented by scientists based in Łódź, especially a polypropylene and polyester skull bone prosthesis called Codubix whose structure resembles that of natural bone.

Fabric of life

Polypropylene and polyester differ in terms of shrinkability. As a result, one of the materials makes the prosthesis rigid and the other produces the effect of a micro-loop cover, which strongly promotes the ingrowth of tissue. Artificial bone weighs much less than natural one; it lets in X-rays and is easy to use. An important thing is that the material is highly biocompatible and can stay in permanent contact with blood for more than 30 days.

But the situation is much more complex when it comes to reconstructing facial bones and the orbit. First of all, the orbit has a complex shape and very thin osseous walls, ranging from 0.7 to 1.01 millimeters. The inferior and medial walls are the thinnest and they become fractured most often. Additionally, this region is much more “aggressive” biologically—direct contact with the sinuses and oral cavity means a potential threat from the bacterial flora. The proximity of the lower jaw causes increased mobility, which is not conductive to healing.
Arkuszewski’s innovative idea was to cover the polypropylene fabric with a thin film of polyurethane to isolate the anastomotic region of the eye socket from the infected region of the sinus connected with the nasal cavity.

Arkuszewski asked for help from Krzysztof Raczyński (pictured), M.Sc., a member of the Polish Engineering Academy and an expert on fabrics with a passion for biomaterials who knew well what the surgeons needed. Raczyński had patented many inventions that were applied in practice by the company of which he was president and co-owner. The biomedical products made by the company, including Colulids and vascular prosthesis, were used around the world.

“We know that we needed material much thinner than our Colulids, that the fabric should be resilient and elastic,” says Raczyński. He and his team—comprised of Krystyna Lesiakowska, Tomasz Gląbiński, and Eugeniusz Przyborowski—developed a new biomaterial within a short time. After a series of clinical trials, Arkuszewski introduced the material into routine eye socket reconstruction procedures.

The material is perfect, the inventors say. It does not become soaked with fluid, which means it does not get thicker and does not raise the eyeball. Unlike bone grafts, it does not waste away, and adheres tightly to the eye socket walls.

“Bone grafts, it does not waste away, and the fabric is put between it and the bone. In this case, the fabric adheres to the bone and is lined with the periosteum. If the periosteum is damaged, we detach it from the bone, and the fabric is put to between it and the bone. In this case, the fabric adheres to the bone and is lined with the periosteum. If the periosteum is damaged, we detach it from the bone,” says Arkuszewski. “An important thing in such procedures is the way in which the surgeon reaches the fracture, Arkuszewski says. “The simplest way is through the traumatic wound. If there is no wound, an incision is made two or three millimeters below the lashes of the lower eyelid or below the lower eyelid.

More than meets the eye

A fracture of an eye socket bone is a frequent injury among boxers, but also tennis players and young children. A young child hit in the eye by a ball, even a very small one, can end up with an eye socket walls fractured. If the hitting object is larger than the eye the impact breaks the eye socket walls or causes soft tissue to get stuck in a keratin. In such a case, the eyelid is swollen and lowered because some of the tissues which surround it sink into the maxillary sinus or other paranasal sinuses.

“After the herniated tissue is freed, the eyelid returns to its original position and we have to reconstruct the defect in the eye socket wall using the fabric, which we cut to size and shape,” says Arkuszewski. “We lay the material in such a way that its edges lean against the edges of the undamaged part of the eye socket wall. We place the tissues surrounding the eyeball on the fabric and cover it with periosteum or muscles. The outer surface of all the bones is lined by a resilient membrane, called periosteum, which is strongly attached to the bone. If the periosteum is not damaged, we detach it from the bone, and the fabric is put between it and the bone. In this case, the fabric adheres to the bone and is lined with the periosteum. If the periosteum is damaged, we detach it from the bone,” says Arkuszewski. “An important thing in such procedures is the way in which the surgeon reaches the fracture, Arkuszewski says. “The simplest way is through the traumatic wound. If there is no wound, an incision is made two or three millimeters below the lashes of the lower eyelid or below the lower eyelid.

Before the surgery the patient undergoes detailed ophthalmic tests with the use of the third-eye screen, computed tomography (CT) and magnetic resonance imaging to make it possible for the surgeon to determine the scope of the procedures and predict complications that may occur after the surgery. The tests are repeated after the operation. Two or three days after the procedure, the patient, in consultation with an eye doctor, starts exercises aimed to strengthen the muscles which control eyeball movement.

Since the first surgery performed in 2001 no complications have been recorded. When performing other procedures in the orbital region in four patients who had had reconstructive surgery, Arkuszewski took samples of the fabric implanted several months and a few years earlier. Histopathological examinations showed that in all those cases the body fully accepted the material, which was excellently overgrown with tissue. Follow-up imaging tests—functional CT scan—showed that the structure controlling eyeball movement functional properly.

The Łódź clinic is the only center in Poland where this innovative method is used to reconstruct eye socket walls.

Dorota K. Gruzicyńska

Arkuszewski: After the herniated tissue is freed, the eyelid returns to its original posi-

MEET THE SURGEON

Prof. Piotr Arkuszewski is a general and maxillofacial surgeon and author of several hundred scientific publications, including 76 dedicated to traumatology. Arkuszewski is president of the Polish Implant Association (PSI) and a member of the European Association for Cranio-Maxillofacial Surgery.

It is also a member of the Deutsches Gesellschaft für Orale Implantologie, member of the International Congress of Oral Implantologists, member of the scientific boards of several journals on oral and maxillofacial surgery, and provincial maxillofacial surgery consultant.
In 2004, Paweł Lis, an archeologist from the Nadwiślaske Museum in Kazimierz Dolny in southeastern Poland, came up with the idea of organizing Experimental Archeology Workshops, an innovative project that was part of a larger program called the Museum of Early Slavs. The main aim was to promote archeology through play, experiments and tests performed by workshop participants, but also to gain an insight into the life of the Slavic peoples who used to inhabit the area.

As part of the workshops, in 2005, the Nadwiślaske Museum launched a research project called Slavic Foods. The project, coordinated by Hanna Lis, is conducted together with specialists from the Faculty of Bromatology at the Medical University of Warsaw. Students from the Bromatos Academic Group take part in field workshops and, tutored by Prof. Andrzej Tokarz and Agnieszka Biały, M.Sc., they perform laboratory analyses on dishes they have prepared during archeological experiments. They check the nutritive value of the foods and their bioassimilability and the efficiency of primordial food preservation techniques.

Participants of last year’s workshops tried to recreate dishes made from plants people used to harvest from the wild, as established through archaeobotanical analyses of archeological research conducted on early medieval settlements in Chodlik and ˚mijowiska in Lublin province. The result is a paper entitled An Evaluation of the Content and Bioavailability of Nutrients in Slavic Dishes. The research was conducted by a team from the Faculty of Bromatology at the Medical University of Warsaw, including Wojciech Anysz, Małgorzata Kamińska, Weronika Kazimierska, Radosław Kuśmirek, Magdalena Nosarzewska, Anna Raczek, Emilia Rogowska and Katarzyna Srebrzyńska.

Mysteries of the past

The researchers and guests who take part in the workshops join forces and perform experiments to unravel many mysteries of the past. They check how Slavic peoples made different household objects and what clay baking and house building techniques they used. For some time, workshop participants have been also working to determine how the ancient Slavs gathered and processed food.

The largest group of artifacts found in most archeological sites are broken clay pots, most of which were used to store, prepare and serve food. “In the beginning of the experimental archeology workshops, we learned to reconstruct the full production cycle of ceramic vessels in the early Middle Ages, that is, we succeeded in forming and baking clay pots,” says Paweł Lis. “Then the questions came: can you cook something in such pots and if so, what will the dishes taste like? That’s how it started.”

The research on the eating habits of early Slavs and the nutritive value and bioassimilability of their foodstuffs soon drew the attention of experts from several major archeology centers in Kazimierz Dolny, Warsaw and Łódź, who have since joined the project. The research has been conducted in the valley of the Chodelka River, home to four Slavic hill forts from the 8th and 9th centuries.

Research reports on the material culture of the Slavs and the prehistory of Poland indicate that agriculture and animal breeding were the primary methods of subsistence of pre-Polish people from the early Neolithic period onward. As a result, Slavs in the early Middle Ages were no longer as dependent on food harvested from the wild as their ancestors had been before them. Still, according to a paper that the staff and students of the Faculty of Bromatology at the Medical University of Warsaw wrote following the research, the ancient Slavs never completely abandoned gathering and, like people in contemporary rural areas, they supplemented their diet with wild plants.

Slavic Foods from Centuries Ago

Human history is bound to the history of food people have eaten over the millennia. Finding out what our ancestors ate can help discover who they really were and how they lived. Questions like these are the focus of Polish experimental archeology.
Reviving ancient recipes

In the experimental part of the research, the participants attempted to reconstruct dishes that had probably been on the menu of the West Slavic tribes which inhabited the Czybinka valley in the 8th and 9th centuries. The archaeologists started out by marking out the territory and the 신용 of the peoples they were most interested in. That approach enabled the researchers to come up with a range of raw materials, equipment and techniques they decided to use in the experiments. During the excavations, the archaeologists found samples of items that enabled them to determine: a long list of foodstuffs that the ancient peoples might have obtained while cultivating land, breeding animals, gathering, hunting and fishing. The same sites revealed objects of material culture that helped identify early food processing techniques, equipment and tools. The most common objects were clay vessels, stone or wooden tools in different forms, hearths and stoves. In the early Middle Ages, Slavs lived primarily on cereals which they ate in different forms, including grouts and all kinds of meat products.

“We had learned about the ingredients and cooking techniques and foods to ethnology, we also knew typical Slavic foods,” says Liś. “Using this knowledge and relying on our culinary experience and on the techniques we accumulated in our basic dishes, noting down the ingredients and processing techniques we used in preparing the food.”

Relying on available research reports and the findings of recent experiments, the archaeologists have established that the early Slavic diet, while dominated by cereals which they ate in different forms, also featured dishes such as broth and soup, which is sour soup made from fermented rye flour. The soups were made from fermented rye flour. The soups were stayed fresh. This part was conducted by bromatologists from the and relying on our culinary experience and on the techniques we used in preparing the food.”

Archaeological workshop for school students

Digging up the past in southeast Poland

The field work was completed, the researchers turned to laboratories to analyze the reconstructed menu, including the nutritive values of the food (the content of vitamin C, nitrogen and proteins), its bioassimilability and the time over which it stayed fresh. This part was conducted by bromatologists from the Medical University of Warsaw. Bromatology students started visiting the Czybinka valley and working hard to prepare Slavic dishes, samples of which they would later submit for lab analysis.

The tests revealed a highly variable content of proteins in old Slavic meals, from 0.3-1.4 percent in rice to 13.2 percent in rye, and up to 31 percent in dried meat. Cereals served as the main source of carbohydrates for early Slavs. Although proteins from plants are somewhat underestimated, due to low consumption of meat and most products contain a valuable protein source from the diet of the Slavic peoples.

Some half-finished products proved to be rich in vitamin C, especially pickled cucumber horseradish, which contained 52 mg of vitamin C in every 100 grams. Pickled horseradish was also the most digestible of all products which underwent analysis, thanks to a high content of lignin from diacetyl (25.5 percent).

The most digestible Slavic dish ready for consumption was bryjła, a meal made of nettle, sorrel and bistort. The lowest digestion rate was slightly more digestible than contemporary foot products. Bromatologists say this could be because of the dietary additives that are currently used to facilitate baking and storage of bread.

The tests helped the researchers establish that the ingredients which Slav locals used for preparing and eating food were quite efficient in supplementing their diet with the necessary nutrients. The experiments also indicate that they were quite efficient in supplementing their diet with the necessary nutrients. They also note that some chemical additives in the early Middle Ages were not inferior to contemporarily produced foods in terms of the content and digestion rate of protein compounds, but in the other hand, it probably absent in a range of chemical compounds contained in modern foods, but even so, the diet of ancient Slavs was quite a healthy one, the researchers say.

Julia Pawlowa

Arturo Paterkiewicz
Until recently, there was no industrial application for scrap car tires and they were incinerated in heat and power generation plants, emitting hazardous substances into the atmosphere. The new Polish technology developed by a team led by Prof. Dariusz Sybilski at the Road and Bridge Research Institute is designed to benefit the environment. Tests show that, when added to asphalt, the TOFIC polymer fiber developed at the Institute significantly improves road surface durability, extends its life span, and improves travel comfort. Poland is the first country where such a fiber has been developed and applied in road building.

TOFIC and GUFI

TOFIC is an innovative material composed of high-quality fibers from worn tires. It was developed at the Road and Bridge Research Institute’s Surface Technology Unit, which has been carrying out various kinds of research over the past few years involving the application of fibers in mineral-asphalt mixes. Before this, the Unit had developed another rubber granulate referred to as GUFI. The mix contains fibers that reduce traffic noise.

The inventors define TOFIC as a fibrous stabilizing/strengthening/modifying material for mineral-asphalt mixes. It plays a triple role. First of all, it stabilizes the asphalt binder. Second, it strengthens the mineral-asphalt mix, because the polymer fiber works like a scattered reinforcement, increasing the surface’s resistance to lasting distortions (such as ruts) and fatigue or low-temperature cracking. Third, it improves the mechanical properties of the mineral-asphalt mix, thus preventing deformation. Furthermore, the fiber reduces noise.

The research included simulations of several processes that road surfaces undergo. A simulation of a mineral-asphalt mix’s short-term aging showed substantially improved capacity for bearing a greater number of load cycles when TOFIC fibers were used. A test of resistance to low temperatures was performed on two kinds of mineral-asphalt mixes: with a cellulose stabilizer and with the TOFIC polymer stabilizer. The scientists discovered that with the same amount of fiber added, the polymer fiber reduced the mix’s cracking temperature by 1.5 degrees Celsius, while doubling the amount improved the result by another degree.

Road to success

Though it has been scientifically proved that using the rubber granulate brings tangible benefits, its popularity is still small. The reason is that modification of asphalt with TOFIC fiber is a complicated process that requires special equipment. A surface containing the rubber granulate is twice as expensive as ordinary asphalt.

"Car tire rubber can have diverse properties," says Sybilski. "Passenger car tires are different from truck tires, winter tires from summer tires, and no one segregates old tires." Today environmental concerns could be the greatest incentive to use rubber granulates, according to Sybilski.

The Road and Bridge Research Institute is taking part in an international research project, as part of the European Commission’s 6th Framework Program Advanced Laborato-
Tests are being developed, and preparations are being made to build a test section and perform full-scale testing (using a heavy vehicle simulator) on an innovative road surface involving TOFIC fibers.

Parallel to this, Sybilski’s team is conducting research on a rubber-asphalt granulate called tecROAD, to be used as an additive in asphalt-aggregate mixes. Such a granulate is currently made in Austria, and has also been used in Switzerland and Germany. The institute plans to launch this product in Poland. The ongoing research concerns fatigue life, resistance to rut formation, low-temperature cracking, and shear modulus. Sybilski says the application of innovative materials and technologies should become a priority in designing and building lasting road surfaces.

The TOFIC polymer fiber is produced on an industrial scale at a plant operated by ABC Recycling company in the town of Końskie Odrzańskie, Lubuskie province. The plant is part of the Drawsko Hydroelectric Plant Complex. ABC Recycling handles toxic waste, its main products being the recovery of fine, iron, and other rubber products. The plant’s annual recycling capacity is 15,000 metric tons of tires. Since the start of its recycling operations, the plant has recycled almost 50,000 tons of scrap tires. All operations are carried out with environmental protection in mind, corporate executives say. A policy that has earned ABC Recycling an award in a nationwide competition for the title of Environmental Friendly Company.

Ewa Doreń
Between Science and Business

One of the oldest technical universities in Poland, the Silesian University of Technology in Gliwice focuses on innovation and the development of new technology. The university is a key scientific and educational institution in Upper Silesia, Poland’s most industrialized region and one of the most industrialized areas in Europe.

AT THE HELM

Prof. Andrzej Karbowik has been with the Silesian University of Technology uninterruptedly since the start of his academic career. In the past he was dean of the Organization and Management Department. Today he heads the Company Management and Production Organization Unit. He was a deputy economy minister in Jerzy Buzek’s government and helped draft a program for restructuring Poland’s coal mining sector. He also worked as chairman of the State Agency for Restructuring Coal Mining. Karbowik has many additional responsibilities, for example as editor-in-chief of several trade periodicals and chairman of the Council of the Foundation of Cardiac Surgery Development in the southern city of Zabrze. He has written numerous scientific publications, research reports and expert studies for industry.
The university began operating in 1945, when it consisted of four departments: Chemistry, Electrical Engineering, Mechanical Engineering, and Construction Engineering. Today the Silesian University of Technology teaches students in 12 departments, and will soon open its 13th department—Biomedical Engineering.

The university also includes the Geometry and Engineering Graphics Center, the Mechatronics Education Center, the Biotechnology Center, and the Biomedical Engineering Center. The last center was one of the reasons why the Biomedical Engineering Department was established. The center is an intercollegiate facility that brings together scientists from the Medical University of Silesia, the University of Silesia and the Silesian University of Technology.

In 2007, the Silesian University of Technology launched a course in biomedical engineering, enrolling 117 students for the first year, followed by 147 in 2008. This year will see the launch of a huge investment project at the Silesian University of Technology—construction of the New Technologies Science and Education Center in Gliwice. This modern facility, with a usable space of around 14,000 square meters, will house the laboratories, classrooms and research premises of three departments: Mathematics and Physics, Mechanical Engineering, and Power and Environmental Engineering.

The center will be an “intelligent building” featuring many advanced systems, including ventilation and air conditioning with an energy recovery system, a system supplying environmentally friendly energy obtained from solar cells, and a system supplying heat from solar energy collectors. The building will be equipped with telecommunication and computer networks, building control and monitoring systems, measuring systems, and fire detection and smoke removal systems.

The Silesian University of Technology is located in the heart of Poland’s largest industrial region. Scientific research at the university focuses on collaboration with local industry. Over the past several months, the university has signed contracts with companies such as Góra Cement (Poland’s leading cement producer).

INTERNATIONAL TIES ARE A PRIORITY

Prof. Andrzej Karbownik, rector of the Silesian University of Technology:

Knowledge acquired in the education process gives people the skills necessary to meet the challenges of modern times. Building a knowledge-based society and economy requires a properly organized, modern system of education and training that also serves to develop a general tendency toward innovation. I have had ties to the Silesian University of Technology for many years, so I am aware of its excellent reputation and the role it plays. Today it is the largest technical university in the region and one of the biggest in the country. In its over 63 years of history, it has become a major institution of public life and currently plays an important culture-building and opinion-forming role. It educates engineering personnel for Silesia’s industry and for companies beyond Silesia, also—very importantly—preparing them for managerial posts.

As a university with a great educational and research potential, the Silesian University of Technology contributes significantly to the development of a knowledge-based economy. One of the priorities in the university’s new development strategy for the coming years is international cooperation. A university’s international position is defined by scientists, both those who visit foreign scientific centers and foreign professors coming in for lectures or research visits. Good relations between universities are often the effect of personal contacts established and maintained by leading scientists, of whom there is no shortage at our university. Student exchanges also play an important role; these are also very well developed at our school.

The European education market emerging before our eyes as a result of the Bologna Process poses a great challenge for any university. I am confident that thanks to the commitment of the entire academic community, the Silesian University of Technology is becoming an innovative center of education and research, with the prospect of assuming a major position in the European Higher Education Area, compatible with our capacity and ambitions.
Wasko (telecommunications and data communication), Enet (electronic control and data transmission systems), and Fiat Auto Poland.

In sync with business

Ties with businesses concern research, education and human resources. The partners exchange experiences and information related to new technology. The university trains staff for companies and provides expert studies and analyses involving technology, organization and management. It also provides companies with research reports related to their operations. This allows students to learn about the latest technological applications on the Polish market, while businesses have an opportunity to select prospective employees from among the students.

The Silesian University of Technology encourages its students to set up their own businesses. A competition called “My Idea for Business” has been held for six years to encourage students to not only come up with their own ideas in technology but also prepare business plans. The best projects receive cash prizes and are applied in industry, while the students can start their own business. Thanks to training opportunities offered in the course of each competition, many students get an insider view of how a scientific idea can be put to practical use.

Last year, the Silesian University of Technology established a center to train personnel for civil aviation. According to Ministry of Transport forecasts, Poland’s civil aviation sector will need some 23,000 employees over the next five years. Some of them will be trained by the Silesian University of Technology.

The center was set up as a joint initiative by the Silesian University of Technology, the Civil Aviation Office in Warsaw, and Górnośląskie Towarzystwo Lotnicze SA, a company that manages Katowice-Pyrzowice Airport. The center aims to train personnel for the civil aviation sector by organizing postgraduate studies, internships for graduate and Ph.D. students, offering new specializations, and setting up a new course in aviation and astronautics at the Silesian University of Technology.

The Silesian University of Technology provides its students with opportunities to take part in international exchange programs. The university has signed agreements with 146 European universities to work together under the European Union’s Erasmus program. In the summer semester of the 2007/2008 academic year and the winter semester of the 2008/2009 academic year, a total of 194 Silesian University of Technology students went to study abroad, while 55 foreign students came to study in Gliwice. In 2008, the mechatronics unit organized its Eastern Europe Summer School for 20 participants from Ukraine and 27 students from other countries, including Croatia, the Czech Republic, Macedonia, Slovakia, Slovenia, and Hungary, as part of a project called “Multimedia as an Auxiliary Tool in Teaching of Electrical Engineering.”

The university also takes part in a project called Top Industrial Managers for Europe (TIME), which promotes and facilitates dual degree programs.
EDUCATION

SILESIAN UNIVERSITY OF TECHNOLOGY IN FIGURES

48 COURSES AT 12 DEPARTMENTS IN 3 CITIES:
GLIWICE (9), KATOWICE (2), ZABRZE (1)

TOTAL NUMBER OF STUDENTS: 30,934
full-time students—19,668
part-time students—9,450
postgraduate students—1,816

NUMBER OF PHD STUDENTS: 706

FACULTY: 1,862 teachers, including 153 professors and
198 teachers with postdoctoral degrees

GRADUATES: OVER 130,000

PHDS: 3,500

POSTDOCTORAL DEGREES: 550

Cooperation agreements with foreign universities: 146
Membership in international academic organizations: 6
Foreign trips by teachers and students in 2008: 1,458
Visits by foreign guests in 2008: 283

THE SILESIAN UNIVERSITY OF TECHNOLOGY HAS THE RIGHT TO CONFER THE FOLLOWING DEGREES:

PhD in technical sciences—18 disciplines
PhD in physical sciences—1 discipline
PhD in chemical sciences—1 discipline
PhD in economic sciences—1 discipline
Postdoctoral degree in technical sciences—14 disciplines
Postdoctoral degree in chemical sciences—1 discipline

STUDENT-FRIENDLY

The Silesian University of Technology has been named a “Student-Friendly University” by a national student organization called the Students’ Assembly of the Republic of Poland. The Silesian University of Technology’s Student Career Service, established in 1997, helps students and graduates by giving them career advice and information about the labor market.
involving a system for monitoring and controlling the water sector. A standout example was a project designed to benefit the economy and financed from European Coordinators (EAEC). The Research (ICEER), and the European Association of Erasmus International Network for Engineering Education and Networks of the Socrates program: EUCEET III, Le:NOTRE TW, and EIE-Surveyor.

EUCEET (European Civil Engineering Education Training) is a network of 135 universities and engineering associations from all over Europe. EUCEET III is a continuation of activities involving education in civil engineering that were initiated in the project’s earlier stages, EUCEET I and EUCEET II. The main focus is on the key aspects of education and business operations in the European construction sector. The project will end in 2009.

Le NOTRE TW (Thematic Network Project in Landscape Architecture) is a forum of European universities teaching landscape architecture. Participation in the work of the forum is based on using an internet platform for building a database on universities and landscape architecture. The project will end in 2009.

The EIE-Surveyor project, which ended in September 2008, aimed to be "a reference point for electrical and information engineering in Europe." It was a continuation of an earlier project called THIEERE (Thematic Harmonization in Electrical and Information Engineering in Europe). The main objectives included "a review of general and specialized knowledge acquired by graduates of these universities, courses, development and implementation of methodology for ensuring a high quality of education, as well as evaluating the implementation of the process initiated by the Bologna Declaration in different European countries."

The Silesian University of Technology is a member of six key aspects of education and business operations in the European construction sector. A standout example was a project designed to benefit the economy and financed from European Coordinators (EAEC). The project will end in 2009.

The Silesian University of Technology is not just about teaching and research. The school offers students numerous opportunities to take part in sports activities and artistic activities. Young people can also use their talent in organizations such as the Academic Choir of the Silesian University of Technology, the Academic Music Ensemble, the Academic Dance Ensemble, and two student theaters. Students can choose from 27 different student organizations, 91 scientific special interest groups, four student clubs as well as sports facilities such as playing fields, sports arenas, gym, tennis courts, and a skating rink. There are 20 different sports sections, making the Silesian University of Technology one of the strongest promoters of sports among Polish universities.

Learning beyond the classroom

The university takes part in numerous research projects designed to benefit the economy and financed from European Union structural funds. A standout example was a project involving a system for monitoring and controlling the water supply and sewerage system in the southern town of Rybnik. Other recent projects have included the establishment of the Innovative Silesian Cluster of Clean Coal Technologies. In the near future, the Silesian Bio-Farm Center for Biotechnology, Bioengineering and Biotechnology will be set up in a joint project with the Medical University of Silesia in Katowice, the University of Silesia and the Oncology Center Maria Niklowska-Curie Institute Branch in Gliwice.

The university has used EU funds to launch, equip and modernize many of its laboratories, including the Mechatronics and Motor Vehicle Design Laboratory at the Transport Department; the Artificial Intelligence Application Laboratory; the CAD/CAM and Technical Diagnostics Multifunctional Laboratory; the Electromagnetic Compatibility Laboratory; the Special Chemical Synthesis Laboratory; and the Organic-Insuring Compounds Laboratory. In 2008, the university completed 17 research projects financed from the EU budget. They included "Research and training on nomination and protection of the city environment in industrial regions" (REPROCITY project); "Model-based adaptive process and product engineering" (MAPPER project); "Absolute time scales and isotope studies for investigating events in Earth and human history" (ATIS project); "Hydrogen-oriented underground coal gasification for Europe" (HUGE project); "Accurate simulation of tailor-welded blanks to reduce process design time for the sheet pressing industry" (SIM-TWB project); "Multifunctional materials and related technologies integrated into the automotive industry of the future" (FUTURA project); and "Knowledge and need assessment on pharmaceutical products in environmental waters" (KNAFPE project).

Using EU funds

The university takes part in numerous research projects designed to benefit the economy and financed from European Union structural funds. A standout example was a project involving a system for monitoring and controlling the water supply and sewerage system in the southern town of Rybnik. Other recent projects have included the establishment of the Innovative Silesian Cluster of Clean Coal Technologies. In the near future, the Silesian Bio-Farm Center for Biotechnology, Bioengineering and Biotechnology will be set up in a joint project with the Medical University of Silesia in Katowice, the University of Silesia and the Oncology Center Maria Niklowska-Curie Institute Branch in Gliwice.
This year’s worldwide Imagine Cup finals were held at the beginning of July in Cairo, Egypt. The “kAMUflage” team from Poznań emerged the winner in its category and walked away with a special award from Egyptian First Lady Suzanne Mubarak. Two other Polish competitors came second in two other categories: “Monastery of Innovations” took home second prize in the MashUp category, and “FteamS” in the Interoperability category. A team named “Demoscene Spirit” also scored a spectacular success when it became the first ever Polish team to make it into the finals in the Software Design category.

One of the guests of the award ceremony was Waldemar Pawlak, the Polish deputy prime minister and economy minister. This year’s finalists had been selected from among over 300,000 university students from more than 100 countries. The worldwide finals in Cairo drew 444 students in 149 teams from 124 countries. Six teams were from Poland. “The Polish teams have once again shown class,” said Jacek Murawski, general manager of the Polish subsidiary of Microsoft. “They have demonstrated very mature ideas with huge business potential. I am happy to see we have such talented and creative young people. The results of this year’s Imagine Cup strengthen our belief that Poland can and should play a greater role on the global market for information technology.”

kAMUflage, the winners of the special award, had built TraMuBraTion (Translate Music to Braille Notation), a system that facilitates the acquisition of the Braille system from hearing. The second-place winner in the MashUp category was Karol Kaczmarek from the Poznań University of Technology, who competed as Monastery of Innovations. He won accolades for his HospFinder, a search engine for hospitals and medical services.

The FteamS team from the Łódź University of Technology came in second in the special category of Interoperability for a project called Euliko. It enables distribution of teaching materials to cell phones via MMS messages. Demoscene Spirit was the first Polish team to make it to the finals of the prestigious Software Design category. The finals of the 2010 Imagine Cup competition will be held in Poland.

“Being the host of the 2010 Imagine Cup finals is an honor and a challenge for Poland,” said Pawlak. “I hope next year’s finals will present an excellent opportunity to take advantage of the creative potential of students and inspire young people to become involved in information technology — for we are living in a time when information and innovation are worth more than money.”

A.R.
Researchers from the Łódź University of Technology, the Central Institute for Labor Protection/National Research Institute, and the Arlen SA company have designed a hi-tech firefighter’s suit that is equipped with sensors to measure the firefighter’s body temperature, temperature under the suit, air temperature, the firefighter’s pulse rate, and ECG. The suit is designed to increase the firefighter’s safety. The devices measuring the pulse rate, ECG signals and temperature are placed in an elastic girdle that is part of the firefighter’s underwear. The devices collect data and transmit them via radio to the monitoring center in the fire engine. The radio transmitter is placed in the jacket and connected to the sensors. The researchers have also built a GPRS module that makes it possible to send data from the sensors over a long distance via a mobile network. The monitoring center receiving data from a radio transmitter or GPRS module is equipped with a computer system with software which analyses the situation on the basis of the parameters measured and helps make the decision on whether or not the firefighter should be evacuated. If the body temperature exceeds the permissible level, the firefighter is alarmed by means of vibration and sound alarm. The suit is complemented by underwear made of a modern textile developed by the Pro-Humano-Tex center for advanced textile technology. The suit is already available on the market, but the researchers are still working to improve it.
More Durable Tools

Scientists at the Wrocław University of Technology’s Institute of Mechanical Engineering and Automation (ITMiA) have developed a new technology to make reinforced tools for use in forestry.

The tools, reinforced with unusual carbides, can be used as equipment such as forestry matches and printing machines.

To develop the tools, the researchers applied an induction generator produced by the Polish Welding Center of Excellence in Gliwice, and they also used new solders and fluxes made by the ITMiA Welding Unit in line with an approach developed at the Wrocław University of Technology.

Following numerous tests, Wigłęgi Spokojni Blade Sp. z o.o company in Kutrów launched production of the new tool.

Tiny But Mighty

Researchers working at the Laboratory for Materials Physicschemistry and Nanotechnology in the town of Wormstad, near Poznań, have developed a nanobiodetector that in the future may be used in what are called microbiological alarm systems, the researchers say.

The nanobiodetector is built of a specific number of polymer microfibers and nanofibers that conduct electricity.

The laboratory is part of the Faculty of Chemistry at the Adam Mickiewicz University in Poznań. “For around five years, our laboratory has been working to develop nanobiodetection systems, that is, sensors used to detect microorganisms of different kind, such as bacteria, as well as other cells, for example cancer cells,” says Prof. Jerzy Godlewski, one of the designers.

“When working on nanobiodetectors, we accidentally discovered quite new properties of detectors built of a specific number of polymer micro- and nanofibers,” Godlewski said. “Polyaniline in an organic polymer that is an excellent electrical conductor. The material, synthesized under appropriate conditions, is the core of the nanobiodetectors developed by the researchers in Wormstad. It is also the most important part of the newly developed nanobiodetector, which works like an on-off switch. The system detects and determines the number of bacterial cells in samples in which the content of the biological material (bacterial cells) exceeds the activation threshold of the detector. In other words, if the amount of bacterial cells per milliliter of the sample is below the threshold value, the nanofibers do not conduct electricity and the “switch” is off. If the amount of cells moves above the activation threshold, the “switch” turns on and the electrical response of the detector is directly proportional to the number of cells. In this state, the detector is several times more sensitive than standard nanobiodetector systems built with the use of polyaniline nanofibers. 

The researchers believe that if in the future a nanobiodetector of this kind could be used as a component of microbiological alarm systems that would sound the alarm whenever a permissible level of microbiological pollution in a monitored environment is crossed.

Extending Battery Life

Scientists at the National Institute of Telecommunications (IT) in Warsaw have developed a portable programmable maintenance-free device that discharges and charges storage batteries with a current of up to 50A and supplies the electricity from the discharged battery to the electricity network.

The researchers have also designed a smaller and more modern device charged with a current of up to 150A. The devices will extend the life of batteries in telecommunications facilities from five years to 30 years. 

The reliability of power supply is an important factor of a well-functioning electricity network. In the event of a planned switch-off, failure, natural disaster or accident, electricity is supplied to telecommunications facilities from storage batteries. However, regular maintenance measures, including battery discharging and charging, are needed to extend their operating time. 

“A device designed to keep storage batteries in telecom facilities in proper shape will be built as part of the project,” says Paweł Godlewski, one of the designers.

Telecommunications supply systems for telecommunications facilities. It is estimated that 10,000 batteries with a total capacity of more than 500Ah work in these supply systems nationwide. Given the average price of one battery is 1,500 euros and that it is operated for five years, the annual expenditure on batteries is not less than 3 million euros, experts say.

IN BRIEF

Can industrial mechanisms work without lubricants and recent wear and tear? They can if they are coated with the material developed by a team of scientists headed by Prof. Bogdan G. Wendorf of the Łódź University of Technology’s Institute of Materials Engineering.

The coating is only around 0.5 micrometers thick—a micrometer is one millionth of a meter—but is four times harder than quenched steel.

The use of lubricants is constrained by environmental protection considerations. On the other hand, as fuel and electricity prices rise and machines need to be increasingly reliable and durable, there is growing demand for coating materials at a low coefficient of friction.

The low-friction nano crystalline amorphous coatings developed by the researchers are resistant to wear and fatigue. They are intended for the machine-building, automotive, aerospace, and power industries. The material can be used in almost all friction pairs if their temperature is below 500 degrees Celsius.

The new coating also finds application in power hydraulic systems, transmission systems, brake linings and fuel injection systems for diesel engines. They may help extend the life of shaving blades and tools for plastic working and machining.

Compiled by Tadeusz Belarski