



Science - Innovation - Business

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Innovation is not new to the Czech Republic. Czech academics and entrepreneurs have been successfully exploiting new ideas for generations. What is new, is that the Czech Republic is now widely recognized as a centre of profitable innovation and technological entrepreneurship. Moreover, innovation throughout the economy is now being stimulated and sustained by both Czech and international companies.

The Czech Republic: Ideas for Science, Science for Life

Increasingly, companies that fail to innovate will not survive, while those which do, need to better serve customers from optimal business environments, like the Czech Republic, where the country's pre-eminent resource, intellectual capital, can creatively and productively respond to the needs of knowledge-based and innovation-driven businesses.

From the country that introduced the world to the contact lens and which successfully developed the compounds on which current anti-AIDS drugs are based, Czech companies have already left a large footprint on groundbreaking technologies in respect of hologram production, nanofibres, speech recognition, hyaluronic acid, cybernetics, stem-cell research and astrophysics, with the highest density of observatories in the world.

Innovation of past and future

The commercialisation of those developments, as elaborated within this publication, are increasingly Czech-driven and thus a better balance has been achieved between exploiting innovation indigenously and through international partnerships and cooperation.

The increase in local innovation companies has also been matched by the unprecedented growth in international companies engaging in technology-intensive and R&D activities. Around 60% of the foreign direct investment by American companies announced in 2006 constituted R&D-related projects within innovative industries. And this trend is set to continue given that the Government's policy goals are to accelerate the transfer of knowledge between the science and the business communities and to provide an enabling environment for small businesses to develop as key sources of innovation.

Skilled and educated people

Some of the oldest and largest technical universities in Europe are located in the Czech Republic, such as the Czech Technical University (CTU) in Prague, which dates back to 1707 and currently has more than 23,000 students. Technical universities in Brno and Ostrava have both recently surpassed the 15,000-student mark too. The strength of Czech technical education lies in secondary schools, however. Approximately 90% of the Czech population has attained at least upper secondary education.

The ability to draw extensive European Union Structural Funds for the period 2007 to 2013, to foster R&D and enhance the R&D infrastructure, especially outside Prague, running in parallel with Operational Programmes like Enterprises and Innovation, Human Resources and Employment and Research and Development for Innovation will help ensure that the Czech Republic remains in the vanguard of skills provision. Given that skills underpin the ability to innovate and innovation, in turn, drives the demand for upgraded skills, the Czech business environment has all the conditions necessary to sustain these mutually supporting activities.

The combination of a clever concept, excellent researchers and a progressive firm forms the basis on which the firm Elmarco, in cooperation with the local technical university, has succeeded in breaking into the world of nanofibre production.

Casting the Nanonet

Nanospider

Together with Professor Oldřich Jirsák's team at the **Technical University in Liberec**, Elmarco developed the Nanospider™ machine for the production of nanofibres, which represents a revolution in industrial production of nanofibres. **Nanospider™ was the world's first machine able to produce nanofibres on an industrial scale**, thanks to which Elmarco is currently the world leader in this field. Not quite two years after the introduction of the first machine to the market, more than ten of them have been sold around the world. "We have sold four machines in Japan and Southeast Asia, four in America, and several more in Europe. With the exception of Australia, Antarctica and Africa, Nanospider™ is present on all continents," says Ladislav Mareš, manager of Elmarco.

The Technical University of Ostrava is the first institute of higher learning in the Czech Republic to provide accredited instruction in the field of the future – nanotechnologies. The selection of nanotechnologies as a field of study was no accident. TU Ostrava has long been conducting its own research in this field, while also actively cooperating with other universities and companies, including Kyushu and Shizuoka Universities in Japan and the Technical University in Liberec, and is working with the Japanese firm Tech I of Yokohama on the development of a more robust windscreen for automobiles.

TECHNICAL UNIVERSITIES

The origins of the **Technical University in Liberec** date back to 1953. Since the beginning, the university's educational and scientific activities have been oriented toward textile technology, which has a strong tradition in the region. Between 1990 and 1995, four faculties were established and accredited at the university.

The **CTU** is the oldest non-military technical university in Europe. Founded in 1707 by Emperor Joseph I, it is celebrating its 300th anniversary. Many great personalities, including Christian Doppler, F.J. Gerstner (the designer of the first railroad on the European continent) and J. Božek (the creator of the first steamship), worked at the university. The university works closely with industrial and high-tech companies such as Toyota, Skanska, Bosch, Siemens, Honeywell, GE, McKinsey, Daimler-Chrysler and Škoda-Volkswagen.



LIBEREC
TECHNICAL UNIVERSITY
www.vslib.cz

PLZEŇ
UNIVERSITY OF WEST BOHEMIA
www.zcu.cz

PRAGUE
CZECH TECHNICAL UNIVERSITY
www.cvut.cz

INSTITUTE OF CHEMICAL TECHNOLOGY
www.vscht.cz

PARDUBICE
UNIVERSITY
www.upce.cz

BRNO
UNIVERSITY OF TECHNOLOGY
www.vutbr.cz

OSTRAVA
TECHNICAL UNIVERSITY
www.vsb.cz

ZLÍN
TOMAS BATA UNIVERSITY
www.utb.cz



A nanofibre has the thickness of several tens to thousands of atoms, i.e. a thousand times thinner than a human hair. Thanks to their size, they have a huge specific surface, but they weigh only 0.1-1 gram per square metre.



The Nanospider's basic element consists of two electrodes, between which is an electrostatic field. The lower electrode has a cylindrical shape which is immersed in the polymer solution. The cylinder revolves and throws out a thin film of the solution into the electrostatic field, which draws long fibres from the solution to the second electrode. Here the fibres come into contact with the backing fabric and are expelled from the machine.

Gateway to the world of nanofibres

What are the possible applications of industrially produced nanofibres? Elmarco has introduced a nanofibrous material called **NANOSPIDER AcousticWeb**, which is **three times lighter than classic insulation material**, while it has comparable or better acoustic properties. This insulation is thus well-suited for use in various fields, ranging from the automotive industry to construction. Also already on the market is the special material **NANOSPIDER AntimicrobeWeb**, which is **nearly 100-percent effective in capturing viruses and bacteria**.

NanoHealthcare

The company is also developing a very promising material that is **highly effective in stopping bleeding and accelerating healing**. The first result of this research is a special bandage made of nanofibres, while in the long term the company is preparing, for example, advanced biodegradable membranes for surgery in the abdominal cavity. These membranes will simply dissolve, thus eliminating the need for follow-up surgery to remove them. Elmarco has therefore joined forces with the Irish pharmaceuticals company Alltracel, establishing the joint enterprise **Nanopeutics**, which will develop **nanofibre healthcare applications**. "Partnerships with other firms are necessary for us. We know how to produce nanofibres, but we also need to know precisely where and how they can be used," says Mareš, explaining the reason behind the establishment of the joint enterprise, which will seek additional applications for nanofibres in the healthcare field.



Would you imagine that it is possible, using a children's construction kit and a dynamo from a bicycle, to produce a prototype of an invention that would change the way millions of people see the world? These are the devices that the well-known Czech chemist Otto Wichterle used to develop the first instrument for casting soft contact lenses.

A Clear Vision for the World

The patent for production of contact lenses was eventually bought by the American company NPDC and through a later sublicense agreement with Bausch & Lomb the road to enormous commercial success was opened. **An insignificant, stagnating company thus reached the peak of technological development over night. Today this eye-care company is worth several billion dollars and employs approximately 14,000 people around the world.**

Polymers are the base

Otto Wichterle used a polymer hydrogel to produce the first soft contact lenses. Currently, three departments of the prestigious Institute of Macromolecular Chemistry of the Academy of Sciences of the CR (ASCR) are focusing on biomedical research, thus carrying on the legacy of the renowned chemist who gave the world clearer vision.

Thirty years ago, one of these departments was instrumental in developing the use of polymers as drug delivery systems. "At that time, the expert public laughed, but today synthetic polymers are commonly used in a wide variety of pharmaceuticals," says the institute's director, Karel Ulbrich, whose department at the institute is engaged in the development of polymers suitable for the preparation of new drugs with targeted effects.



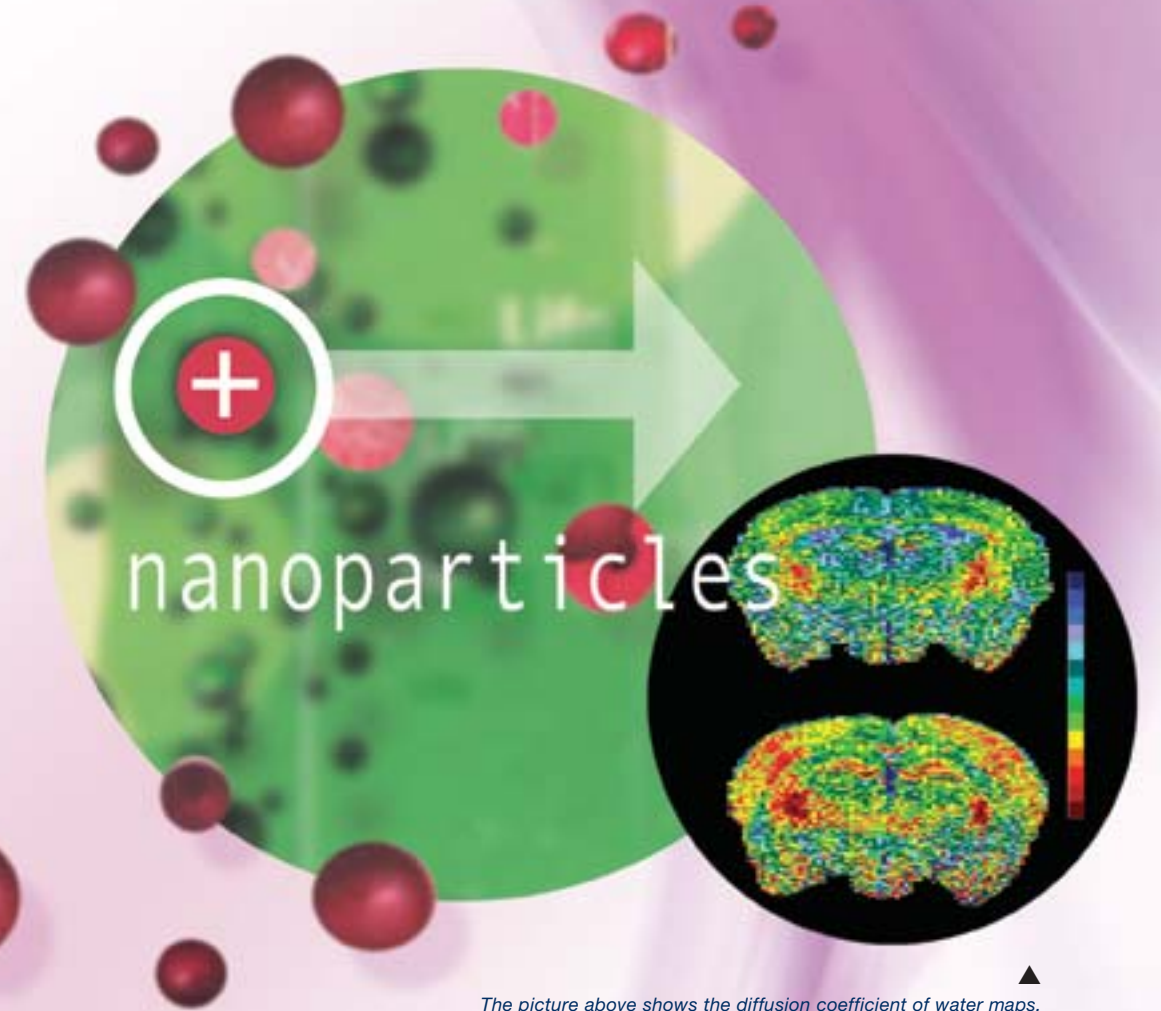
▲ Vascular stent

Targeted attack against cancer

In cooperation with the team of Professor Blanka Říhová at the Institute of Microbiology of the ASCR and the pharmaceuticals company Zentiva, Karel Ulbrich's team is focusing on the development of new anti-cancer compounds that directly target tumours. They are currently preparing **a new generation of anti-tumour drugs for pre-clinical and possibly later clinical testing. If these tests confirm the results achieved so far, this will represent a significant advance in the targeted use of polymers for the treatment of a range of serious illnesses.**

Patented vascular stent

The combined efforts of another department of the institute, led by František Rypáček, and a partner in the United States have resulted in a different product intended for biomedical applications – **a patented vascular stent whose surface is coated with polymers containing specific bioactive substances** which have a substantial ability to regulate the body's reaction to transplants.



▲ The picture above shows the diffusion coefficient of water maps, located in the brain of control mice and mice with amyloid plaques, that were made by means of magnetic resonance.

Tiny Helpers, Huge Results

Scientists at the Institute of Experimental Medicine of the Academy of Sciences, under the leadership of director Eva Syková, have introduced **a system that monitors the behaviour of stem cells in living organisms.** The scientists created new iron nanoparticles coated in a polymer (in cooperation with the Institute of Macromolecular Chemistry of the Academy of Sciences of the CR), which disperse among the cells. The cells absorb the iron nanoparticles and using magnetic resonance, the scientists can determine their destination and position. This process substantially aids research and monitoring of the effect of stem cells following implantation into animals with experimental brain or spinalcord injuries as well as other disorders. **The institute is an internationally recognised centre in the field of regenerative medicine and was thus selected as an EU Centre of Excellence.**

Stem cells: a revolution in medicine?

Stem cells have the ability to develop into any type of cell in the body, support the function of those cells and thus treat a whole range of hitherto untreatable disorders. Professor Syková and her team have obtained five EU grants

and in the coming period are planning to establish the Czech-German **Nano-4-Nerves** institute of regenerative medicine. Together with other partners, they are also planning the construction of the **Biotechnology Centre in the surroundings of Prague.**

EXBIO

Exbio is an example of an innovative company in the field of nanotechnology. Exbio is engaged in the design and production of hybridomas, i.e. synthetic cells, which serve for the targeted production of certain antibodies in unlimited quantities. Antibodies derived from hybridomas are used for research and diagnostics, and in recent years have begun to be **used in cancer-treatment drugs**, for example. Antibodies produced by Exbio Prague are the basis of some drugs and are **sold to firms in more than sixty countries.**

Selected Science and Technology Parks

In science and technology parks, young, innovative firms cross paths with well-established companies with a shared interest in research and development. Within the context of science and technology parks the Czech Republic supports cooperation between the research and business spheres through the Prosperity Programme of EU Structural Funds (see pages 14 - 15) within the Operational Programme Enterprise and Innovation.

More than twenty accredited science and technology parks have been established in the Czech Republic since 1994, of which particularly the Centre of Biological Technologies in Nové Hradky, the South Moravian Innovation Centre in Brno, and the Ostrava Science and Technology Park have laid the foundations of **success of numerous innovative firms**.

BUSINESS AND INNOVATION CENTRE OF THE CZECH TECHNICAL UNIVERSITY IN PRAGUE
<http://www.bic.cvut.cz>

TECHNOLOGY CENTRE OF THE ACADEMY OF SCIENCES OF THE CR
<http://www.tc.cz>

SCIENCE AND TECHNOLOGY PARK OF THE AERONAUTICAL RESEARCH AND TEST INSTITUTE
<http://www.vzlu.cz>

SCIENCE AND TECHNOLOGY PARK ŘEŽ
<http://www.ujv.cz/cz/park.html>

TECHNOLOGY AND INNOVATION CENTRE – RESEARCH INSTITUTE FOR METALS
<http://www.volny.cz/vuk>

PLZEŇ SCIENCE AND TECHNOLOGY PARK (under construction)
<http://www.vtpplzen.cz>

BUSINESS AND INNOVATION CENTRE PLZEŇ
<http://www.bic.cz>

INNOVATION CENTRE TŘEBOŇ
<http://www.tic.trebon.cz>

CENTRE OF BIOLOGICAL TECHNOLOGIES, NOVÉ HRADY
<http://www.greentech.cz/cbt>
 The specific focus of this centre is the **application of physical and chemical methods in biology** (specifically through technologies for cultivation of algal biomass) **and cooperation with institutes of applied research in the field of biotechnology and technologies for sustainable development**. The CBTI includes an innovation centre, a technology-transfer centre and a business incubator.
 The České Budějovice-based firm **Gali-3D** is one of the spin-offs of the Institute of Physical Biology at the University of South Bohemia. Gali-3D is continuing the institute's work in the **development of software for three-dimensional imaging of molecules**. The company developed a universally applicable algorithm that today is used in museum presentations, creation of 3D films and games, as well as for imaging inaccessible parts of the anatomy scanned with a camera in the human body. Gali-3D currently implements the greatest part of its services in North America.

SCIENCE AND TECHNOLOGY PARK OF PALACKÝ UNIVERSITY, OLOMOUC
<http://www.vtpup.cz>

BUSINESS AND INNOVATION CENTRE IN OSTRAVA
<http://www.bicova.cz>

OSTRAVA SCIENCE AND TECHNOLOGY PARK
<http://www.vtpo.cz>
 ICT has been the dominant field at the OSTP since 2005, which is due primarily to the **outstanding activity of the Faculty of Electrical Engineering and Computer Science at the Technical University of Ostrava in the area of cooperation with the private sector**.

The park is home to the Czech **software-development centre of TietoEnator**, an **academic laboratory of Bang & Olufsen**, and the **design and development centre of Siemens Kolejová vozidla s.r.o.** It is also preparing the **ChipInvest** project focused on the development of integrated circuits and control systems.

The Scandinavian multinational corporation TietoEnator, which provides services in the area of consulting, development and hosting of digital business, established a solution centre at the OSTP in 2003. Today, the centre employs roughly 200 highly qualified IT specialists, a number that is expected to grow to 500 in coming years.

TECHNOLOGY AND INNOVATION CENTRE, LTD., ZLÍN
<http://www.ticzlin.cz>

TECHNOLOGY TRANSFER OFFICE OF MASARYK UNIVERSITY, BRNO
<http://www.muni.cz/ctt>

BUSINESS AND INNOVATION CENTRE BRNO
<http://www.bicbrno.cz>

SOUTH MORAVIAN INNOVATION CENTRE, BRNO
<http://www.jic.cz>
 Brno has recently been spoken of as the **Czech Silicon Valley**. Founded by the South Moravia region, the City of Brno and four local universities in 2003, the South Moravian Innovation Centre has played an important role in the region's dynamic development. The centre is the parent organisation of the **VUT Technology Incubator**. Set up to encourage the growth of local talent, this incubator currently includes **25 firms that have already registered roughly 70 patents and utility models**. However, the South Moravian Innovation Centre's leaders are not resting on their laurels and are planning further expansion of the centre's activities. In addition to the **Technology Incubator II**, this expansion involves the pivotal area of biotechnology, which due to its strong potential will be served by a **separate incubator – INBIT**.

Gate2Biotech portal

Created by the South Moravian Innovation Centre with support from CzechInvest, the **Gate2Biotech portal brings together the biotechnology community in Central Europe**. The primary mission of Gate2Biotech is to facilitate communication within the Czech Republic and internationally, and to support the Czech biotechnology sector.
<http://www.gate2biotech.cz>



Another cutting-edge technology in the Czech Republic is the production of holograms. Optaglio ranks among the world's top ten most significant companies in the area of hologram production. The firm's products represent the absolute peak of protection against counterfeiting of official documents, banknotes, stamps and company brands. Optaglio is currently present in sixty countries and delivers its products to thirty governments.

Czech-made Holograms Protect Documents around the World

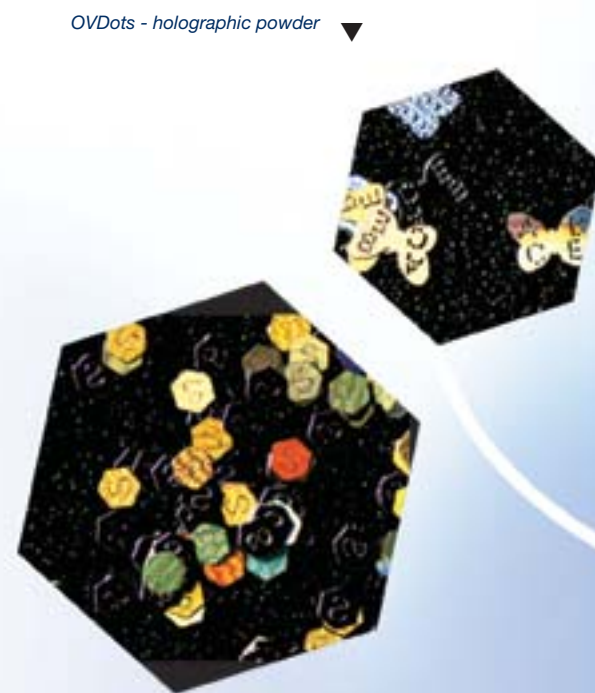
The company's success lies in an original concept worked out by a team led by the company's current manager, Tomáš Těthal. Together with his co-workers, he began to produce holograms in the classic way – with a laser – at the beginning of the 1990s. After some time, however, they began to use a technology called electron beam lithography. Following modifications of its control systems, the lithograph enabled far more sophisticated production of holograms. The device was developed by scientist **Armin Delong**, whose home laboratory, the **Institute of Scientific Instruments in Brno**, has long cooperated with Optaglio. Thanks to its innovative use of the lithograph, the institute has found many new possibilities for application of its research in practice.

Safer than safe

Holographic powder is one of the many innovations developed by Optaglio's team of scientists. This powder enables the application of protection codes on surfaces the size of a grain of sand. The production technology is very sophisticated and financially demanding, thus making counterfeiting extremely difficult. Another advancement is a hologram in spray form, which in future **can help prevent automobile theft**, as a PIN or VIN identifying a specific vehicle can be incorporated into the hologram. In the **"audiovisual hologram"** Optaglio has also managed to combine the graphic effect with a soundtrack in products enabling an even higher degree of protection. **Replication of the technology for reading such a hologram is practically impossible for potential counterfeiters.** Thus Optaglio's list of clients for brand protection includes such renowned global companies as Microsoft, Calvin Klein, Siemens, Toshiba, Nokia and Bosch.

Not resting on their laurels

Optaglio also plans to be present at the inception of a new branch of industry – **printed electronics** – which will represent a revolution both in price as well as in the way chips and displays are produced. "We are preparing our entry into this new branch of industry, in which we see tremendous potential," says Těthal, adding: "There is a demand for new ideas in this area, and we have them."

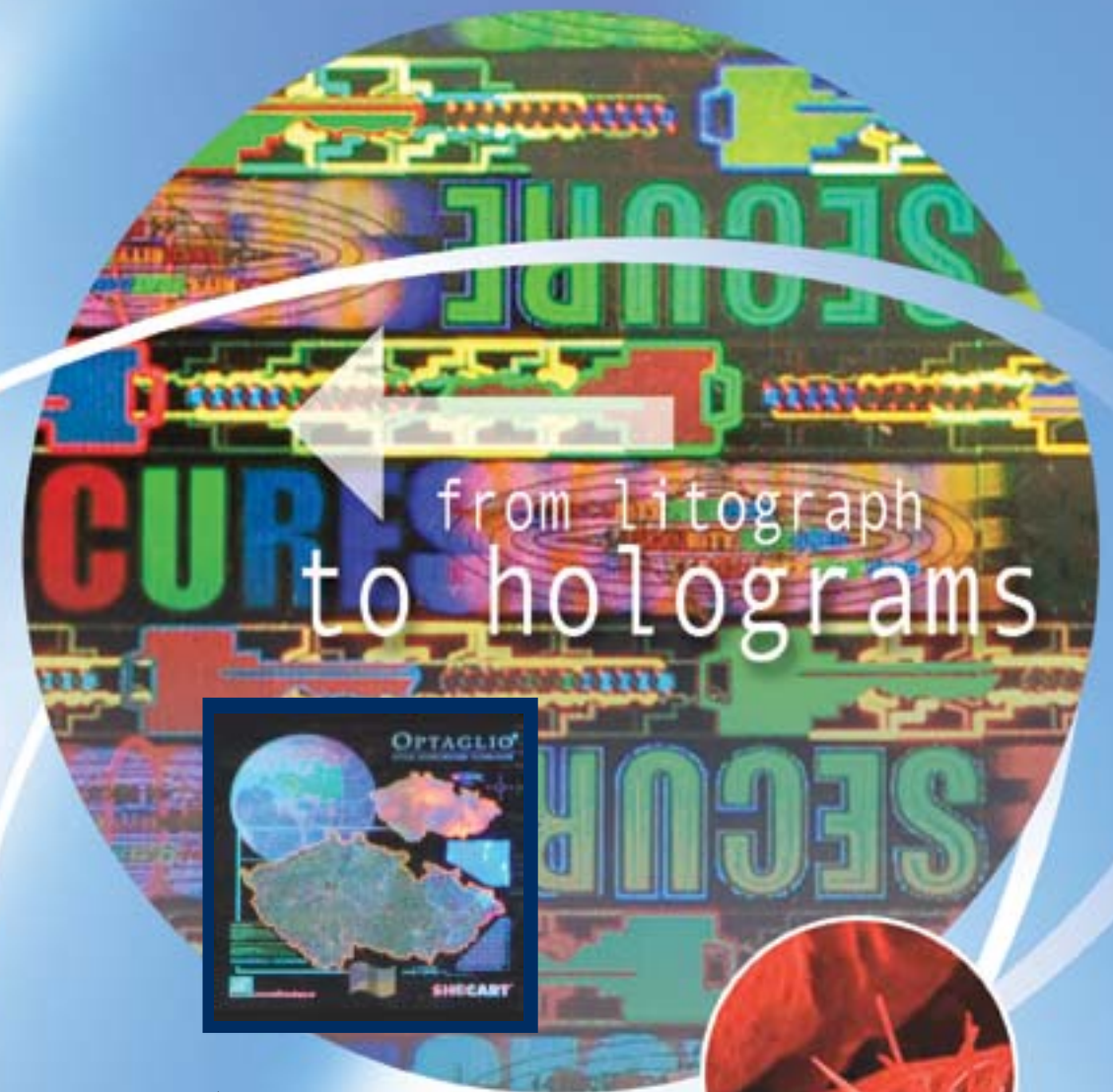


OVDots - holographic powder ▼



Commemorative coin with Optaglio hologram ▼

In addition to the Czech firms Optaglio and Metallic Security, the Optaglio group also includes the British company Optaglio Limited.



▲ Road map on a few square centimetres

Etched with an electron lithograph, this hologram contains a 1:200,000-scale roadmap of the Czech Republic, a 1:20,000-scale map of Prague, and a relief and elevation map. Now all you need is a sufficiently strong microscope.



TOP-QUALITY ELECTRON MICROSCOPES

Delong Instruments in Brno employs around sixty specialists working on the development of electron microscopes and other electronic instruments that are exported throughout the world. The technology centre is named for its founder, **Armin Delong, a pioneer in the production of electron microscopes.**

Professor Armin Delong introduced **the first electron microscope** into production in 1949. At that time, only **five countries had accomplished a similar feat.** Delong's

electron microscopes (thirty types developed so far) have been in use for decades in laboratories around the world and, among other things, serve for the study of protein structures and the diagnosis of some types of tumours.

In addition to manufacturing microscopes, the company has extensive experience with joint projects, serving as a contract developer of unique tailor-made devices and collaborating with world-renowned companies.

Since 1999 a Czech team of physicists, opticians and mathematicians has played an important role in the Pierre Auger Observatory, a prestigious international astrophysics project, which is among the world's most extensive basic research projects. This observatory is the largest existing detector of cosmic radiation. Czech opticians were nominated to the project on the basis of their excellent references.

Mirrors from Olomouc for the World's Largest Observatory

The observatory, which covers 3,000 km² in Argentina, studies extremely high-energy particles in the form of cosmic rays, which are completely beyond the reach of particle accelerators on Earth. The project is meant to provide an answer to the question of where these particles come from and to describe the accompanying physical phenomena.

Larger and smoother

The Joint Laboratory of Optics of Palacký University in Olomouc and the Institute of Physics of the Academy of Sciences of the Czech Republic (ASCR) supplied more than 800 ultra-light mirrors for half of the observatory's FD detectors. **The opticians in Olomouc worked out the technological process of producing mirrors that are unique with regard to their size – with a diameter of 62,3 cm, these are the largest mirrors of their kind in world.** In addition, the opticians have the ability to polish the mirrors to an unusually low surface roughness, which is given in units of nanometres.

Detecting the clearest gamma-ray optical counterpart

Mirrors are not the only Czech contribution to the project. Scientists from the Institute of Physics of the ASCR, in cooperation with the Institute of Astronomy of the ASCR, designed the **FRAM robotic telescope** based on a model from the Ondřejov Observatory. Two months after being incorporated into the project, this telescope **detected the clearest gamma-ray optical counterpart in history.**

Participation in the project has brought the laboratory tremendous renown and offers of collaboration are rolling in. For instance, **the laboratory supplies the telescopic system of the Cerenkov-type detector for the CERN particle accelerator.** The laboratory also produces equipment for monitoring flame temperature for the German firm Powitec and, for the company Mubea, equipment for identifying colour-coded wound springs for the automobile industry. The laboratory also conducts expert analysis; Barum Continental and numerous other companies have the quality and parameters of their products tested here.

WE TRANSMIT DATA VIA LIGHT

Jaromír Fiurášek of the Department of Optics at Palacký University in Olomouc discovered a way to store quantum information transmitted by light. He invented a device consisting of two cells with oppositely polarized caesium atoms, which serve as the basic memory unit. Quantum informatics is a young and very promising branch of physics that, among other things, is opening new horizons in the transmission of encrypted messages. The possibility of its practical application in modern banking is particularly significant.

CZECHS AMONG THE STARS

The Czech Republic is an astronomical power. The country is home to the densest network of observatories in the world. Czech astronomers are among the world's most successful in discovering planetoids and were the first to photographically document the impact of a meteorite. There are currently almost 500 planetoids named for famous Czechs, both real and imagined. **The Czech astronaut Vladimír Remek was the first non-Soviet or non-American citizen to reach space.**

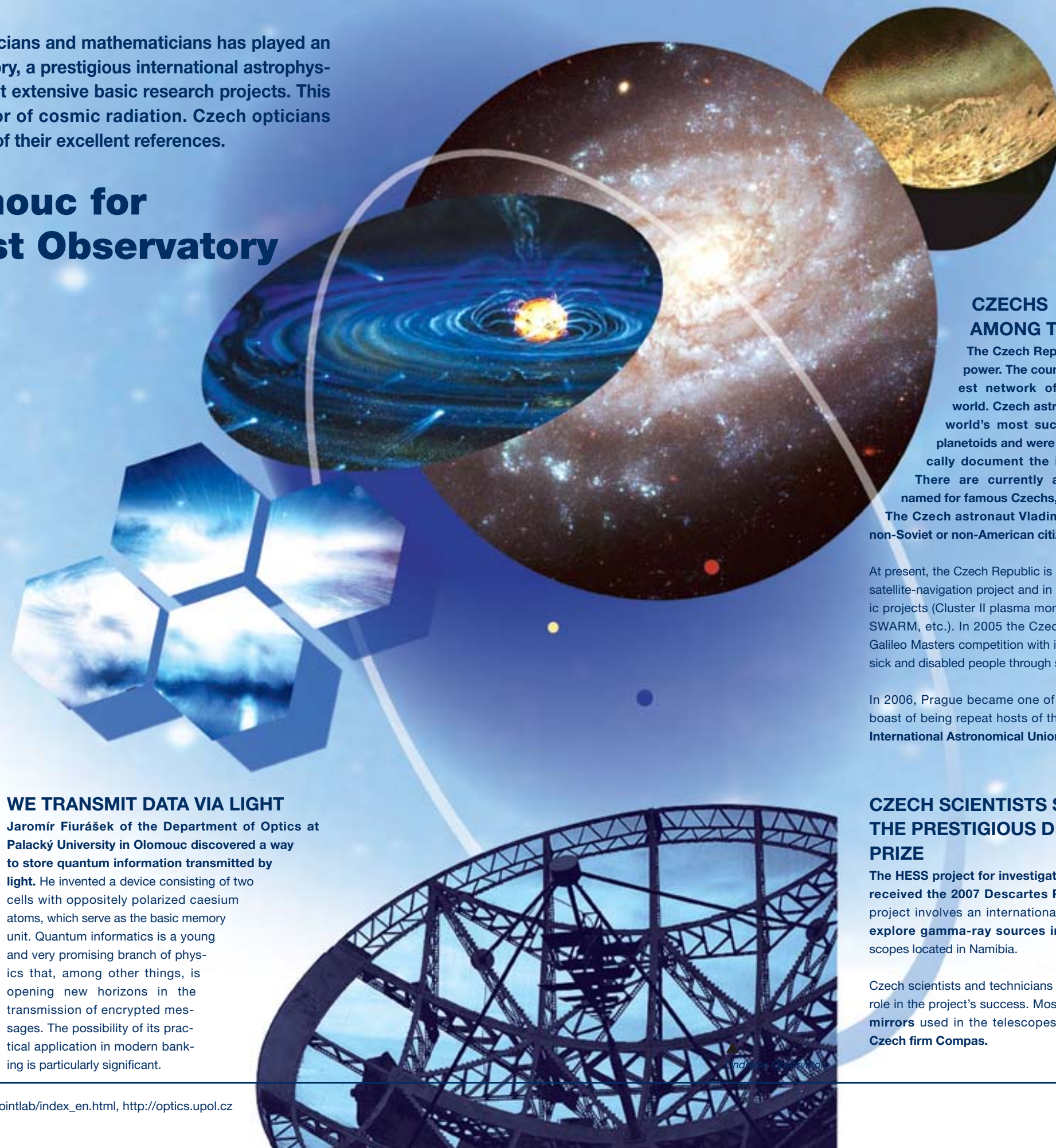
At present, the Czech Republic is participating in the Galileo satellite-navigation project and in several European scientific projects (Cluster II plasma monitoring mission, Demeter, SWARM, etc.). In 2005 the Czech company ICE won the Galileo Masters competition with its proposal for monitoring sick and disabled people through satellite navigation.

In 2006, Prague became one of the three cities that can boast of being repeat hosts of the annual **meeting of the International Astronomical Union.**

CZECH SCIENTISTS SHARE IN THE PRESTIGIOUS DESCARTES PRIZE

The HESS project for investigating cosmic gamma rays received the 2007 Descartes Prize for Research. The project involves an international team of scientists who **explore gamma-ray sources in space** using four telescopes located in Namibia.

Czech scientists and technicians have played an important role in the project's success. Most of the **specialty ground mirrors** used in the telescopes were **produced by the Czech firm Compas.**



Smart Support of Smart Projects

Over the past ten years, the Czech Republic's spending on R&D has increased from 0.95% of GDP to 1.42%. In 2004, the country became a member of the European Union, which spurred an additional, fundamental increase of support for science and research. The country has gained access to a variety of European funds and programmes, such as EU Structural Funds and EU Cohesion Funds, which have already had a positive impact on the economy. To that end, the funds can be used particularly for development of R&D infrastructure and the innovation activities of enterprises.

Government institutions support R&D activities through the use of various tools:

- Deduction of all R&D costs – companies can deduct R&D costs from their tax base and at the same time include them in eligible costs.
- Grants from the National Research Programme.
- Investment incentives to support companies setting up or expanding technology centres and centres for industrial research and development.
- Grants provided from EU Structural Funds covering the development of educational systems for R&D, development and upgrading of R&D infrastructure and support provided to small and medium-sized enterprises for innovation projects.

Protection of intellectual property

Protection of intellectual property rights in the Czech Republic is advanced due to the Czech Republic's membership of many multilateral international treaties and its membership in the EU, which forced the country to harmonize its intellectual property legislation with EU laws and regulations.

PROGRAMME	SUPPORTED ACTIVITIES	RECIPIENT	BASIC CONDITIONS	GRANT AMOUNT	NOTES
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FINANCING - STATE BUDGET

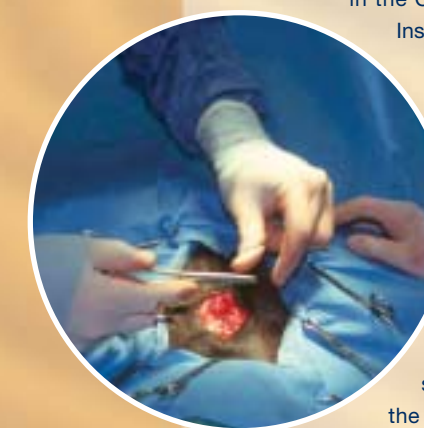
PERMANENT PROSPERITY www.mpo.cz	research projects within thematic areas defined by the state	LE SME	trade license or other permit for research and development activity in the area of natural or technical sciences	max. 100% of EC for basic and applied research, max 75% of EC for industrial research, max. 50% of EC for development; investment, operating and wage costs are recoverable	
TANDEM www.mpo.cz	projects of directed or industrial research and development whose results will be applicable in industry	LE SME	1) project implementers only specific groupings 2) trade license or other permit for research and development activity in the area of natural or technical sciences	max. 50% of EC - for development, max 75% of EC - for industrial research	
IMPULSE www.mpo.cz	projects focused on applied research and development at the level of prototype, pilot operation, etc.	LE SME	trade license or other permit for research and development activity in the area of natural or technical sciences	max. 50% of EC - for development, max 75% of EC - for applied research	
DEVELOPMENT www.czechinvest.org	support for preparation of projects in the 7 th FP of the EU	SME	only for active participants in the 7 th FP	50% - 75% of EC, max CZK 100 or 250 thousand	
FP FOR TC SUPPORT www.czechinvest.org	development of high-tech products, technologies and related software	LE SME	investment of min. CZK 10 mil., min. 30 new jobs	max 40% - 60% of wages (Prague 10% - 30%) + 35% of training	

FINANCING - SF EU (85%) AND STATE BUDGET (15%)

OPEI INNOVATION www.czechinvest.org	A) innovation projects - product and process innovation	LE SME	outside Prague, tax history of 2 years in the CR	36% - 60% of EC (according to the regional map)	only for LEs that are not multinational companies or a part thereof, decision - April 2007
	B) innovation projects - marketing and organisational innovations	SME	outside Prague, tax history of 2 years in the CR	36% - 60% of EC (according to the regional map)	
	C) projects for the protection of industrial ownership rights (patents, utility models, industrial designs and protected trademarks)	SME	outside Prague	SME and natural person 45% of EC, SME cooperating with a university or PRI 55% of EC, grant CZK 10 - 300 thousand	
OPEI POTENTIAL www.czechinvest.org	projects for implementing and increasing capacities needed for conducting research, development and innovation activities - e.g. establishment or expansion of a development centre including related software development	LE SME	outside Prague	40% - 60% of EC from investments, CZK 1 - 75 million	only for LEs that are not multinational companies or a part thereof, decision - April 2007
OPEI COOPERATION www.czechinvest.org www.klastr.cz	projects to establish and develop clusters, fields of excellence, technology platforms	legal entity	outside Prague	investment costs, operating costs - aid amount currently not known	specification of eligible entities will always be stated in the call, from the 2nd half of 2007
OPEI PROSPERITY www.czechinvest.org	projects to establish and develop science and technology parks, business incubators, technology-transfer centres	legal entity NNO	outside Prague	CZK 5 - 200 mil. in the case of construction works, CZK 1 - 30 mil. in the case of non-construction works	specification of eligible entities will always be stated in the call, from the 2nd half of 2007

FINANCING - EU

7th FP http://cordis.europa.eu/fp7/home_en.html www.tc.cz	research and development projects in Europe	LE SME	necessary added value for the EU	investment costs according to the focus and type of project	cooperation with a partner from another EU country
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BIOVETA CASE STUDY

The joint-stock company Bioveta is a significant producer of veterinary, immunobiological and pharmaceutical preparations in the Czech Republic. The company currently has **approximately 150 types of products in its production portfolio and successfully exports its veterinary preparations to nearly 40 countries.**

Within the context of its own research and development, Bioveta cooperates with specialists from various institutions in the Czech Republic (The Veterinary Research Institute in Brno, The Academy of Sciences of the Czech Republic, The Faculty of Medicine at Palacký University in Olomouc, and others), as well as with foreign organizations (The College of Veterinary Medicine in Leipzig).

In 2004 Bioveta launched a project involving the **construction of clean spaces for finalisation of veterinary preparations.** The aim of this project was to enable increased production of some existing pharmaceutical products and the introduction of new products. In connection with the project, the company **received a grant from the Innovation Programme** of EU Structural Funds and was thus able to complete the project two years later. Thanks to the Innovation Programme, the company got back over 45% of deductible costs, which in this case amounted to EUR 262,464.

<http://www.bioveta.cz>

Operational Programme Research and Development for Innovation

In the case that investors do not have their own research capacities, they may obtain, within the context of cooperation with public research organisations, financial aid up to **the amount of 100% of eligible costs for implementation of projects focused particularly on building and modernising infrastructure and capacities in the region.** This concerns projects focusing on both targeted (non-technical) and technical research, incorporation of R&D capacities into the European research environment, ensuring the transfer of R&D findings to users, and the establishment of technology-oriented firms (including spin-offs) connected with universities and research institutes.

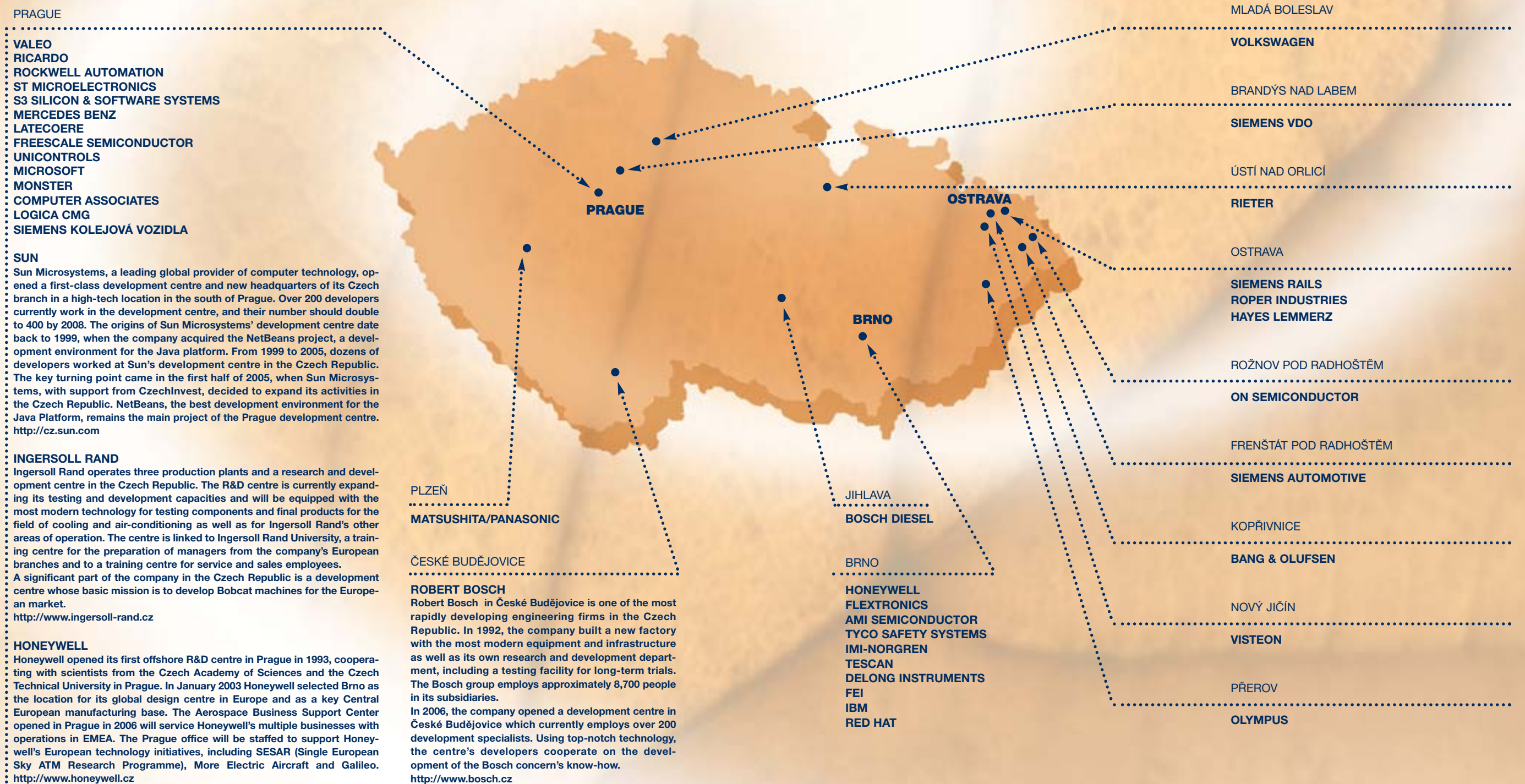
- LE - large enterprise
- SME - small or medium-sized enterprise
- PRI - public research institute
- EC - eligible costs
- TC - technology centre
- FP - framework programme
- OPEI - Operational Programme Enterprise and Innovation
- NNO - non-governmental non-profit organisation

Selected Technology and IT Centres in the Czech Republic

A growing share of FDI is flowing into R&D activities in the Czech Republic. While many R&D activities have been spun off from manufacturing operations, such as Matsushita's R&D centre in Plzeň developing software for digital TVs, increasingly companies are establishing R&D centres in the Czech Republic without first having a manufacturing presence. Companies such as Honeywell, Roper Industries, Rockwell Automation, Ricardo, ST Microelectronics, Olympus and AMI Semiconductor are good examples of such investments. This is a sign of foreign companies' growing confidence in the Czech R&D and business climate as well as in the country's legal system and intellectual property environment. Many companies have also established effective cooperation with Czech universities and research institutes.

"The level of automotive research carried out by the Josef Božek Centre in Prague meets the highest demands of the competitive automotive industry. Its contribution to the education of young researchers and designers creates a significant base of highly skilled automotive engineers in Central and Eastern Europe. These facts have been reflected in our continuing mutual cooperation started five years ago."

Dr. Ing. Peter Dittrich, Mercedes-Benz Engineering, Prague



Czech cyberneticians cannot complain about having a lack of work. In fact, quite the opposite is true, thanks to the interest that the world's most significant companies have shown in their ideas, which also explains the constant flow of people through the door at their home base at the Czech Technical University (CTU) in Prague.

Doing Research for Hitachi, Toyota and Honeywell

"We selected CTU to do advanced research in the computer-vision field. We consider the university's top workers engaged in this research area to be irreplaceable."

Dr. Shoichiro Toyoda, former president of the Toyota Motor Corporation, on the occasion of being awarded the Doctorate Honoris Causa of the Czech Technical University in Prague

The list of companies with which the team of engineers under the leadership of Professor Vladimír Mařík at the Department of Cybernetics at CTU collaborates is very long and includes such names as **Toyota, Honeywell, Rockwell Automation, and Hitachi**, as well as the **American military services**. "Our cooperation with each firm is based on a different model," says Mařík. "The interest in Czech engineers lies in their ability to improvise and to find solutions in complicated situations."

In 1991, the department's activities began attracting the interest of Rockwell Automation, which led to its most significant cooperative partnership. Two years later, **Rockwell Automation's independent Advanced Technology Laboratory** was established. Today this laboratory employs around fifty researchers under Mařík's leadership.

This is not science fiction

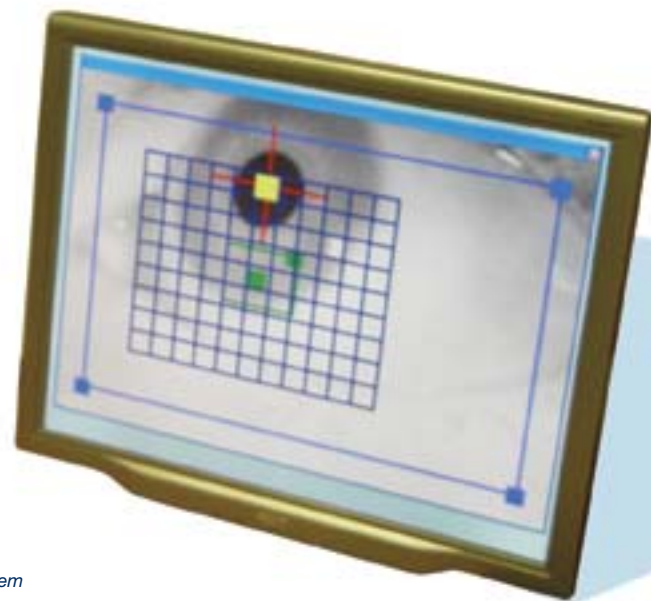
Teams from the Department of Cybernetics participate in numerous projects which, at first glance, appear to have been taken straight from a science-fiction novel. For example, the teams are developing algorithms for **Toyota's car of the future – the so-called "smart car"** which will be able to automatically recognise road signs or park itself. With Hitachi, they are collaborating on programs for object recognition and processing of displayed information. The teams of engineers at the Department of Cybernetics are also working on aircraft-control algorithms within a project of the US Air Force, while collaborating with Honeywell in the Homeland Security programme. At the same time, they are also involved in work on systems for coordinating various humanitarian organisations in areas affected by disasters.



robot



The word "robot" was first used by the Czech writer Karel Čapek in the play R.U.R. in 1920. Eighty-three years later, a robot called Asimo (developed by Honda) placed flowers on a bust of Čapek while accompanying a delegation of Japanese government officials in the Czech Republic.



▲ I4 Control (Eye for Control) System

Making robots understand people

In the longterm, the department is working on systems enabling the participation and interaction of robots in rescue work and their communication with people. "We are developing automated machines – robots which will be able to autonomously react in a decentralised environment," says Mařík, explaining his department's research. For one of their solutions, the cyberneticians received prestigious awards, the **European IST (Information Society Technology) Prize** and the gold medal at MSVB Brno 2006. These prizes were awarded to the Czech engineers for their **patented I4 Control device, which significantly assists disabled people by enabling them to control computers using only eye movement**. Commenting on this achievement, Vladimír Mařík adds that, "in future, it will be possible to use evaluation stimuli detected by the optic papillae to determine the level of fatigue of pilots and workers in nuclear facilities."

CERTICON SPIN-OFF

The department's branched system of cooperation is complemented by four spin-offs whose aim is to create an environment enabling the cultivation of skilled engineering works and to stay abreast of the latest trends in industry. One of these spin-offs is Certicon, which is involved in the development of software and expert systems for pacemakers for the Dutch producer Vitatron Medical, which accounts for half of the world's pacemaker market. **The Czech Republic has thus become one of the global centres for the development of pacemaker software.**

When the world leader in speech technologies, IBM, and the prestigious Johns Hopkins University were searching for a high-quality, reliable partner with a track record of excellent results in this field, they looked to the Czech Republic, selecting cyberneticians from the University of West Bohemia in Plzeň (UWB) for collaboration on the international MALACH project.

Masters of Captured Memory

The project originated from the need to automatically process a unique video archive with the testimonies of 52,000 Holocaust witnesses in various languages. Based on their **unmatched expert position in the CEE region**, Czech scientists were assigned the task of processing Slavic languages – Czech, Polish, Russian and Slovak. **Within the project, they managed to create a system for the automatic recognition of uninterrupted speech and its transcription into text form for testimonies given in Slavic languages.** The aim of this ambitious project is to digitalise the entire archive, enabling automatic searching of its testimonies via internet terminals around the world.

Voice interaction with ICT devices

However, the MALACH project is far from being the only activity of the Cybernetics Department at UWB. The laboratory is currently involved in the EU project called Companions, which enables **voice communication with the internet**. For Czech Television, the university's scientists are creating a system for automatic subtitling of live broadcasts, and for Fincom Materna Communication they developed a system that is able to **convert SMS messages sent over a fixed line into speech**. A system for sending MMS messages supported with visual and verbal commentary of the sender will surely capture the interest of telecommunications companies in future.

Advanced algorithms for control of processes

Another significant area of the department's expertise is development of advanced algorithms for the control of processes and machines. **For the German company PMA, the department is developing a completely new algorithm for the automatic tuning of industrial regulators.** The department is also successfully collaborating with the Research Institute of Textile Machines in Liberec, with which it is currently working on a **control system for a new generation of jet loom.**



SPEECHTECH AND REX CONTROLS SPIN-OFFS

For easier commercialisation of its research findings, the **Cybernetics Department established the successful spin-offs SpeechTech**, which in cooperation with the university is developing interactive voice telephone dialogue systems based on its own technology, and **Rex Controls**, which is engaged in research and development of advanced algorithms for the control of dynamic processes based on its own REX programming system.

More information is available at <http://speechtech.eu>, http://www.rexcontrols.cz/_new

ROBOFOOTBALLERS

The **Research Centre of Applied Cybernetics of the Technical University of Brno** concentrates on research and development of mobile groups of robots. The researchers chalked up a success with the ORPHEUS mobile robotic research system intended particularly for research of areas considered too dangerous or inaccessible to humans. **ORPHEUS took first place in the 2003 Robocub competition in Padova, Italy.**

Robots from Brno have also distinguished themselves in the sport of robot football, which involves teams of robots that are completely controlled by a computer without any human intervention during the course of the match. **RoBohemia, a team established at the Department of Control and Instrumentation, won the European championship in 2001 and 2002.**



PUBLIC RESEARCH INSTITUTIONS

(Selection of Non-humanities)

EARTH SCIENCES

Mathematics

Institute of Mathematics of the Academy of Sciences of the CR (ASCR)
Institute of Computer Science of the ASCR
Institute of Information Theory and Automation of the ASCR
Transport Research Centre

<http://www.math.cas.cz>
<http://www.cs.cas.cz>
<http://www.utia.cas.cz>
<http://www.cdv.cz>

Physics

Institute of Physics of the ASCR
Institute of Photonics and Electronics of the ASCR
Institute of Physics of Materials of the ASCR
Institute of Plasma Physics of the ASCR
Nuclear Physics Institute of the ASCR
Institute of Hydrodynamics of the ASCR
Institute of Scientific Instruments of the ASCR
Institute of Theoretical and Applied Mechanics of the ASCR
Institute of Thermomechanics of the ASCR

<http://www.fzu.cz>
<http://www.ure.cas.cz>
<http://www.ipm.cz>
<http://www.ipp.cas.cz>
<http://www.ujf.cas.cz>
<http://www.ih.cas.cz>
<http://www.isibrno.cz>
<http://www.itam.cas.cz>
<http://www.it.cas.cz>

Geology

Geophysical Institute of the ASCR
Institute of Geology of the ASCR
Institute of Atmospheric Physics of the ASCR
Institute of Geonics of the ASCR
Institute of Rock Structure and Mechanics of the ASCR
Czech Geological Survey
T. G. Masaryk Water Research Institute
Czech Hydrometeorological Institute
Research Institute of Geodesy, Topography and Cartography

<http://www.ig.cas.cz>
<http://www.gli.cas.cz>
<http://www.ufa.cas.cz>
<http://www.ugn.cas.cz>
<http://www.irms.cas.cz>
<http://nts1.cgu.cz>
<http://www.vuv.cz>
<http://www.chmi.cz>
<http://www.vugtk.cz>

Space

Astronomical Institute of the ASCR

<http://www.asu.cas.cz>

LIFE SCIENCES

Chemical Sciences

Institute of Analytical Chemistry of the ASCR
Institute of Inorganic Chemistry of the ASCR
J. Heyrovský Institute of Physical Chemistry of the ASCR
Institute of Chemical Process Fundamentals of the ASCR
Institute of Macromolecular Chemistry of the ASCR
Institute of Organic Chemistry and Biochemistry of the ASCR
National Institute for Nuclear, Chemical and Biological Protection

<http://www.iach.cz/uiach>
<http://www.iic.cas.cz>
<http://www.jh-inst.cas.cz>
<http://www.icpf.cas.cz>
<http://www.imc.cas.cz>
<http://www.uochb.cas.cz>
<http://www.sujchbo.cz>

Biology

Biology Centre of the ASCR
Institute of Vertebrate Biology of the ASCR
Institute of Systems Biology and Ecology of the ASCR

<http://www.bc.cas.cz>
<http://www.ivb.cz>
<http://www.usbe.cas.cz>

Botany

Institute of Botany of the ASCR
Institute of Experimental Botany of the ASCR
The Silva Tarouca Research Institute for Landscape and Ornamental Gardening
Crop Research Institute
Research Institute of Agricultural Engineering
Research Institute of Ameliorations and Soil Conservation
The Forestry and Game Management Research Institute

<http://www.ibot.cas.cz>
<http://www.ueb.cas.cz>
<http://www.vukoz.cz>
<http://www.vurv.cz>
<http://www.vuzt.cz>
<http://www.vumop.cz>
<http://www.vulhm.cz>

Medicine

Institute of Biophysics of the ASCR
Institute of Physiology of the ASCR
Institute of Experimental Medicine of the ASCR

<http://www.ibp.cz>
<http://www.biomed.cas.cz/fgu>
<http://www.iem.cas.cz>

Zoology

Institute of Animal Science
Veterinary Research Institute

<http://www.vuzv.cz>
<http://www.vri.cz>

Biochemistry

Institute of Microbiology of the ASCR
Food Research Institute Prague

<http://www.biomed.cas.cz/mbu>
<http://www.vupp.cz>

Medical R&D Centre for the 21st Century

The International Clinical Research Centre (ICRC) in the city of Brno is a strategic project of the Czech Republic in the area of development of applied research, education, public medical care and the knowledge economy.

One of the objectives of the ICRC project is to build the **biggest cluster for biomedical and biotechnology research in Central Europe**. This cluster will arise from the logistical connection of the Masaryk University campus in Brno, the ICRC and the Cardiovascular Animal Research Centre in Brno.

Hand-in-hand with Mayo Clinic

In the field of research, the ICRC will be the **world's third international research centre**, following the International Space Station (ISS 2) and the European Organisation for Nuclear Research (CERN) and **the first international centre in the field of medical research**. The exceptional nature of the project is underscored by **collaboration with Mayo Clinic**, which is regarded by experts as the world's most prestigious healthcare facility, both for the quality and scope of provided healthcare and for its leading position in the area of basic and clinical research as well as pre- and post-graduate medical education. Mayo Clinic will play a significant role in the strategic planning and management of the ICRC.

The ICRC, construction of which began at the end of 2006, will be a multi-purpose unit combining four basic elements:

- Next-generation science and research base
- Top-quality public healthcare facility providing clinical and preventive care and treatment in the area of cardiology and cardiovascular and transplant surgery according to the latest findings of the world's medical scientists
- International education centre
- Technology park

Scientists in motion

The newly formulated concept of international scientific collaboration, i.e. the concept of dynamic science teams (science teams formed on a short-term basis in a single location specifically for each research project) and a flexible system of science laboratories, will allow **research and development to be accelerated by up to 50%** in comparison with the clinical research concept in use today.

To develop compounds that are effective against HIV is the dream of many laboratories around the world. Professor Antonín Holý of the Czech Institute of Organic Chemistry and Biochemistry (IOCHB) has succeeded in realizing this dream with the assistance of a team of scientists from the university in Louvain, Belgium.

Czech Chemist Successful in Fight against HIV

The exceptional antiviral effects of Professor Holý's compounds were recognised 21 years ago by American researchers who under the trade name Gilead Sciences set out on the risky path of development of anti-AIDS drugs based on these compounds. And what is the result of their endeavours? Gilead Sciences now has over 1,900 employees in nine centres around the world, has several times been recognised as the world's most dynamic pharmaceuticals firm and covers 45% of the world market with its anti-AIDS drugs. Five of Gilead Sciences' nine approved products are derived from Professor Holý's compounds.

Uncompromising antivirals

This is the reason that Gilead decided in 2006 to establish and finance its only R&D centre outside the United States with Professor Holý in Prague. "We have done so because Dr. Holý and his team have shown such productivity and such impressive scientific leadership over the years," emphasizes John F. Milligan, executive vice president of Gilead. An advantage of the centre is that the scientists from the IOCHB are not working only on things intended for commercialisation, which gives them the necessary freedom to conduct their research. And the world has already seen the first result, a virtually non-toxic antiviral compound which is 500 times more effective against HIV and retroviruses than the best currently available compounds.

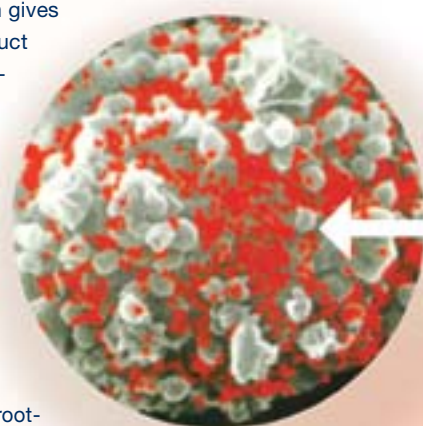
New generation of cancer drugs

"The institute's current successes are rooted in its celebrated history," says Zdeněk Havlas, director of the institute. This is confirmed by the findings of Professor Peter Jones of the University of Southern California, who discovered that compounds syn-

thesized by the institute 40 years ago have the ability to heal cells damaged by cancer, which is absolutely unique in today's world of science. In the United States, an approved drug containing these compounds is now freely available. The institute is, of course, still in the game, having recently patented another compound which surpasses the original compounds in terms of stability.

Molecular electronics

Another important scientific personality at the institute is Professor Josef Michl. This American of Czech descent, who has been awarded several Czech doctorates and nominated for a Nobel prize, is working on the American DARPA project – molecular electronics for the third millennium with the aim of creating computer components on the molecular scale. This is an important project for the future which holds promise of an essential, qualitative advance of science.



123

▼
Instead of the original 13 tablets taken daily, only one Atripla pill is needed each morning.

HEPATITIS B

HIV

cancer

Tenofoviri disoproxili fumaras

GILEAD SCIENCES' PRODUCTS DERIVED FROM PROFESSOR HOLÝ'S COMPOUNDS:

HEPSERA - based on adefovir, serves for the treatment of CHRONIC HEPATITIS B

VISTIDE - effective against SHINGLES and SMALLPOX, for example

VIREAD and **TRUVADA** - approved for the treatment of AIDS

ATRIPLA - a drug which substantially changes the frequency of use of ANTI-AIDS drugs



At the end of the 1990s, the Koreans began to use the phrase “Czech Quality” to evaluate products made from hyaluronic acid. The benchmark was set by the Czech company Contipro, whose products based on this substance dominate two-thirds of the European and one-third of the world market.

Czech Researchers Set the Benchmark

Hyaluronic acid is a natural component of the human body and ensures the proper hydration of the skin – it is present, for example, in ocular mucous membranes, cartilage and other organs. Contipro’s current director and one of its founders, Dr. Vladimír Velebný, saw the potential of this substance as early as the 1980s. His team managed to produce hyaluronic acid in pharmaceutical quality and soon became the **market leader** in the sector.

Hyiodine makes wonders

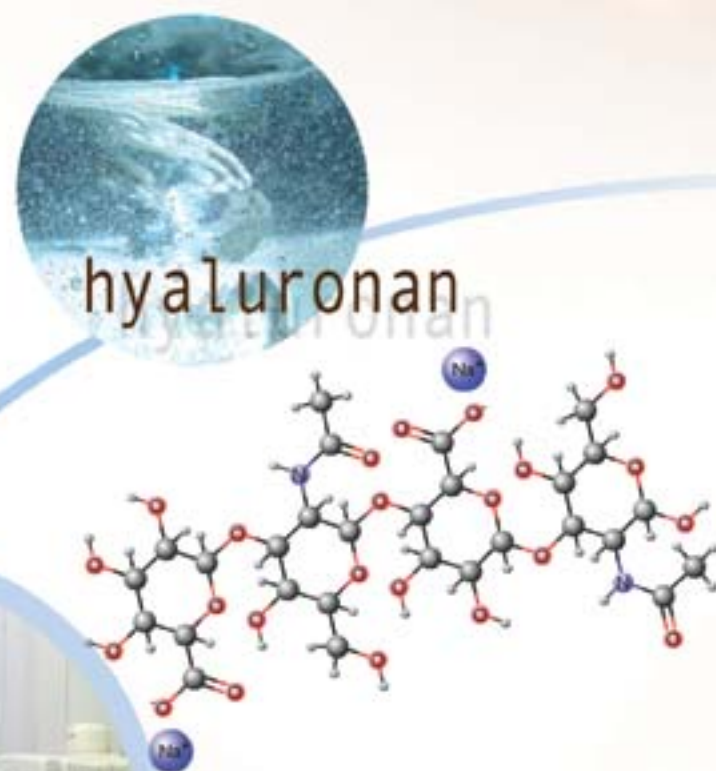
Hyaluronic acid contains Contipro’s patented product Hyiodine which has a **unique healing capability with a high hydration function and favourable effects on the organisation of connective tissue**. Using Hyiodine, it is possible to successfully **treat serious afflictions such as infected surgical wounds, ulcers, septic wounds and diabetes-related ulcers**.

Foreign partners have Contipro produce sophisticated chemical products based on hyaluronic acid. The company also conducts its own research and development in more than ten laboratories. The singular quality of its products is evidenced by the fact that a **significant Japanese pharmaceuticals firm abandoned its production of hyaluronic acid**, ceasing to compete with Contipro and becoming its distributor.

Strength through cooperation

“We cannot do all the research and development alone – cooperation with other firms, research institutes and universities is a must,” says Dr. Velebný. That’s why Contipro decided to establish the **Nanomedic cluster** by offering partnership to firms that complement each other’s research and production programmes. Today the cluster comprises **22 members and, in addition to trading companies and**

commercial laboratories, includes the Institute of Biophysics of the Academy of Sciences. Contipro’s collaboration is not limited only to Czech entities – the company runs joint projects also with, for example, the Research Institute of Polymers in Wrexham in Great Britain and the ophthalmological laboratory of René Descartes University in Paris.



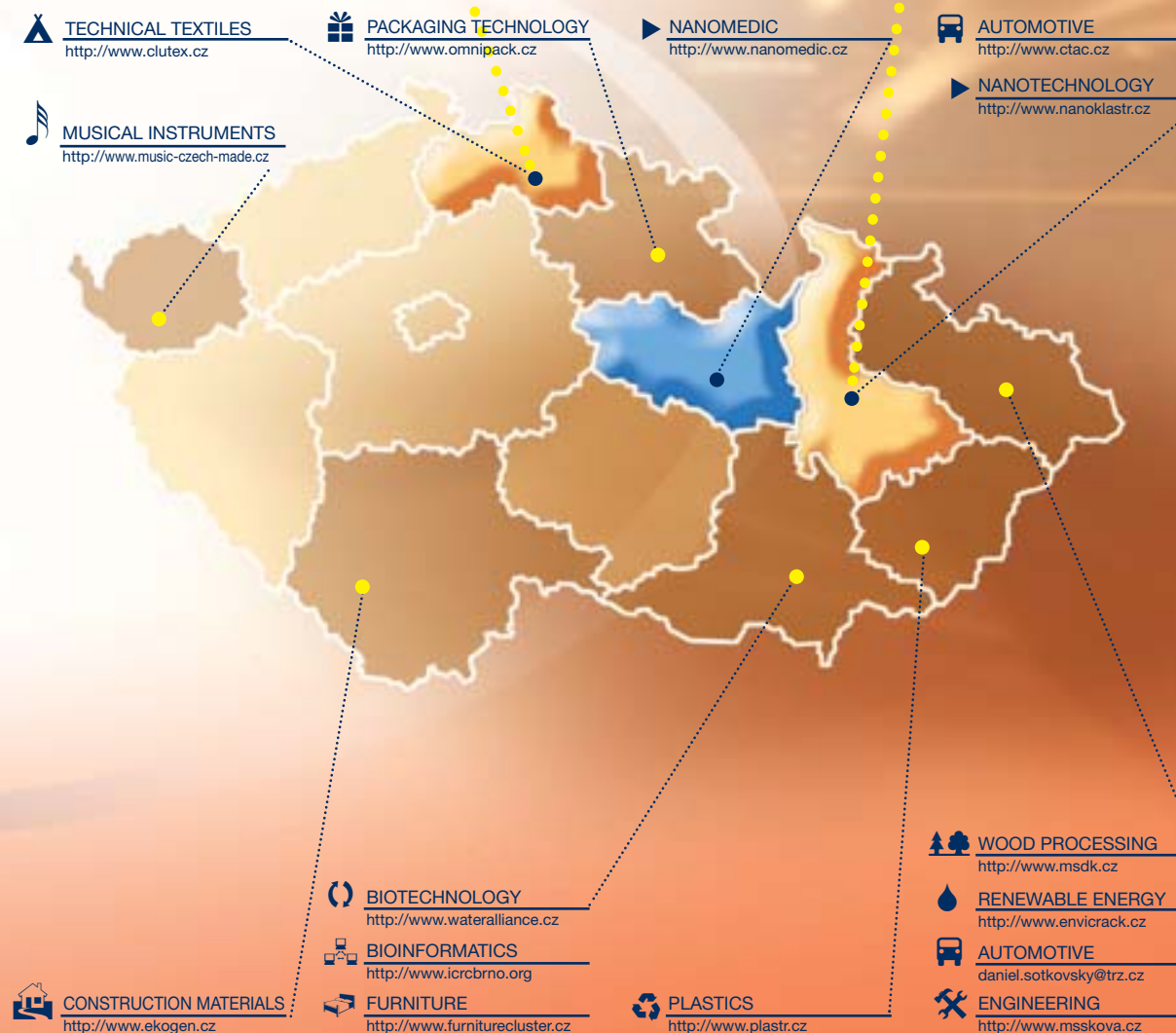
technical-textiles cluster

The **CLUTEX technical-textiles cluster** was established in 2006 as a result of the activities of the Technical University in Liberec. The cluster currently associates 19 members including small and medium-sized enterprises, TU Liberec and research organisations such as the Textile Testing Institute and the Research Institute of Textile Machines. So far the cluster has announced projects focused on nano-treatment of textiles to achieve antibacterial and self-cleaning effects and to increase the electrical conductivity of textiles.

nanotechnology cluster

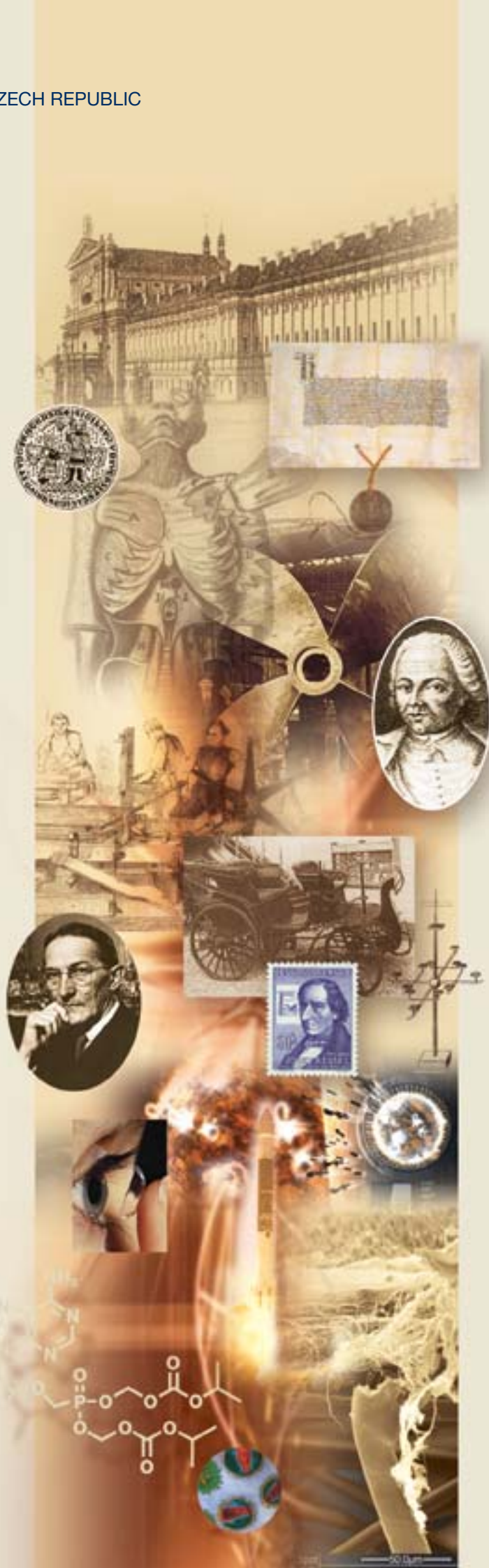
The first Czech **nanotechnology cluster** was established in the first half of 2006 at Palacký University in Olomouc. In founding the cluster, the university succeeded in bringing together twenty renowned firms which will collaborate in the field of nanotechnologies. The cluster’s specific projects include, e.g., the addition of the antibacterial effects of nanoparticles to clothing during the washing process and mapping the market in the area of nanotechnological treatments of textile surfaces. One of the successful firms involved in the cluster is Nanotrade, which uses the Envirox nanotechnology to enrich diesel fuel, thus lowering emissions and improving engine performance.

SELECTED CLUSTER INITIATIVES



TECHNOLOGY TIMELINE OF THE CZECH REPUBLIC

- 1348 Charles University established in Prague
- 1600 First public dissection of a human body performed in Prague
- 1707 Czech Technical University (CTU) established
- 1754 Prokop Diviš invents lightning rod
- 1773 Czech Royal Society of Science established
- 1796 Discovery of lithography by Alois Senefeld
- 1815 Josef Božek exhibits his steam-driven carriage
- 1827 Josef Ressel demonstrates ship's propeller
- 1837 J.E. Purkyně formulates the cell theory
- 1842 Pilsner-type beer brewed in Plzeň (Pilsen in German) for the first time
- 1866 Johan Gregor Mendel discovers laws of heredity
- 1881 František Křižík introduces new type of fluxional arc lamp
- 1897 First car in Central Europe, the President, manufactured in Koprivnice
- 1905 Škoda Auto manufactures its first car
- 1905 Karel Schinzel receives patent for three-layer colour photography
- 1912 Víktor Kaplan invents the Kaplan turbine (patented in 1920)
- 1914 Jan Jánský discovers the fourth blood type
- 1922 Jaroslav Heyrovský invents the polarographic method
- 1952 Czechoslovak Academy of Sciences established
- 1957 Jaroslav Kurzweil co-formulates the Henstock-Kurzweil integral
- 1959 Jaroslav Heyrovský receives the Nobel Prize for Chemistry
- 1961 Otto Wichterle invents method of manufacturing soft contact lenses
- 1966 Invention of the Semtex explosive in Pardubice
- 1978 Vladimír Remek becomes the first non-Soviet and non-American astronaut in space
- 1987 The Czechoslovak army develops the TAMARA passive radar
- 1992 Czechoslovakia joins CERN, the European Organization for Nuclear Research
- 1998 Jiří Čížek nominated for a Nobel Prize for his method of calculating correlation energy
- 2002 The FDA approves the B-hepatitis drug Hepsera based on a compound discovered by Antonín Holý
- 2004 Elmarco introduces Nanospider - the world's first industrial nanofibre production machine
- 2006 The FDA approves Atripla - a once-daily pill for treating HIV, based on A. Holý's compound



Join the Successful!



Partnership to Support Foreign Direct Investment into the CR...

...is a joint project of the Association for Foreign Investment and CzechInvest - the Investment and Business Development Agency of the Czech Republic. The project is intended for stable companies that offer highly competitive services and products and that are interested in supporting the high-quality investment climate in the Czech Republic while promoting the country abroad. Programme activities support, to the maximum degree possible, communication between partners and foreign investors, Czech companies, representatives of the state administration and AFI members by means of e.g. organising prestigious award ceremonies, such as:



Organized with the kind support of:



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