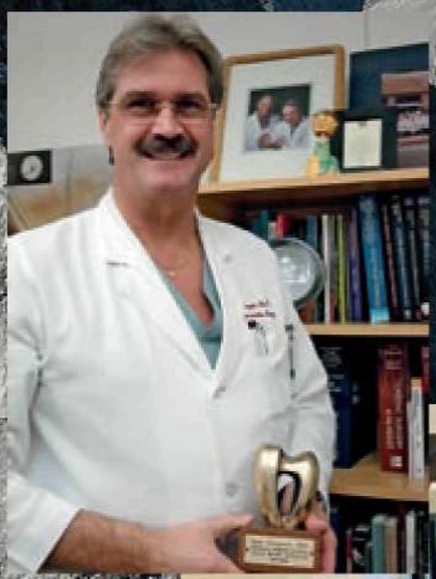
Quark®

Research and Development in Slovenia

ISSN 1318 - 2641 Summer 2008 EUR 18,30



Cover photo:

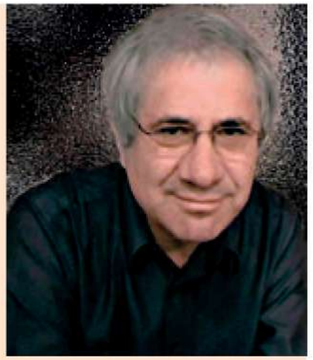
Photo: Matevž Lenarčič
Pge 70
Slovenia's Protected Areas

Photo: Janez Pelko
Page 178
Iskratel: The Secret Is in the Co-operation

Photo: Dragica Bošnjak
Page 28.
Working in the Team of World Legends

Page 172
We Continually Increase Our Investments in R&D

Why promote scientific and development research activity?



Setting out one's development on the basis of knowledge and innovative work does not mean simply more powerful technical devices, more powerful electronics, better cars, more effective medications and easier remote communication, even though we require such benefits. Such an orientation can have a much broader significance and effect on the quality of our lives.

But in our opinion it is worth especially highlighting some of the things that speak in favour of greater investment in developmental, research and scientific endeavours. My selection would be brilliance of the mind. A thought born from knowledge and unleashed through imagination. This was necessary for scientific achievement, and must be pursued in all directions.

Science and R&D activity are one of the major sources of brilliance of the mind.

A range of innovative solutions is necessary before we can ultimately fulfil our desire for a new technical achievement to afford us also a higher quality life.

Nothing benefits a new, more effective medicine, if it is not attainable or if the doctor has given a wrong diagnosis.

Even technical and software solutions that facilitate better communication with our associates at greater distances can only raise our productivity when we ourselves are innovative in our work.

Technological progress can help us make our life in society more diverse and lively, but again we need great inventiveness in resolving ongoing problems before we can say that new technological solutions will afford us a higher quality life.

And once we resolve to base our development on science and innovation, we embark on a road where imaginative responses to new things move forward after each scientific discovery or new technical device, whose greater capacity fires our imagination and our creativity.

Boris Čerin, Editor of Quark

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QUARK d.o.o.

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Quark, Winter 06/07

Cover photo: Matjaž Omrzel

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Language editing:
AMIDAS

Designed:
Quark d.o.o.

Printed by:
PRIMA TISK

Pursuant to the Value Added Tax Act (Official Gazette of the Republic of Slovenia, 89/99), the magazine is classified as a product for which VAT is paid at the rate of 8 per cent.

CONTENTS

R&D in Slovenia

Quark, Summer 2008

- Events

Page (5-38)

New Terminal Radar at Jože Pučnik Airport

Rado Križ

The public company Slovenia Control, Slovenian Air Navigation Services Ltd. provides safe and effective air navigation services in Slovenian airspace. Air navigation services include air traffic management, air traffic control, publications, and collection of relevant information and technical maintenance of communication, surveillance and navigational equipment. Slovenia Control provides control of traffic arriving, departing and en-route in Slovenian airspace from the Area Control Centre in Ljubljana and Aerodrome Control Towers in Brnik, Portorož and Maribor.

Rado Križ, Head of the Surveillance Department Slovenia Control, Slovenian Air Navigation Services, Ltd.

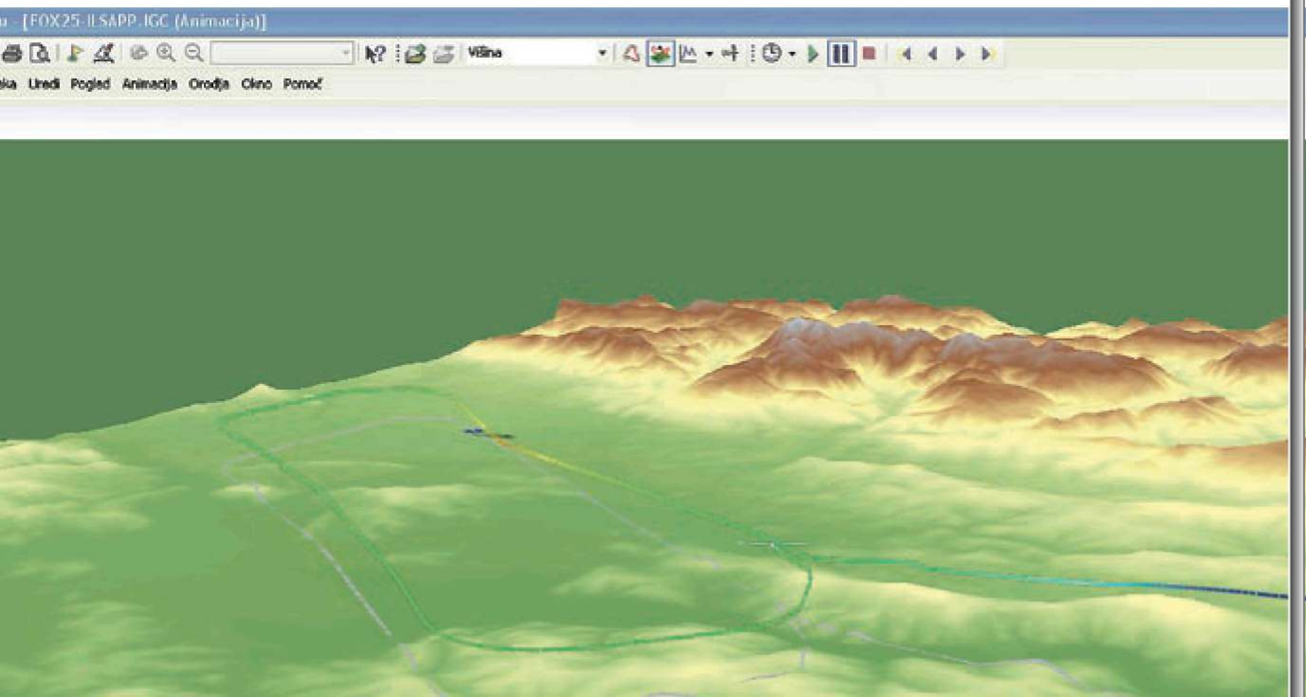
A radome protects two antennae of PSR and MODE-S radar at Jože Pučnik Airport.

To be able to successfully manage increasing number of overflights, and flights originating or arriving at Jože Pučnik Airport, while maintaining a high level of safety, the company must continually introduce new technical solutions, procure new equipment, and educate technical and other operational users. And this is exactly what Slovenia Control does. It is committed to providing the best service possible to pilots and indirectly to every passenger who uses Jože Pučnik Airport, or crosses Slovenian airspace.

Being dedicated to maintaining at least the same level of safety while air traffic increases by roughly 13% per year and is projected to more than double by 2025, Slovenia Control decided to procure a new PSR/MODE-S (Primary Surveillance Radar) terminal radar. The new terminal radar was delivered and installed in November 2007 at Jože Pučnik Airport. The main reason for procuring additional radar was in fulfilling the Eurocontrol requirement to provide duplicate radar coverage for arriving and departing traffic, and also the wish to be among the first to start introducing new, advanced technologies. Duplicated coverage means that radar data is available from two independent sources. In case one of the radar systems fails, air traffic controllers would still be able to issue directions and vectors to the aircraft using data from the other radar.

As far as new technologies are concerned, with this new terminal radar, air traffic controllers have received a whole new range of data to work with. When radar was first introduced during World War II it was able to detect aircraft and only give their 2D position – range and azimuth, and later on it was enhanced with added IFF (Identification Friend or Foe) capability. During the Cold War era, radar technology improved dramatically. As a result of that, by the1970s, radar systems were available that were capable of detecting aircraft and giving their range, azimuth, speed, altitude and IFF/SSR (Identification Friend or Foe/ Secondary Surveillance radar) data.

Radar coverage diagrams



Franc Željko Županic, MSc, director

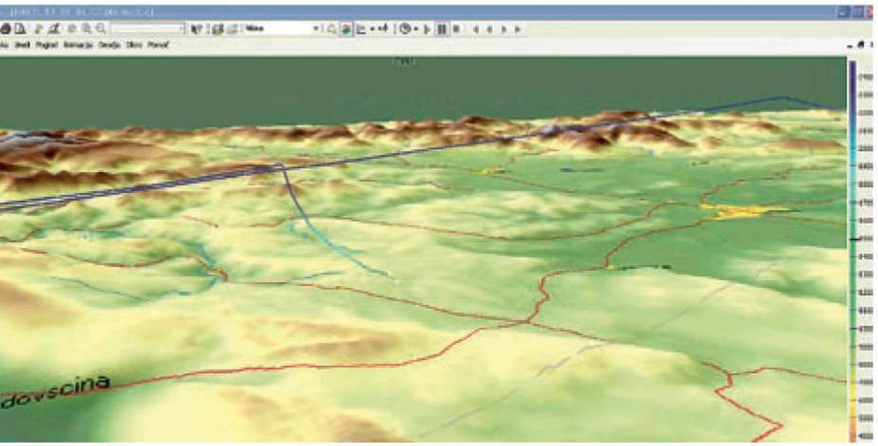
Airline passengers, when flying to or from Slovenia, normally don't know much about what is happening around them in the air or who is taking care of their safety and the smooth operation of their flight. This is taken care of behind the scenes by a highly professional organization that provides air navigation services to all users of Slovene airspace. Slovenia Control provides safe, high-quality and cost-effective services to arriving, departing and transit traffic. This is done from the Area Control Centre in Ljubljana and aerodrome control towers at the airports of Ljubljana, Portorož, Maribor and Cerklje ob Krki.

With expected annual traffic growth of over 15%, maintaining and improving the required performance is not an easy task. This can be achieved only through highly skilled and motivated personnel, and with continuous upgrades and modernization of technical equipment.

We are also highly involved in the implementation of Single European Sky regulations, which should enable further major improvements in safety, efficiency and capacity of air traffic by 2020. Technology is very important and this is why we are also participating in SESAR – the European air traffic control infrastructure modernisation programme. SESAR aims to develop the new generation of air traffic management system capable of ensuring the safety and capacity of air transport worldwide over the next 30 years.

One of the most important fields of air navigation technologies is surveillance. We are proud to introduce the most comprehensive surveillance technology, MODE-S radar, implemented recently at Jože Pučnik - Ljubljana Airport. This will make it possible for our air traffic controllers to get more detailed and reliable information about air traffic over Slovenia and will put us firmly on track towards the Single European Sky.

MSc Franc Željko Županic, Director:



Since the 1980s, radar systems have improved in accuracy and reliability, yet have still been limited to the same amount of derived data as their predecessors. A significant breakthrough came with the introduction of MODE-S radar systems. MODE-S stands for Mode Selective, and brings us selective interrogation capability. This means that we can now selectively interrogate each properly equipped aircraft and download a pre-set number of aircraft transponder parameters. These parameters can be:

- Selected Altitude – the altitude that pilots set as their level-off altitude
- ROC/ROD – rate of climb/rate of descend in feet per minute tells us how fast aircraft is climbing or descending
- TAS, IAS, Mach number – True air speed, Indicated air speed, Mach number
- Next waypoint– sends the next three waypoints selected in the aircraft's flight management system
- TCAS RA – traffic collision and avoidance system/resolution advisory will send an alert to air traffic controllers that a TCAS warning has been issued to the aircraft crew
- ModeS address – unique ICAO number
- Flight ID – call sign or registration number
- Flight status – on ground/airborne, tells us if the aircraft is flying or is on the ground
- PSR – primary surveillance radar provides position of non-co-operative targets (aircraft which do not have a transponder, or have switched transponder off) and provides weather pictures which can be used to warn pilots of heavy storms in their flight path

... and much more.

All this data is now available at the output of our new terminal radar. The radar was produced in France by Thales Air Systems; training for technical personnel was also conducted in the Thales factory in Rouen, France. All of this new technology requires a well-trained and capable technical crew which is ready to give up free time to be able to follow and adopt all of the challenges that new technology brings.

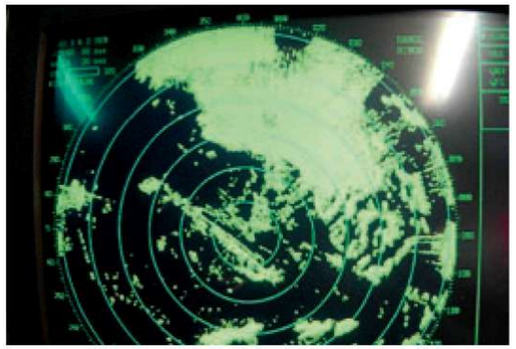
However, all this additional data would mean little if it was not implemented operationally. Therefore, we are planning to use it as part of our new Safety Nets tool and in the new Arats tracker system. The Safety Nets tool has several sub-functionalities:

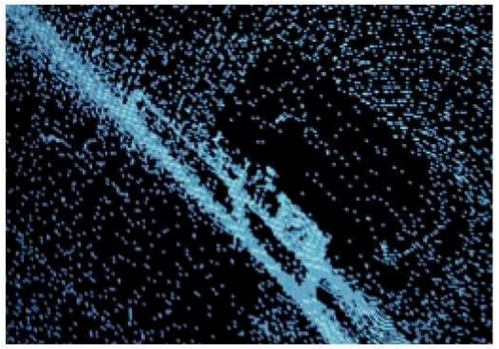
- STCA (Short Term Conflict Alert), which offers similar functionality for the air traffic controller functionality to that offered to pilots by ACAS/TCAS. STCA issues an alarm if there is the possibility of loss of separation, and therefore indirectly prevent two aircraft coming too close together.
- MSAW (Minimum Safe Altitude Warning), which issues an alarm if an aircraft is too close to terrain.
- APM (Area Proximity Monitoring) sets off an alarm if an aircraft is about to unintentionally enter a prohibited zone, for example, a military exercise zone.

All these extra features in air traffic control are not directly visible to the passengers and yet are there to aid them to travel more safely and quickly. Being part of the air transportation community, Slovenia Control is ever more committed to be a leader in implementing new technologies that are now available on the market. Among these developments are a new analytical tool for radar data quality assessment, the automatic dependent system (ADS-B) and multilateration system, which are all to be used in the future to additionally enhance safety at Slovenia's main airport.

Matej Eljon, MSc, head of CNS/ATM

With deployment of the new MODE-S radar at Jože Pučnik Airport we reached a new milestone in radar surveillance technology, bringing higher-quality tracking on air traffic controller displays. Mode S technology also helps overcome the radio frequency congestion problems experienced with conventional radars in high-density airspace. It reduces the risk of confusion or misidentification due to overlapping signals and can therefore support substantially higher air traffic levels.





Displays of the new PSR radar.

60th Anniversary of the National Institute of Chemistry

Peter Venturini

The National Institute of Chemistry (NIC) has been, from its very beginnings under the leadership of Professor Maks Samec until today, true to its mission and fundamental values, which are: high-level science and cooperation with industry, to which high-quality education is ever more strongly linked. In the 60 years since its establishment, the NIC has developed into a modern, well-equipped research institution, which is a part of global research efforts, with the aim of aiding economic advancement and enhancing the quality of life in Slovenia.

Dr Peter Venturini, Assist. Prof.

Now, let us focus on the implementation of the fundamental strategic goals of the NIC within the past 10 years.

NIC has consistently raised the level of understanding and science in the fields of:

- biotechnology and the chemistry of drugs (as well as food),
- materials and engineering,
- environmental protection and analytical chemistry, as well as
- structural and computational chemistry.

The ever higher quality of the research of those working at the NIC is shown by the increase in publications in better scientific journals; it is also evidenced by the higher impact factors of the journals where our scientific articles are published. International cooperation is very important in order to carry out high-quality research work and for our successful competition for European and other international research projects. To this end, our traditional openness in the international sphere and the professional work of our researchers while visiting prestigious institutions abroad, where they are always welcome, has helped us.

Photographs: Matjaž Omerzel and Milan Simčič

Prof. Janez Plavec was among the first to be congratulated by Prime Minister Janez Janša

For research to be comparable with the best in the world, there cannot be simply enthusiastic scientists, but there must also be appropriate research equipment and working conditions. Within the past few years, we have put a lot of energy into investment. Among other things, we have made the largest investment into an individual piece of research equipment in Slovenia in the form of an 800 MHz NMR spectrometer, which, together with other instruments in our European Center of Excellence, represents an important part of Europe's research infrastructure. There is an ever greater interest from abroad in undertaking research work at the NIC, which is a good sign that we are heading in the right direction. A comparative study of European research institutes from 2002 showed the NIC to be quite competitive with the best in the world, as we managed, despite more modest financial resources, to outdo other European institutions on many criteria.

One of the constants which has been with our institute from its foundation is the strong cooperation with industry. The NIC has consistently cooperated in a large-scale and successful way with companies. This cooperation has demanded a great deal of organization in our work and business matters, but at the same time has allowed us to obtain additional knowledge and financial resources, with which we have been able to buy research equipment for the long-term development

The Grand Pregl Award of the National Institute of Chemistry for Research Work was awarded to Member of the Slovenian Academy of Sciences Professor Dušan Hadži for his outstanding work in various fields of research.

Photographs: Matjaž Omerzel and Milan Simčič

The Pregl Award of the National Institute of Chemistry for outstanding achievements was received by Professor Janez Plavec, for his important scientific achievements in the research of nucleic acid building blocks using magnetic resonance.

The Pregl Award of the National Institute of Chemistry for outstanding doctoral work in the field of chemistry and related sciences was awarded to Dr Primož Šket.

of the institute. We have also created a number of long-term partnerships with companies in Slovenia, which are based on a high-level of interpersonal trust and have been strengthened through exchanges of experts.

Therefore, the NIC is very pleased with the exceptionally successful development of our economic partners, many of whom are among the largest and most successful in Slovenia, even among those who do business globally and must therefore face tough global competition. We are aware that we can successfully cooperate and also contribute to their success in the future only if our own knowledge is globally competitive. Average knowledge or science is simply not good enough! The NIC is working more and more with foreign companies. We are also gaining business experience through the co-establishment of a company in the Netherlands in the field of chemometrics, together with other high-level research institutions. An illustration of our innovativeness has been the breakthrough invention of our institute in the field of nutritional supplements in cooperation with industrial partners.

An excellent level of knowledge strengthened by appropriate working conditions and a modern research infrastructure are not the only necessary conditions for successful cooperation with industry and for achieving excellent science in an international framework; another necessary condition needed is high-quality education. The NIC successfully participates in the education process. Within the past ten years, research work at the NIC towards a PhD was completed by 74 researchers, towards a Master's degree by 42 researchers, and towards a B.S. degree by 323 students. At the moment, 65 doctoral students are undertaking research work at the institute and approximately one-third (out of 96) of our PhD's are affiliated with a university. Our successful association with education is also shown by the amazing win by a Slovenian group at an international competition of students from the world's best universities in the field of synthetic biology last year.

The prestigious Pregl Awards were awarded for the first time on the occasion of the 60th anniversary of the National Institute of Chemistry (Grand Hotel Union, Ljubljana, 29 May

With all we have achieved it is no surprise that we are in the process of establishing an institute of higher education: the Research School of the National Institute of Chemistry. We are convinced that in a strategic partnership with other organizations of higher education we can contribute to the global competitiveness of Slovenian higher education and, indirectly, to the competitiveness of the Slovenian economy as a whole.

In order to successfully compete on a global level in the future we are going to have to bring together all of our knowledge and capabilities not only within the institute but also within Slovenia itself. The interdisciplinary nature of the NIC will be a great advantage in this regard. Researchers who work at the institute come from the fields of chemistry, physics, biology, pharmacy, medicine, and mathematics. I am convinced that closer work between individuals and smaller groups from different fields of research will also contribute to successful collaboration in highly competitive research projects. Such international projects, where many research groups from the NIC are already participating, are currently up and running, for example, the previously mentioned NMR Center, a fuel cell project and a project concerning nanobiopharmaceuticals.

The National Institute of Chemistry has travelled a remarkably successful road over the past 60 years. Those who have worked at the institute have contributed to this success through their own creative work. Thank you all for your contribution to the development of the institute. I am personally very pleased to have been able to work with you and to contribute my own talents to the development of the institute.

Many successful projects have not been carried out by us alone, but together with partners from the academic sphere and the economy. Therefore, I would finally like to thank all of our partners for their successful partnerships with the hope that these will only be strengthened in the future.

Shaping the Future Networked Society

The Future Internet Conference: perspectives emerging from research and development in Europe

Borka Jerman Blažič

We are heading inevitably towards the networked society. It is important that different actors, including citizens, participate in making its achievement successful and desirable. The European Union has identified this opportunity and has already committed hundreds of millions of research and development (R&D) funding through different instruments to enable the development of the future Internet. Among the new projects funded by the EU is EIFFEL (Evolved Future Internet for European Leadership), which aims to facilitate a high-level think tank and encourage a collaborative R&D approach amongst European stakeholders from industry, public institutions, and academia towards the future networked society. The Slovenian partner of EIFFEL, the Laboratory for Open Systems and Networks of the Jožef Stefan Institute, organised the Future Internet Conference in Bled, 31 March to 2 April.

Today's Internet was never designed to be a critical part of the worldwide economic infrastructure and an integral part of our society, but it has become exactly that. The future Internet must not be seen as a mere technical entity, but as an enabler of the future networked society. This leads to the logical conclusion that new research initiatives and approaches are needed to cover all aspects and that more interdisciplinary research is required in this domain.

It is of key importance in Europe to achieve a balanced research agenda towards the future networked society. There is a clear need to further support evolutionary, applied engineering research, based on present industry projections towards the future. But this will not be enough to ensure that Europe grasps the great opportunities offered by the future Internet. The evolutionary path has to be comple-

mented by a portfolio of radical exploratory research activities that will push beyond the limits of existing ideas, architectures and technologies. This leading edge work was the focus of the conference and the technical meeting of 65 projects from the area that were selected in the first call for the EU Seventh Framework Programme (FP7). The 350 experts who attended discussed the following areas:

- networking (wireless, fibre, the Internet network);
- software and services (SOAs, the Internet of services);
- content creation and distribution (the 3D Internet);
- enterprise (the Internet of objects).

With the aim of searching out the potential sources of talent within Europe for its leadership, other issues that were discussed during the conference were:

- international co-operation and issues (EU strategy, policy);
- relationships with programmes in China, Japan, Korea, Latin America, the USA;
- standardisation (where, why, what ...) requirements;
- network architecture, wireless, service, test beds, policy;
- the common research agenda.

At the end of the first day of the programme, the European Assembly on Future Internet R&D projects was set as a vehicle that permits open interaction and cross-fertilisation. It also enables sharing of information presented in project workshops and conferences, to minimise duplication and prevent fragmentation. The Assembly adopted the "Bled Declaration" which was signed by participants in 65 FP7 projects. The declaration defines the European route to development of the future Internet and requests that the EU Member States strengthen and co-ordinate their national R&D efforts and initiatives towards the future Internet. The European Commission is asked to stress the vision and amplify the related R&D in order to drive Europe ahead of tomorrow's Internet transformations in the way we work, live and interact. Both the Member States and the European Commission are called on to support the creation and activities of the European Future Internet Assembly established at the Bled conference.

Joao da Silva, European Commission: "I have rarely seen a conference so well organised, to the extent that no one noticed that there was an organisation."

John Domingue, Open University, Netherlands: "These were the three best days of my life."

The role of EIFFEL within these activities is to ensure that there is enough interaction between the community undertaking exploratory, fundamental research and those involved in more engineering-based approaches, including the possibility that interdisciplinary approaches are considered and debated outside of the limits of narrow technical projects. The EIFFEL project, through the Bled Future Internet Conference and other meetings, is establishing a pan-European discussion platform and an international technical think tank leading discussions on the future of the Internet, particularly on network architecture and governance issues. Although EIFFEL accesses European expertise, it is uniquely an international, peer-recognition-based think tank, which is embracing experts from around the world. Technical experts explore and debate areas relevant to the shaping of the future networked society, study the fundamental challenges of improving Internet architecture and related technologies, and develop a vision for the future networked society. Cross-fertilisation of scientific investigations targeted at deployable Internet design principles will catalyse, through debates, the adoption of white papers and common roadmaps. This approach and the results from the R&D work of the projects that have signed the Bled Declaration will lead to the transformation of the current Internet towards the future networked society.

There are many questions on how the Internet will develop in the future. What has been clearly identified is that the Internet must progress and that the rate of progress must be revolutionary. Once we determine what kinds of transformations are required, we may start working on how to migrate from today's Internet to the predicted future Internet, or the future networked society.

As a major part of European efforts, the Future Internet conference, the Bled Declaration and the EIFFEL project will build the vision of the future networked society in the 2025 timeframe, as well as an outline of the technical areas of importance for realising it. The Future Internet Assembly is building bridges across disciplines and between different communities to establish the European voice in exploratory research in this field, eventually aiming at constituting the European arm of any international activity. With this milestone, the conference, the assembly and the Bled Declaration, Europe has the opportunity to make a major contribution towards the future Internet and set the stage for the future networked society.

Minister Dr Žiga Turk is addressing the conference.

Prof. Dr Borka Jerman Blažič

Further information is available on the conference: www.fi-bled.eu, the portal: www.future-internet.eu and the EIFFEL project website at www.fp7-eiffel.eu

Optical access networks

The 20th VITEL Workshop

– an important milestone in organising workshops within the framework of VITEL

Marko Jagodič

Dr Marko Jagodič

Apart from organising an international symposium on a selected key subject every second year, the Electrotechnical Association of Slovenia organises, within the framework of VITEL, one or two workshops each year on the most relevant topic for Slovenia at the time. The workshops involve experts from Slovenia as well as from other countries in Europe and around the world. The workshops are always well attended. On 5 and 6 November 2007, the 20th workshop was held at our favourite location, Brdo, near Kranj. This important milestone undoubtedly motivated all engaged to continue to organise these kinds of events with even more commitment.

This workshop was organised by:
- the Electrotechnical Association of Slovenia, EZS;
- the Slovenian Communication Society, SIKOM;
- the IEEE Communications Society Chapter of Slovenia;
- the Faculty of Electrical Engineering, University of Ljubljana;
- the Faculty of Electrical Engineering and Computer Science, University of Maribor.

The topic chosen for the 20th workshop was optical access networks and optical access technologies. This area is extremely important now, and will be even more important in the future. General interest in optical access is increasing and gaining new momentum on a global scale. Therefore it was the right moment to address the essentials of these technologies and to discuss them in detail with experts from Slovenia and from abroad. We ought to be fully aware now of the short and long-term influence of optical access networks on the economy as a whole.

Optical access networks are in bits/second by far the most powerful transmission media. Nevertheless, this is not a sufficient argument to decide for optical communications in each and every case. Besides technical arguments, there are also economic, environmental, regulatory and others, all of which influence the decision. The decision taken has to ensure the largest possible positive effect in the given situation. The breadth, the challenging requirements, relevance of the matter and its association with many other areas, requires a comprehensive approach taking into account many different perspectives; this was exactly the intention of the 20th VITEL Workshop on Telecommunications.

The following topics were discussed:
- the situation around the world;
- the situation in the developed countries of Europe;
- the situation in Slovenia;
- available technologies and standards;
- network architectures;
- forecasting possible development trends.

Different available solutions for optical access were also examined in detail, such as:
- passive and active optical access networks: PON, AON;
- different configurations of optical and hybrid optical – wireline networks: FTTx, PtP, PtMP;
- different standards: APON, BPON, GPON, EPON, GEPON, WDM PON;
- optical access networks compared to wireline and wireless access networks.

Europe as a whole and Slovenia within Europe are lagging behind the Far East and North America in fast introduction of optical access. Therefore, in June 007, the FTTH Council Europe challenged its interested parties to increase by 10 times the present number of optical accesses in the next 3 to 5 years, from today's 820,000 to 8 million at the end of 2012.

In addition to experts from Slovenia, the workshop hosted some prominent and influential specialists from other European countries including Joeri Van Bogaert (FTTH Council Europe), Darren Shea (University College London, United Kingdom), Željko Popović (Ericsson Nikola Tesla d.d., Croatia), Thomas Kallstenius (Alcatel-Lucent, Belgium), Dave Stockton (Emtelle UK Ltd., United Kingdom), Jiri Štefl (OPTOCON Co. Ltd., Czech Republic), Jan Dannesfeldt (Dannesfeldt Group, Denmark), Russell Woolsey (Sumitomo Electric Europe Ltd.) and Stephan Brüggen (TRANSMODE Systems AB, Sweden).

The workshop completely fulfilled the expectations of the organisers. It attracted more than 150 professionals, most of them from Slovenia, including network operators, service providers, equipment manufacturers, research and development institutions, regulators, and, last but not least, users.

Darren Shea, British Telecom

Blaž Peternel, Mobitel

Joško Budin and Boštjan Batagelj, discussion moderators, FE, University of Ljubljana

Katja Mohar Bastar, Slovenian Agency for Post and Electronic Communications

Bled Forum on Europe

Tina Vuga

Bled Forum on Europe is an influential international think-tank (knowledge-sharing platform) which advocates knowledge-based governance and the use of futures studies and foresight in the decision-making process. Bled Forum on Europe is supported by the European Commission, governmental institutions, the scientific community, the business sector and NGOs. Bled Forum on Europe is registered as a research association according to Slovenian law on associations (NGOs). The main issues for Bled Forum on Europe are global challenges of today that will influence our future. The whole "international knowledge-sharing platform" is structured as a network of people, stakeholders, forward-looking ideas and projects.

At the IX Bled Forum, we discussed these issues with Director of CeGD (Centre for eGovernance Development for South East Europe) Blaž Golob, president of Bled Forum on Europe.

The theme of this year's Bled Forum on Europe – Foresight and Policy-making in Relation to Climate Change – is currently at the very forefront of the challenges posed to global policy-makers. In what way does Bled Forum initiative identify and decide upon the subject of the annual conference?

The agenda-setting process is of great importance for the success of the key Bled Forum project, namely the annual Foresight Conference. The starting point of the agenda-setting process is definition of a relevant theme that is in line with our vision and mission statements. The objectives, the title of the conference and the first composition of sessions are decided one year in advance by the Futures Committee of Bled Forum. The Futures Committee is composed of international and Slovenian experts on foresight, science and policy-making. During the following year, key stakeholders, relevant projects and scientific authorities are identified. The relevant policies and strategies of the conference theme are also analysed, and this leads on to the final construction of the agenda of the conference. The whole agenda-setting process involves creative teamwork and, in my opinion, brings real added value to the final drafting of the agenda, topics selected and speakers invited. In 2007, the climate change theme was identified as the relevant topic for the 2008 Foresight Conference.

Bled Forum on Europe operates as a think tank. What is in your opinion the key instrument of Bled Forum on Europe for influencing the policy-making process?

There are two crucial instruments for influencing the policy-making arena. First is the involvement of relevant stakeholders in the agenda-setting process and at the conference in the final stage. Stakeholders identified are those that can bring not only awareness but also different perspectives to the various scenarios (the different scenarios for the selected themes are produced by the use of foresight). Second is the composition of the final document, which has the status of a declaration, as in the case of the 2006 statement on Knowledge-based Governance and Foresight. The other good example was an appeal for the foundation of a new international institution, in 1998. The final document of the 1998 forum debate called for strengthening the common position of the European Union, at that time fifteen member states, to achieve a common position at the UN Diplomatic Conference in Rome where a new institution to combat global challenges was founded, namely the International Criminal Court (ICC). It would be naive to think that the ICC was founded solely because of the Bled Forum appeal; nevertheless, the effect on the partners involved was of great importance. At that time, the message from the region to the UK Presidency of the European Union was an example of an innovative approach for the support of the foundation of a new international institution.

Foresight is more and more perceived as a valuable policy instrument complementing more classical steering approaches. What is in your opinion the key added value of foresight methodology?

The key added value of foresight and futures studies in general is the process, in which relevant stake-holders, such as the research community, policy-makers, civil society and the private sector, define the long-term priorities, trends or scenarios. This process means that the channels of communication for various partners are opened and this leads to the exchange of prospective future-oriented thinking and a consensus-building definition of priorities. Those long-term priorities can steer concrete short-term actions

SOL OMNIBUS LUCET

BLED FORUM

VISION

"SOL OMNIBUS LUCET"

TO EFFECTIVELY INFLUENCE THE DECISION-MAKING PROCESS AT EU AND GOVERNMENTAL, PRIVATE SECTOR AND CIVIL SOCIETY LEVEL TO BRING ABOUT "PUBLIC VIRTUE";

PUBLIC VIRTUE DEFINED as EU VALUES & UN VALUES such as HUMAN RIGHTS, THE RULE OF LAW, ENVIRONMENTAL PROTECTION and VALUES DERIVED from MILLENNIUM PROJECT CHALLENGES.

MISSION

Bled Forum is an international think tank. Bled Forum practises and promotes futures studies and foresight with the aim of influencing the decision-making process.

GOALS

To promote knowledge-based governance with ethical considerations, and the use of futures studies and foresight.

To connect researchers, scientists, business people, policy makers and civil society with the aim of responding to global challenges.

To influence the above-mentioned stakeholders to implement Bled Forum recommendations in long-term planning and short-term action.

There are five projects currently running at Bled Forum on Europe:

1. **The annual Foresight Conference in Bled. The IX Bled Forum on Europe (for 2008) has already been held.**
2. **Bled Forum Institute (knowledge-sharing platform).**
3. **South Eastern Europe foresight meeting point.**
4. **Node of the Millennium Project, which publishes the annual State of the Future report and, through the Mexican node, organises the Global Millennium Prize competition.**
5. **Node of the UN Global Compact Slovenia, which brings business partners and their perspectives into futures studies and foresight.**

THE CHALLENGE OF BEING A NODE OF THE MILLENNIUM PROJECT

The Millennium Project of WFUNA is a global participatory futures research think tank of futures practitioners, scholars, business planners, and policy-makers who work for international organisations, governments, corporations, NGOs and universities. The Millennium Project manages a coherent and cumulative process that collects and assesses judgements from its several hundred participants to produce the annual State of the Future and Futures Research Methodology series, and special studies such as the State of the Future Index, studies on future scenarios for Africa, lessons from history, environmental security, applications of futures research to policy, and a bibliography of 700+ annotated scenarios.

It connects local and global perspectives via regional nodes (groups of individuals and institutions) in Baku (Azerbaijan), Beijing (China), Berlin/Essen (Germany), Brussels (Belgium), Buenos Aires (Argentina), Cairo (Egypt), Caracas (Venezuela), Dubai (United Arab Emirates), Helsinki (Finland), Istanbul (Turkey), Kuwait (Gulf region), Lima (Peru), Ljubljana/Bled Forum on Europe (Slovenia), London (UK), Madurai and New Delhi (India), Melbourne (Australia), Mexico City (Mexico), Moscow (Russia), Ottawa/Montreal (Canada), Paris (France), Prague/Bratislava (Central and Eastern Europe), Pretoria and Johannesburg (South Africa), Rome (Italy), Santiago (Chile), Sao Paulo (Brazil), Seoul (South Korea), Silicon Valley (US), Tehran (Iran), Tel Aviv (Israel), Tokyo (Japan) and Cyberspace (Hawaii).
The Millennium Project was selected among the "100 Best Practices" by UN Habitat, the best seven foresight organisations by Battelle Northwest for the US Department of Energy, and among the "Top Picks" of the Future Survey of the World Future Society.

The purpose of the Millennium Project is to be an international utility to assist in organising futures research by continuously updating and improving humanity's thinking about the future, and making that thinking available for feedback as a geographically and institutionally dispersed think tank.

The Bled Forum award in 2008 was delivered to Jerome C. Glenn Director of the WFUNA Millennium project.

Glenn: "It is too late to say later!"

of the stakeholders involved.
The outcomes of foresights could be used as a valuable input for various strategies and policies of the stakeholders involved. Many successful countries in the top 10 according to the Human Development Index, regions, cities, NGOs and corporations use this method to define long-term priorities.
Every year during the Bled Forum Foresight Conference, we present various successful cases of foresight. In this respect we co-operate with the EU-funded project, the European Foresight Monitoring Network. The European Commission and the EU have also recognised foresight as a useful tool for a long-term planning and priorities setting. This fact was recognised by the huge financial support from the European Union to foresight studies in the EU Seventh Framework Programme, from 2007 until 2013.

Director of CeGD (Centre for eGovernance Development for South East Europe) Blaž Golob, president of Bled Forum on Europe.

Bled Forum on Europe became a UN Millennium Project node in July 2007. What does the privilege of becoming one of the 27 nodes worldwide bring to Bled Forum on Europe?

The fact that Bled Forum has become a Millennium Project node means a new challenge and responsibility. The new challenge means that we are involved in the daily business of a leading global think tank, which brings us new up-to-date ideas about the possible responses to global challenges. The real value of being a node is a connection to people, institutions, ideas with key findings and recommendations of the forum. These findings are addressed to the media, key politicians, economic and other relevant actors at all levels.

Nadya Zhexembayeva, Vice President, UN Global Compact Slovenia: "The annual conference of the Bled Forum on Europe each year focuses on a distinctive topic, which is debated from different angles by participants with different professional backgrounds. The key topic is selected in a structured process of several months in which different groups of relevant actors are consulted, with a final decision made by the programme committee of the conference (a section of the Futures Committee, with additional invited experts). The aim of this wide consultation is to ensure the social relevance and importance of the topic, so that the intellectual potential and capacity of the conference can have a significant social influence. To achieve visibility and influence, it is important to involve adequate stakeholders from different levels. Therefore, at the end of the each annual conference, a statement of conclusions or a declaration is prepared

Important topics which have been addressed in past events include:

- An appeal for the establishment of the International Criminal Court;
- The European quality of life area;
- Towards a global research area;
- A forward look for Europe;
- The future of legal education in Europe;
- The Bled Forum declaration on knowledge-based governance;
- Foresight and climate change.

Think papers are available at the webpage: www.bled-forum.org

In 2008, the Bled Forum on Europe addressed one of the most important challenges of the forthcoming decades – climate change. The question is how can this topic be addressed through the business, policy-making and research agendas on different levels. The conclusions and the resulting Bled Forum Declaration on Foresight.

Jana Kolar, Chair of the session on climate change and its regional impact on South Eastern Europe: "Climate change will have far-reaching effects on the people and economy of South Eastern Europe, which will lead to long-term impacts on society and the environment."

Dr Franci Demšar, Director, Slovenian Research Agency: "Thus, it is extremely important that the facts and the science get a fair hearing. Without that balanced outlook, the global warming debate is motivated by fear, rather than science. We are all aware of the fact that climate change requires an immediate and effective response from all actors. But such a response should be based on scientific evidence alone and should supply a clear vision of the possible alternatives to this situation."

Lučka Kajfež-Bogataj, Slovenian member of the IPCC, Nobel Peace Prize winners in 2007, in conversation with Tanja Cegnar from the Environmental Agency of the Republic of Slovenia.

Kajfež-Bogataj: "It is necessary to talk about topics which are currently untouchable. The topic of climate change is inevitably connected with demographic questions and the question of changing our core values. Without that, the debate about climate change will have only limited success."

Vida Ogorelec Wagner, Director of UMANOTERA Foundation for Sustainable Development, and Jerome C. Glenn at the plenary session.

Ogorelec Wagner: "Things can not be changed top-down. It is important to bridge the gap between what science says is necessary and what politics accepts as feasible."

Romana Jordan-Cizelj, Slovenian Member of the European Parliament, in the company of the two main organisers of the IX Bled Forum, Miroslav Polzer, Director, Austrian Science and Liaison Office in Ljubljana, and Blaž Golob.

Jordan-Cizelj: "For fighting climate change, it is important to use a cross-sectoral holistic approach. The fact is that poor and less developed countries will be hit hardest and it is the responsibility of all the others to help them to manage that challenge."

and policy initiatives related to global challenges from all around the world. The other advantage is that the Millennium Project has the best collection of futures studies methodologies and case studies, which could find future use in the operations of the forum.

We have a responsibility to contribute to the research and futures studies that are necessary to bring about the publication of an annual State of the Future report, which analyses 15 global challenges. Each node around the world also has its own specialism. As a policy-making node, Bled Forum's vision is to influence policy-making circles, with an emphasis on the EU policy-making system, through foresight studies. In the area of connecting foresight and policy-making we are practising a new, innovative approach that is recognised by the various actors involved.

The UN Global Compact Initiative Slovenia is an enrichment to Bled Forum on Europe. What is the main purpose of the initiative and in what way does it complement the existing Bled Forum instruments and initiatives?

Members of the organising committee of the Bled Forum as a ++Dream Team++

Today we live in a complex world of global challenges, such as climate change, that impact in every corner in the world. To effectively respond to those challenges, there is a need for co-operation with the private sector. In responding to global challenges, there are also significant business opportunities for the private sector. If everyone gains, then I see this as an opportunity for the creation of a win-win situation.

The principles of the UN Global Compact, which define how business could be socially responsible, are in line with the forum's vision statement. Due to the fact that the basic principle of foresight is to create synergies between similar initiatives where one of the stakeholders is the business sector, it is natural that we co-operate with, or I would rather say that we are a responsible part of, the UN Global Compact Slovenia.

One of the areas of operation of Bled Forum is the regional impact of its activities. Where do you see opportunities for the region of South Eastern Europe?

From the first Bled Forum annual conference, there were always many initiatives established in relation to the region. One of the major influences at the early stage was the creation of the law school on peace in Sarajevo in the summer of 1996. On one side there were the European Union and international foundation initiatives, and on the other side demand from the region. The creative process undertaken by Slovenia, Sarajevo and Brussels at that time was the identification of the curriculum of the school in order to satisfy the expectations of both law students (from three different entities – Banja Luka, Mostar and Sarajevo) and international donors. Deals were successfully brokered and the project delivered more than the planned objectives. The other example of our positioning in the region of South Eastern Europe is that, as a side event of Bled Forum, from 2006 onwards we have organised an annual foresight training seminar for participants from South Eastern Europe. We finance the participation of 25 to 30 participants who are selected from applicants across the region. This process is carried out in co-operation with the European Commission and the Austrian Science Liaison Office in Ljubljana.

What is the topic for the 2009 Bled Forum?

The Futures Committee has decided that the theme for the 10th Bled Forum will be the role of culture as a driving force for the future development of economy, science, international co-operation and European integration. The theme will be subject to evaluation and foresight throughout the European, global and South Eastern Europe dimensions.

History

Presidents of the Republic of Slovenia, namely Mr Milan Kučan, Mr Janez Drnovšek and Mr Danilo Türk, have actively supported debates about the future of Europe at the Bled Forum.

Slovenian President Danilo TÜRK in 1996, as ambassador of Slovenia to the United Nations, with international lawyers during the debate about the future development of law and foundation of the International Criminal Court (ICC).

Bled Forum debates about the future development of Europe started in 1996, when for the first time law students, lawyers, diplomats and policy makers met in Bled under the patronage of the former president of the Republic of Slovenia, Mr Milan Kučan.

Keynote speaker at the Bled Forum in 2006, Mr Janez Drnovšek, former president of the Republic of Slovenia, received the Bled Forum award sundial from its creator, the European artist and researcher Mr Bojan Frantar.

17–18 January 2008 in Ljubljana, Cankarjev dom – Cultural and Congress Centre

The 2nd Slovenian Innovation Forum

The Slovenian Ministry of the Economy and Public Agency for Entrepreneurship and Foreign Investments – JAPTI organised the 2nd Slovenian Innovation Forum to showcase the best innovative ideas, approaches and products on the national scale in 2007. From 175 innovations submitted for evaluation, 40 were selected by the national committee and showcased as an exhibition of top Slovenian achievements called "Innovative Potential of Slovenia!"

The best three in the small/ medium enterprises category were:

1. Gama System d.o.o. with the innovative Gama System E-Archive; contact Mr. Marko Šobota.
2. Izoelektro d.o.o. with composite surge arresters for outdoor fitting with protection against excess voltage.
3. Intera d.o.o. with the Intrix Project – an innovative web tool for managing projects and project teams; contact Ms. Alenka Simonič.

The best three in the large enterprises category were:

1. Domel d.d. with a new compact lightweight high-speed motor for wet and dry applications; contact Mr. Martin Pintar.
2. Acroni, d.o.o. with new stainless austenitic steel stabilised with titanium; contact Mr. Avguštin Novšak.
3. Lama Avtomatizacija d.o.o. with Speed-caster – a machine for combined casting.

In the individual innovators category, the national committee selected the following:

1. Tomaž Rotovnik for a voice-operated telephone.
2. Davorin Kralj for recycling post-construction waste from light concrete and polyurethane chips.
3. Marko Valič for his USWR device using the USWR measuring method.

A chance for self-promotion at the event was offered to the best innovative enterprises, also selected by the national committee.

- Acroni, d.o.o.
- ATech elektronika d.o.o.
- Domel d.d.
- Elaphe d.o.o.
- Gama System d.o.o.
- Intera d.o.o.
- Lama Avtomatizacija d.o.o.
- SAOP d.o.o.
- Špica International d.o.o.
- XLAB d.o.o.

Each innovation was presented at the event by a poster describing the idea and showing an image of the innovation as well as by a 15-minute live presentation on the open stage by the developers. During the presentation, a range of questions was raised by the audience, demonstrating pleasure and curiosity at the new invention on the one hand, and business interests of investors and company representatives on the other. The 2nd Slovenian Innovation Forum also brought about numerous connections between inventors and innovators, and representatives of programmes and policies to support innovation on the national or regional scale. In fact, 150 business meetings were registered in two days, as a consequence of carefully pre-planned matchmaking.

Apart from the exhibition, organised matchmaking and the programme on the open stage, the event also introduced the common thread concept of presenting the innovation process by means of "The Route of an Entrepreneurial Idea" – five stages in the growth of an idea into successful marketing of the innovation. This received wide attention from innovators who welcomed the advisory support of technology networks, parks, clusters, associations and other organisations.

The programme, with 40 parallel events, attended by more than 1500 participants, gained a good response overall from students, innovators, and the public at large, as well as from businessmen and investors, which suggests that the objectives were fully achieved. In short, these were:

- to provide the opportunity for innovators to receive free advice, instruction and material support by bringing together all development actors, governmental and non-governmental;
- to raise the awareness of decision-makers to the potential of innovation and entrepreneurship in the national economy.

The programme of the 2nd Slovenian Innovation Forum also focused on specific events for the young, aiming to motivate them towards invention and creative approaches, and encouraging entrepreneurship in their activities by including them, together with innovators, businessmen and advisers, in round tables, discussions and matchmaking.

At the opening of the 2nd Slovenian Innovation Forum, a catalogue: The Innovative Potential of Slovenia was issued, comprising an overview of the selected innovations for 2007 and several topics on the state of innovation in Slovenia, including a survey of opinion-makers' views on Slovenia as an environment for innovators.

Opinion-makers gave interesting views when comparing the innovation environment in Slovenia to that of the EU: Minister Dr Žiga Turk of the Government Office for Growth noted:

"The share of technologically high-intensive products within total Slovenian exports is hardly grounds for pride as it is not reaching 5% (4.5% in 2006), compared to the three times higher share in EU countries (EU-27: 16.7% in 2006).

The role of Slovenian government agencies and departments is to improve the efficiency of the national innovation system regarding the selection of those spheres of activity where innovative potentials, competition and the synergies among them are at their best."

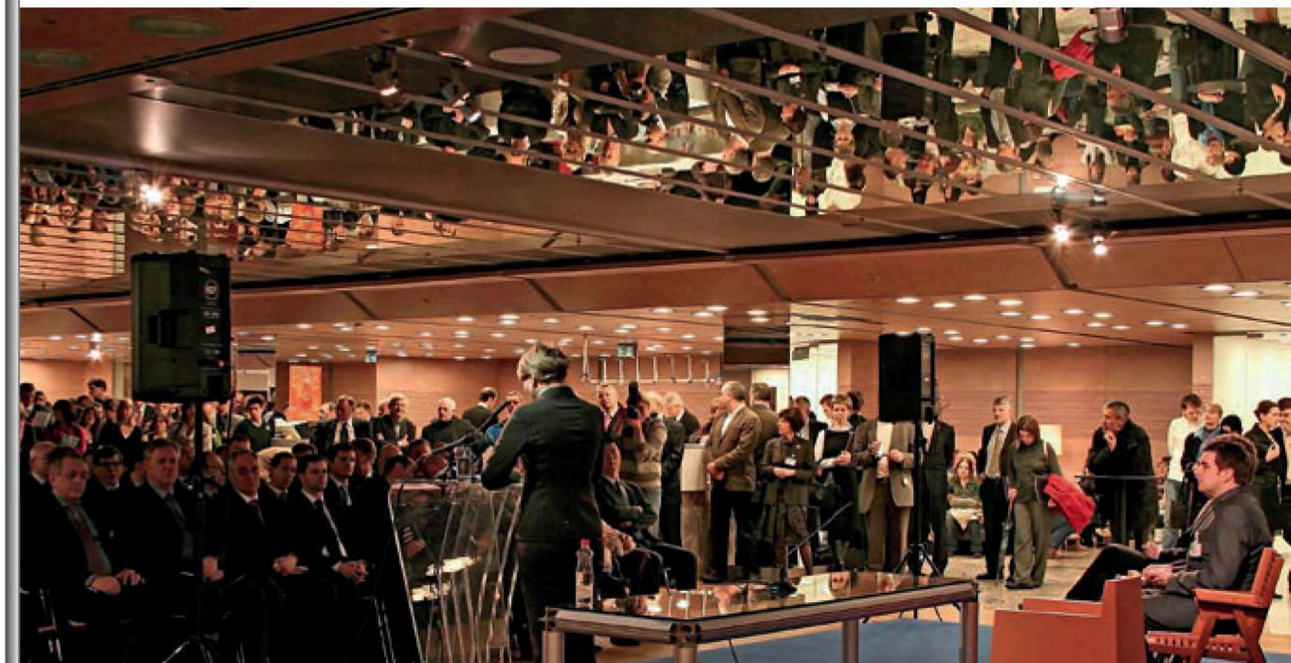
Jean-Noel Durvy, Director for Innovation Policy at the European Commission, only confirmed this statement:

"As frequently noted in Europe, governance issues play a particular role in the case of innovation. Therefore, from the Commission point of view, one of the main innovation policy challenges for Slovenia is also to improve the coordination of the different government departments and agencies responsible for the promotion of research, entrepreneurship and innovation."

However, Andrej Vizjak MSc, Minister of the Economy, reassuringly stated that "the measures in the programme of measures to support entrepreneurship and competition are priority issues focused on innovation policies and practice in the period between 2007 and 2013."

The Forum launched a number of activities which met innovators' expectations. The event was, briefly, focused on selection and presentation of innovations and their inventors, matchmaking, and advice and support. In the future, every effort should be made to prolong these activities throughout the year and to develop a special permanent space (physical and virtual) for matchmaking, for keeping in contact, and for generating interactive events.

From left to right: Mojca Kucler Dolinar, Minister of Higher Education, Science and Technology; Peter Ješovnik, MSc, director of the Public Agency for Entrepreneurship and Foreign Investments (JAPTI); Prof. Dr Matjaž B. Jurič, Faculty of Engineering and Computer Science, University of Maribor, and chairman of the national committee of the Slovenian Innovation Forum; and Matej Rus, MSc, head of programme.



"A Real Miniature City"

Tomaž Švagelj
DELO

Slovenians lack entrepreneurial courage. Although we have very good engineers and scientists, and therefore some excellent high-tech products, we lack the courage to take financial risks.
We prefer business to progress in small steps, but this is not good enough in today's globalised world. Besides, quite often we still function too slowly. The product is here today, but what, we must ask, will be its position on the market in two years time? A young person can, for example, be an excellent physicist but have little idea about business. How then should this person found his or her own business, to create profit and new jobs? In principle it is easy: with some initial capital, only the help of business experts is required.

Two kinds of help

Help is available at one of Slovenia's technology parks. These include Styria Technology Park, Primorski Technology Park, the Technopolis technology city in Celje and Technology Park Ljubljana at Brdo near Ljubljana. We have asked its general manager, Iztok Lesjak, MSc, about everything connected with the Park.
Would-be entrepreneurs can obtain two kinds of assistance in Technology Park Ljubljana. Firstly, they can prove and check their business plan and ideas, and in this way link up with companies which are located anywhere that can be reached in one day's travel (Friuli, Styria and Carinthia, Zagreb, Rijeka, etc.). Technology Park Ljubljana is particularly lucky in that it is located near the largest university in the region. Slovenia's main university, in Ljubljana, has 60,000 students, which is a very large number even by western European standards. They represent two thirds of all Slovenian students.
Last year, Technology Park Ljubljana co-operated with the Ljubljana City Council and partners in preparing the "Capital in support of new business ideas" project. In this framework, a personal mentor acts as consultant for a business group, assisting with their business idea to develop a coherent business plan and set a path for implementation. The mentor either provides external assistance or actually joins the group and becomes an active business member for eight or ten months. During this period, the business group, with the mentor's assistance, devise a strategy for development and then carry it out together. According to Lesjak, this is "something very different from the usual business developer approach." This year, two such experimental groups were formed.

General manager, Iztok Lesjak, MSc

Attracting venture capital

Without money, the initial capital, nothing can happen. That is why at Technology Park Ljubljana, for every individual business idea and at every stage, the possibilities of attracting seed or venture capital are determined: "providing the entrepreneur agrees of course, otherwise we have other sources such as credit lines," Lesjak said. It is convenient that Technology Park Ljubljana has a specialised company for venture investments and this has proved to be very successful. Horizonte Venture Management (HVM), "one of the pioneers in this field in Slovenia," has its premises at Technology Park Ljubljana. Companies which were created in Technology Park Ljubljana's incubator have to date attracted over EUR 7 million of such investments. Most of this investment was by HVM, with a smaller share from other strategic partners. A credit line has also been opened this year by the Slovenian Enterprise Fund.
The former state Technology Development Fund (TRS) in the end "became simply a bad bank" and went bankrupt because there were not enough hi-tech products available at the time.
A real entrepreneur is not just someone who wants to make money, but is a rather special person. Here and elsewhere, for example in Germany, most talented young people start out by working somewhere for two or three years; then they leave because they feel too restricted in the environment of the multinational giants. Often they are unable to fully develop their potential and enjoy their work in these environments. "I believe that being a entrepreneur is in fact a state of mind," said Lesjak.
People like Jernej and Japec Jakopin, Ivo Boscarol and others certainly do not work just for money, but are above all fired by creativity and the wish to bring to fruition the ideas with which their heads are brimming. In any case, they already have so much money that they would not need to work ever again in their lives (and neither would their children). Despite all this, they still enjoy working up to ten hours a day.

An exceptionally difficult task

These are of course examples of success stories, but in general, according to Lesjak, Slovenians have something in their makeup which we must urgently address: we somehow have difficulties in linking up and co-operating.
Among the Technology Park Ljubljana members, co-operation has so far only successfully been set up "horizontally" i.e. in reducing costs: they share a snack bar, archives, fax machine, etc. But it has not yet happened "vertically", which would mean a qualitative jump, or joining up and tackling one of the market segments. The task is exceptionally difficult because everyone prefers to stick to his or her own little patch.
It is different in the West. Their contemporaries in Cambridge, for example, attend networking events with the aim of returning with at least three or four new contacts, while in Slovenia, people at similar events tend to stick together in groups which already know each other. "So we have now introduced circulation, like when you dance the waltz," Lesjak said. According to him, the infrastructure at the park is designed like a veritable miniature city so that people have the opportunity to meet. They have a whole range of everyday public meeting places: a restaurant, cafe, sweet shop, kindergarten, library, stationery shop, gym, doctor, dentist, venues for massage, relaxation, recreation, etc. Programmers from IT companies have even suggested introducing so-called floatation tanks, saying that each hour spent in one is equivalent to between three and four hours of sleep. When deadlines are approaching, they are in the park day and night, so it is important that everything is available in the direct vicinity. This means that recreation can be planned as a business meeting at any time. There will also be interaction and mixing between generations: one section will be devoted to educating those that are a little older.

The same working conditions for all

The main buildings of the new premises of Technology Park Ljubljana established at Brdo are, in the words of the architect, Boštjan Kolenc from Inženiring 4M, relatively simple, as they were not allowed to be too expensive. The emphasis is on "functionality and the continuity of the façade belt, which at every point allows each anonymous user the same working conditions." The way it is set out, the way the façades are divided and the materials used are typical of suburban architecture. All heat loss, even that due to ventilation, is strictly limited according to current Slovenian standards, which are high enough for the careful conservation of energy. The settlement gets its primary energy in all three demanded forms, that is in cooling, heating and electricity. It could therefore be said that the power unit is "triply cogenerative". Which, of course, comes at no small price. According to Lesjak, Technology Park Ljubljana "has a stake of 15% in this consortium; all the rest has been contributed by Petrol and Petrol Energetika from Ravne."
This kind of power unit therefore enables the cooling and heating of premises. In laboratories, this means a four-pipe system so that parts can be cooled in winter and heated in summer. Electrical energy is gained from excess heat and sold to the grid. Of course, in the event of a power cut, there is also the possibility of using this same energy.
There have also been advances in information technology and telecommunications. Analogue telephony has been phased out and users will instead be connected via the Internet, even if not all operators in Slovenia are yet prepared for this. They have designed a modern version of such a central application because they would like to enable those within the Park to choose an operator upon entry, to promote competition.

The main buildings of the new Technology Park Ljubljana at Brdo.

The New President of the Slovenian Academy of Sciences and Arts, Academician Jože Trontelj

Dragica Bošnjak

...noble, calming, dignified ..., Jože ...
Such was one of the first responses in the web portal of the Delo newspaper immediately after the announcement that Academician Jože Trontelj had become president of the Slovenian Academy of Sciences and Arts (SAZU). It will perhaps appear to some the least disrespectful to use as an introduction to the presentation of such an exceptionally distinguished personality precisely this flash of inspiration, worthy of a poet laureate and now almost part of the folk tradition, which for good measure is still casually ringing in our ears. Perhaps also in those of our subject, who is famous for not just providing exceptionally systematic and well argumented substantiation for the things he wants to say. He always employs a nobility of language to provide patient assistance in seeking a path through the labyrinths of lawyers' formulations and in understanding (bio)medical ethics and fundamental ethical principles in everyday life.

Academician Jože Trontelj

Yet when you run through and arrange the impressions of the impenetrable mass of his original work, which has accumulated over the decades on bookshelves or nowadays on computers, as well as what has become stamped in your memory from his public appearances and personal meetings, there seems no need to worry about how such an approach will be understood. It is enough to glance at the current, real-life, vitally important issues of bioethics that are agitating Europeans, and of course also generating discomfort and concern for people elsewhere in the world. According to a survey conducted by the Steering Committee for Bioethics at the Council of Europe, decisions on the end of life are at the very peak of interest (and concern). Immediately following this are genetics and new biotechnology, protection of human embryos conceived outside the womb, and then research ethics, neuroethics and hybrid chimeras, i.e. human-animal crosses.

"If we link this to topics which in the same way signify ethics in biomedical science, in other words with new biotechnology and nanotechnology, it seems that biomedical research is the main bioethical concern in Europe," mused Prof. Trontelj at a recent consultation on the topic of Ethics: the wisdom of cognisance, judgement and good advice. And he admitted that in seeking an answer to the question, can ethics offer sage advice, people are sometimes in a quandary. For if the advice is taken, the person may be frustrated, since it will seem as if he has missed a good opportunity. If the advice is not taken, the good opportunity might turn out for the bad. One thing is clear, of that he is certain.
"It will be easier to live with the first frustration than with the second." With his characteristic restraint, this former pupil of a classical grammar school, whose teachers were able to instil in their pupils a feeling for the beauty of art and what is "right and proper", later a student of medicine and then for a number of years a teacher, a clinician and world-renowned researcher in the field of neurophysiology, takes the view that the word wisdom, which has been accorded to him in broad fields of medicine and law by experts and the general public alike, is "excessive". After all he "gained merely a few impressions of law in countless hours of discussion with excellent lawyers in the Council of Europe Steering Committee and in the Medical Ethics Committee".

Regarding the latter, he frequently recalls with pleasure how important foundations for it were laid down decades ago, indeed among the first in the world, by his predecessors, and today there is a prevalent impression that it "enjoys considerable standing and trust". Of course the committee is occasionally marked by a certain sarcasm at his expense, and as its long-serving president he is accused of being conservative, because he restricts the freedom of researchers.

But where this involves ethics, which in the same sweep as life itself, stretches and interweaves from its earliest beginnings – from a "bundle of cells" – to the period when a person might find himself in the position of an incapable "semi-being", "well you can't make everyone happy", for instance unrestricted research on embryonic stem cells, flirting with or actually accepting euthanasia and so forth...

Thus he must recall countless times the bad examples from the past and the abuse of ethics and unethical practices, which in ethics is called walking the slippery slope. And also explain that only through patient dialogue between different thinking people adhering to the fundamental ethical principles and protecting human dignity is it possible to try to contribute to a safe and agreeable future. And in this role of advocate for development with careful consideration, with a critical distance towards any kind of uncleanness in science, the majority acknowledge that his mild conservatism in this field is in fact appropriate. The majority will also say that he has a calming and civilising effect on those he talks to. People value his advice and recommendations where they involve the support of science in Slovenia, since he is firmly convinced that greater attention should be devoted to it and its achievements should be appreciated, while there should also be better provision of financing and the status of universities.

In response to the question on plans and goals for SAZU under the new leadership, Academician Trontelj has a ready answer: "The Academy is of course just people. But the members," he adds, "are intellectuals worthy of respect, independent scholars, people with great scientific and artistic talent, and also tireless workers who avoid the fluid and often insufficiently transparent daily politics." They regard it as their place and duty to draw attention to the value aspects of certain important issues of our society and its development. These questions include education, management of limited natural resources, protecting the natural and cultural heritage, the culture of the Slovenian language, protection and development of the humanist tradition and current sociological problems.

When the argument of power prevails, there is time only for a statement for history. For the records and archives. Discussion requires tolerance and empathy, and a respect of the other person. Positions come closer if people talk for a sufficiently long time.

He has a calming and civilising effect on those he talks to, and he radiates a balance and critical distance towards the fleeting fashions in science.

It is torture when an ageing person waits with dread to become a surplus burden to himself and others. It is even worse to see a young person who believes he will be successful only if he is sufficiently selfish and unscrupulous. We should also therefore be thinking seriously about social and political goals. Open to the public, drawing attention to values

"In my work as president of SAZU I intend to continue the excellent tradition of my predecessors. I also wish to continue developing the trend of change, especially towards the Academy opening up increasingly to the public.
I am thinking of our views regarding events in public and in the country, from those in science to those in the economy or administration of the

Academician Jože Trontelj

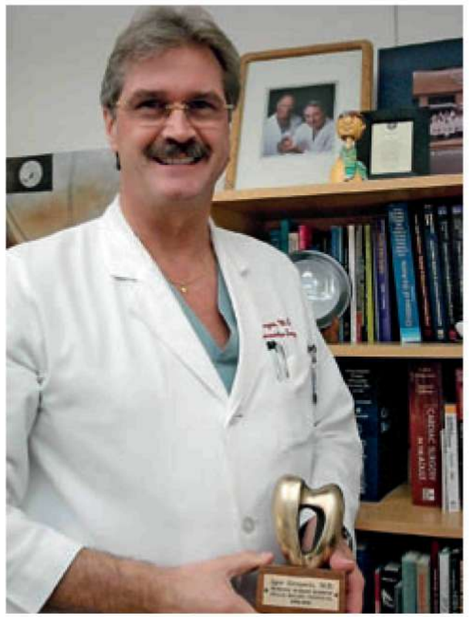
natural wealth, natural and human resources and the cultural heritage. SAZU should draw attention to values, especially when we believe that they are being held down in favour of capital, the interests of individuals or merely insufficient awareness and negligence," said Academician Jože Trontelj upon his election as president. He added that SAZU is in fact already doing this, and here he recalled the negative stance of the Academy regarding the construction of wind farms in an area of high environmental value, the view of two classes regarding the megacasino project in the Gorica area, which would have bad consequences for numerous individuals, on the senseless rejection of immunisations, and on the poor organisation of the medical sector. "Right in front of us there is a debate on the Triglav National Park Act and on the protection of the Ljubljana architectural heritage. SAZU does not wish to force its views, but it intends as far as it is able to respond to requests for an opinion, and we will of course also formulate opinions on our own initiative," added the new president of SAZU, Jože Trontelj.

Texas Medical Center and Texas Heart Institute

Working in the Team of World Legends

By Dragica Bošnjak DELO

His mother – like all caring parents who closely observe the first serious independent steps of their teenagers, especially when they are unusually bold – anxiously shook her head, as if to say, of course, "whoever flies high falls low…" No, came the determined rejoinder: "Whoever flies high, sees far!" And this is how today, after more than two decades living and working in the centre of the five million-strong city of Houston, which is famous for the Texas Medical Center and especially its institute for the heart, the M.D. Anderson Cancer Center, well known universities and numerous other medical institutions, and a stone's throw from the NASA space centre, our acclaimed countryman Prof. Dr. Igor D. Gregorič MD, vividly recalls the ambition he uttered aloud early on: He would go to America and become a heart surgeon!



Dr Igor D. Gregorič MD

This story, even told after a workday of more than 12 hours – which is no rarity, when for instance an artificial pump in a patient is replaced by a donated heart – is accompanied by the characteristic grin, which in the daily routine no doubt serves to disarm, calm and compel. Day has long since fused into night, and the small group of Slovenian medical interns, who are numerous enough at this time to be able to form pretty much their own cardiology intensive care unit, have already trickled in. They are intimately familiar with the rhythm of work in the wards and operating theatres, since they themselves have only just got out of their working clothes. The younger ones, students or doctors at the beginning of their internship with relatively modest experience, "crane their necks" even closer to the distinguished grey-haired surgeon, bent over an open chest cavity, and some get to "hold the clamps", while others, especially the intern "veterans" such as "Petra from Sobota", who is now in Houston for the tenth time, even get to "do incisions", create an anastomosis, sew stitches and so forth.

In the very late evening, when Prof. Gregorič can finally join his current, who knows which, group of Slovenian protégés – in a decade a large number have come here and it is hard to count them – they already know that the operation is finished. They quickly check up on how things went with some higher-risk detail, then they devote themselves to "current news" on the home front; a day earlier, one younger colleague had arrived for a brief spell around the hospital labyrinths of the famous St. Luke's Episcopal Hospital in the very heart of the unimaginably gigantic medical complex, while the American internship of another will soon be up and he will have to start packing his bags.

Working in the Team of World Legends

... Just as Dr. Gregorič himself had to pack his bags in that distant May of 1984, when he left his native Primorska to cross the Atlantic. Then followed years of professional training, and today we can say with no small pleasure that he is at the very top of his profession in the world, rubbing shoulders with some of his previous mentors, now colleagues, such as Professors George J. Reul and Oskar Howard "Bud" Frazier, and led by the still active founder of the institute, Denton A. Cooley, plus other outstanding experts. After all this time spent across the Atlantic, our interviewee could have long since obtained American citizenship. But "Dr. Gregorik", as indeed he is known by the staff, or among his closer professional colleagues, as is the custom in America, simply Igor, always travels around with a Slovenian passport and at home he uses his personal ID card. This is quite sufficient for him for all travel around the world, and of course when he comes home at least three times a year, and if possible more frequently – his partner, a young doctor called Nina, lives in Ljubljana.

Otherwise in its primary meaning, the word "home" rings of Primorska, where his sister Vlasta, also being a doctor, who lives with her family, Dr Gregorič also inherited some property from his deceased parents. Of course in every person there is also a part of the non-material heritage; this is created by the earliest parental, teacher and other messages and models for life, pleasant and less pleasant events, which, especially the latter, are burnished by time and later in the period of maturity are regarded as "valuable experiences". And then there may be entirely

personal, very intimate and pleasant "sentiments". For Dr. Gregorič this is embodied by the letter D, between his first name and surname, on his business card and on his internet resume, and in documents he is also officially Darko. Of course this detail would be in no way special, since many people, especially in professional circles, have two names or various different combinations.

"But with me my parents couldn't agree on what name to give me, so both stuck. My mother wanted me to be Darko, because that was the Partisan name under which she met my father, who was actually Alojz. He, on the other hand, liked Russian names. When he was about 18, he was conscripted into the Italian army in Primorska, and sent to the Russian front, where he got sick, but he was somehow rescued by a Russian commander called Igor... You see, this is how equality and equal influence from both parents was nicely demonstrated in a simple, humble rather than wealthy, family."

Investment with no guarantee of return

From what he said later it would appear that the members of the family were also very closely tied and caring, since it was no easy thing even to send a child to university in another town, let alone to support several years of study and professional training in America. "And without any guarantee of a serious return," as Dr. Gregorič recalls that period. When he was a doctor with several years of experience in general medicine, and he went off to America, a degree and knowledge "from outside" in itself were far from any guarantee of employment; at least not at that prestigious address and not in that profession. The invitation to Houston as a positive response to his request, the chance of seeing up close the work of that famous cardiovascular centre, therefore cracked the door open only enough for him to be able to join a whole line of other young people from all over the world with similar ambitions. So to begin... of course at the very beginning.

"At THI there were always hundreds of people arriving from different parts of the world, and at any time there were some 30 or more interns in the operating theatres and wards. I was just one of many ... with a great desire to be as close as possible to the experts and wherever possible in the given circumstances, directly present in the operating theatres. In addition to their normal duties, my prematurely deceased colleague Dr. Brane Radovančevič and I spent almost every free moment in the transplant ward, and helped do research ... right up until I finished my internship in general surgery. There was a lot of hard work, with a few happy coincidences along the way."

Such as this – one of the key factors in the idea of America taking root in his

Dr Gregorič prepareing the Donor heart for heart Transplant.

View of the operation from the observation dome.

head goes a little further back in the past, to the fact that he did his national military service in a former prestigious medical insititute, the Military Medical Academy (VMA) in Belgrade. "I had the good luck as a young army doctor to wind up in the coronary unit. I was already keen on cardiology, but I also wanted to be a surgeon. And what at that time could be more enticing than the chance of working in such a ward, where the two were combined, in other words cardiosurgery..." But the opportunities for such a specialisation, which among doctors is highly sought after, are of course not overflowing.

Waiting for internship

"After I finished my national service in 1981, with some working experience in general and family medicine in Kanal and as a surgery intern at the Franc Derganc Hospital in Šempeter pri Novi Gorici, I searched for the possibility of specialising in cardiosurgery. At that time the only possibility was in Ljubljana ... They promised to let me know when an opportunity arose for this. You can probably guess that this dragged on for some time..."

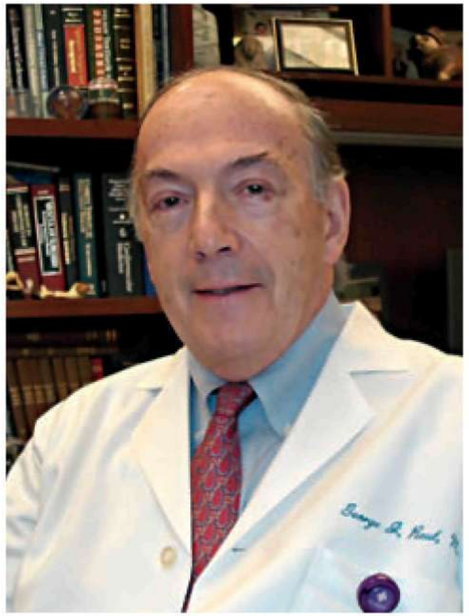
But national service at the VMA was interesting not just because of the work in cardiosurgery. This was a medical institution which at that time, in the eighties, sent some difficulte patients to Dr. Cooley at the Texas Heart Institute for cardiosurgical operations. At that time the Ljubljana Clinical Centre also collaborated with TMC, but with another distinguished expert in the field of cardiosurgery, Dr. Michael DeBakey. Dr. Gregorič thus knew a little about THI from his time at the VMA, and a more tangible possibility of going there "that is, here, to Houston, where I am today at the very peak of the cardiosurgical team for cardiac transplantation, artificial hearts and auxiliary heart pumps," arose after three years at a lecture for surgery interns organised at the Clinical Centre in Ljubljana. And there one of the lecturers mentioned the possibility of training at THI.

Finally – America, oh, America!

"No, in America I had no one and nothing. I didn't know where I would be staying, with whom, and how it would be... When colleagues arrived later, we joked that we had landed in Houston like some parachutists. When I finally received the invitation to come to THI after a long and tense wait, in addition to my basic luggage and some money to be going on with, which we had managed to put together at home, I took with me just the address of some lady. A distant relative of some friends of friends. Mrs Jožica was not expecting me at all. She hadn't a clue who this stranger was who had arrived in a taxi, and who claimed to have got her address from some acquaintances in Ljubljana, with the assurance that she would help me. She probably took pity on me, this quiet, well-presented young men who because of the delay to the flight from Belgrade via New York had spent the night at Houston's Hobby Airport. She was kind and understanding of my plight. We agreed that I could stay with her until I found something suitable."

As he explains, Dr. Gregorič had actually tried a little bit of American life earlier. But that was just on holiday, in other words very much working experiences. As a student in the mid-seventies he worked at petrol stations – as he had done at home for the Petrol company when he was 15 – and earlier in America in tobacco fields, and he also space painted apartments and did various odd jobs.

"Even as a child I had good manual dexterity. Probably from my father, who was very dextrous. He made and repaired a lot of things, various machines and devices, himself. He always got me involved in his work, and also took me everywhere with him. And my mother was not lacking here, either. When some television programme was over, a sweater or some other knitted garment would be almost finished."



Dr George J. Reul

Photo: Dragica Bošnjak

Dr Denton Cooley

First steps into small-scale surgery

Our interviewee's words about his experiences in general medicine back in Primorska are also fascinating and at times quite touching. Expecting the possibility of specialising immediately in surgery seemed audacious and conceited. And since the peripheral health centres at that time for the most part did not have the custom of performing what was called small-scale surgery, he says with a smile, he was like a squirrel gathering and bringing in sewing equipment and various such items; he sterilised the equipment at the hospital.

That relatively short period, when he among other things went around in a Fiat 500 visiting patients in remote villages, he calls a true idyll. The clinic equipment was supplemented at that time with an ECG machine, which was a rare and previous novelty in such areas, but he was very familiar with them from his cardiology days at the VMA. And when the opportunity arose, he also volunteered for surgical work at the hospital. This proclivity for surgery, gaining experience, knowledge and skills, and also his calmness when there was a veritable "flood of blood", were very important on various occasions "in the field", where you have to quickly make the right response even though, or precisely because, it is far from the hospital. Such cases, which were noticed and positively assessed by Dr. Koglot, "were an admission ticket to start a specialisation internship in general surgery in Nova Gorica."

However, as already mentioned, in the eighties and a little later, in the period probably remembered by our middle aged and older generations for the high inflation levels and devaluation, Milka Planinc, the odd-even system and so forth, the decision had already been taken to go and get at least some professional experience in the USA.

The dilemma: return or risk ...

It was agreed with his home institution, the Šempeter Hospital, that he would go to THI in Houston for half a year. This was interesting, and he saw that he had already learned new things, so he wanted to stay in America for another six months. But at that time at home in Slovenia there was a lack of personnel, so the hospital management did not agree to him extending his stay. He found himself on the horns of a dilemma: should he pack up all his things, then await specialisation internship at home and probably a secure job – or should he roll the dice? America was offering him a fascinating professional challenge, he could work as an assistant in operations and he had a lot of desire to succeed, although there was no guarantee at all that this would really happen. Assisting in operations

Photo: Dragica Bošnjak

does sound fine, and in actual fact gradually, as he gained experience, he would practically participate more and more in surgical procedures, but what was otherwise an excellent opportunity for professional enhancement had a minor "drawback": this work was not paid. Until a physician from abroad obtains the American nostrification of his degree, he cannot expect to get paid.

"No one forced me into such an exhausting rhythm of work in that medical jungle, where they perform 5,000 operations a year. No one demanded of me that I should spend every day, including Saturday, practically all day from seven in the morning until midnight, in the operating theatre. It would indeed have been more logical and simpler first to get the nostrification done. But since I was already there, in direct daily contact with such distinguished surgeons, at the very centre of exceptionally exciting developments, both in clinical and research work, where they were also working on developing artificial hearts, auxiliary pumps and so forth, I made the carefully considered decision to persevere right there for a little longer. This was a very carefully considered decision, as well as a desire for them to observe me, remember me and help me. If at that moment I had taken the time to study, in a few months or a year no one would recognise me any longer, and again I would just be one of the mass of young doctors from all over the world who circulate through the operating theatres and wards. In order for me to be able to make an impression, or at least I thought I could make one, I had to be convincingly better. I had to be more or less day and night in the operating theatre, always available. I had vision and ambition, I wanted to learn a lot and for that reason I needed to make great sacrifices. Four years of drudgery without pay..."

Valuable support of mentor with Slovenian roots

Right at that time, in September 1988 I received at my home address in Primorska an invitation to do an internship in cardiosurgery at the Ljubljana Clinical Centre. But at that time "America had already worked its magic..." The entirely hardened decision to stay in Houston was further boosted by an agreement with his then mentor, head of the vascular surgery department, Prof. Reul, for me to take six months' study leave and perform the nostrification of my degree, which would finally allow me to get paid for the work I did. There is certainly no need to elaborate on how modestly he had to live until then, scrupulously allocating every last cent that he was sent from home. Legally he could not take a job, and he could have been immediately sent home if he had done, and in that situation he clearly developed a stronger sense of responsibility that the investment made in him by those at home should be returned. This helped him in his perseverance and motivation. It should also be added that Prof. Reul, who has Slovenian roots through his grandmother, did indeed share with him unselfishly great knowledge and experience, and encouraged and supported him in his decision to obtain the position of "fellow" once he had obtained his nostrification. Then another four years of fairly but not entirely independent, more responsible and finally paid work; only doctors with an American licence can treat private patients independently in

Dr Igor Gregorič (left) and Dr. O. H. 'Bud' Frazier holding Abiocor Totat Artificial Heart.

Texas Heart Institute at St. Luke's Episcopal Hospital

Dr. J. Willerson the President Elect of Texas Heart Institute

Dr. Srdjan Verstov¹ek, from Texas M. D. Anderson Cancer Center.

Dr. Špan and Dr. Poglajen - The Residents in CVS and Cardiology from University Clinicam Medical Centre (UKC) Ljubljana, spending their 6 Month rotation at THI (Texas Heart Institute).

America.

We should condense this story, however, although even a shorter version of his story would be full of fascinating experiences. These experiences were gained in an environment where he had the opportunity to participate actively in several thousand cardiosurgical operations. As said, however, we should just mention briefly that several times he had to go a few steps back down the ladder that he had already climbed, in order to make new jumps ahead; not for failures, but simply because this was dictated by the system of study, specialisation and advancement. As a "fellow" he had four years of experience in the field of cardiovascular surgery under his belt, but he still had first to complete his specialisation in general surgery. Without that specialisation he could not specialise directly in cardiothoracic surgery. So one step forward, three steps back and then again ahead ... one after the other, eight years of training, specialisation and subspecialisation, right up until 1998, when it was possible to speak of being successfully established in a position that facilitated a proper, successful American career both at THI and at the university there, where he was also employed.

Together with Prof. Frazier for complex operations

At the time when he was employed full-time at the university, Prof. Frazier, head of the department for cardiopulmonary transplants at THI and head of transplant activities at St. Luke's Episcopal Hospital, frequently invited him to come and assist in some fairly complicated heart transplant or for instance the installation of an artificial heart or auxiliary mechanical pump. In 2000 he accepted an offer of full-time employment at St. Luke's, which was also the main clinical base for such operations, and he became a member of Cooley's team, the only foreigner out of nine cardiosurgeons. The team is composed of distinguished names which today can claim thirty, forty or – in the case of the founder of THI, Prof. Denton A. Cooley – more than sixty years of experience.

Among pioneers in developing cardiosurgery

Joining such a team, which was among the pioneers in developing transplants, artificial hearts and auxiliary pumps, was certainly an exceptionally precious opportunity for a physician. Just as it is an indescribably exciting experience for a person "from outside and far away" who finds himself for the first time in an endless labyrinth of buildings, passages between them, corridors and wards, and can observe closely the entire procedure of a heart transplant, or the installing or removal of an auxiliary heart pump, from the first incision to the last stitch. Yet it is also incredible how quickly the eyes become accustomed, and the mind and emotions accept the fact that in an open chest cavity, where there is an entirely worn out, almost formless heart muscle that has been assisted for some time by a pump, there will soon be a new heart; while Prof. Frazier leans over the patient, Prof. Gregorič prepares the heart, which has been brought into the operating theatre a little earlier, for transplanting. When everything is prepared as it should be, modelled as precisely as possible to suit the recipient and donor, the skilful strokes of this well-rehearsed tandem will enable a still but healthy young heart to find once again its natural rhythm in a new body. Occasionally, with the influx of blood, this happens spontaneously, but usually it starts up with electrostimulation. From the calm movements and behaviour of the surgical team we can deduce, or at least we inexpert observers can imagine and tell ourselves with bated breath, and this can be affirmed by those who know a little bit about it, medical students and entirely fresh young interns, that the initial highly irregular, wildly fast or slow quivering in the open chest cavity is normal. The heart will soon gain its normal rhythm.

What the interior of the auxiliary pump shows

Yet seen through the eyes of Prof. Frazier and Prof. Gregorič, who performed the described operation together, just as they have done countless times in the past, while they each also perform a great many operations independently with some junior assistant, this is now the concluding routine procedure that can be dealt with by the more junior part of the team. Their interest will now be focused on a detailed inspection of the removed pump. After very close inspection, they will obtain new data and enrich the experiences being gained gradually with different types of pump.

"We colleagues at the institution itself

Dragica Bošnjak and Blaž Kondža with Dr Cooley, who received the delegation of journalists from "DELO", the leading daily newspaper with SCIENCE supplement in Slovenia. Dr. Cooley led the delegation through the history of the Texas Heart Institute, where over a period of 60 years invented and performed many unique surgical procedures that saved numerous lives.

and at various wider professional meetings are talking very intensively about the functioning of the pumps and the status of our patients: we are comparing different variabilities regarding pressures in the circulatory system and regarding possible disturbances in blood circulation, signs of clotting, and we are interested in every detail of the functioning of the respiratory and circulatory organs, the neurological status and so on and so forth. We have to verify hundreds of parameters," explains Prof. Gregorič.

Legendary associates and competitors

For a better understanding, we should stop to refresh certain data concerning the exceptionally rich history of this now unbelievably large complex, called the Texas Medical Center (TMC) and its main protagonists, the famous Michael E. DeBakey and the slightly younger, but no less famous Prof. Denton A. Cooley. In the beginning, these two brilliant colleagues took together the first pioneering steps in the fifties at Baylor Methodist College and at the Methodist hospital of the same name, creating what are today many of the established methods of treating diseases of the heart and circulatory system. Later, in 1969, when Cooley was the first in the world to transplant an artificial heart, they split up and became competitors, who were literally on either side of the street, or actually the car park, each developing their own "heart centre", where the legendary heart surgeons each performed their own operations on many famous personalities. We may also recall that very early on, indeed decades ago, cardiosurgeons from the Ljubljana Clinical Centre, Prof. MiroKošak and associates, established cooperation with Houston and that Dr. DeBakey was also in Slovenia.

But getting back to Houston: only after four decades did the legendary surgeons break the longest, four-decades-long silence in medicine, and DeBakey, aged 99, and Cooley, 87, had a touching reconciliation a few months ago. DeBakey received an award for his life's work, awarded to him by the Denton A. Cooley Cardiovascular Surgical Society, and the award was of course presented personally by the Society's president.

TMC – city within a city

Texas Medical Center is a gigantic complex, a city within a city, and is hard to take in entirely even from the tallest building. It comprises a whole range of clinical hospitals, universities, colleges and research institutions. Within this complex is the especially well recognised and world-famous University of Texas M. D. Anderson Cancer Center. Outstanding teams of experts have been developing clinical and basic research work in the field of oncology, and are also famous for the fact that many of their physicians – including again successful Europeans, such as Prof. Dr. Srdjan Verstovšek from Zagreb – have participated in numerous international research projects, which are also presented at the annual meetings of the American Society of Hematology (ASH). The last such meeting was in Atlanta, and this year, the 50th in succession, will be in San Francisco. Young doctors from Slovenia are also getting professional training in various departments at M. D. Anderson. The TMC complex also incorporates the regional centre for collecting and researching blood and blood products, Houston Hospice, a health and medical science museum and so forth.

In addition to medical institutions, there are located here various foundations, and within the TMC complex there are several hotels of varying categories with well-provided transport links. Close to the paediatric wards there are suitable accommodation facilities for parents and relations of children receiving treatment.

Most illustrative is no doubt the fact that TMC employs full-time, temporarily and transitionally approximately 100,000 people, including approximately 10,000 doctors, 25,000 nurses and so on. This makes TMC the "biggest employer" in Houston. Within the Center, in other words in the numerous general and specialised clinics, more than 5.5 million patients are treated every year. And more than 12,000 volunteers participate in the process of dealing with patients and providing assistance to relations or visitors. More than 90,000 people are obtaining education in the student campus and other educational institutions, and of these more than 20,000 are full-time students.

Owing precisely to the aforementioned legendary cardiosurgeons and their associates and successors, THI – the Texas Heart Institute – symbolises TMC, and the same can be said in the field of oncology for the aforementioned M. D. Anderson Center, just a few dozen metres away. THI, a small section within the enormous complex (TMC), comprises for the visitor what is probably from the outside the most recognisable modern building, with a large sculpture in the form of a heart, housing research institutes, various laboratories and so forth, and St. Luke's Hospital, which is their clinical partner. THI is actually a non-profit institution, or rather an association of experts who do not have their own clinical base, which is in fact in the hospital, where there are 17 operating theatres available, of course with pertaining intensive care units, laboratories for heart catheterisation and everything else necessary for the most complicated procedures and research, and they also collaborate closely with the nearby children's hospital. In 2002 a new Denton Cooley building was completed, with some floors housing hospital wards, and alongside

Faculty of Medicine, University of Ljubljana

Dean Prof. Dr Dušan Šuput: "Professor Gregorič is, like many Slovenians who live abroad, still deeply connected to Slovenia and keeps close contacts with friends he left behind. And yet he is different. His passion for medicine and generosity made him one of the leading physicians in his field, including in Slovenia. His ties with cardiovascular surgery are strong and he helped the development of this field in Slovenia by accepting many young residents to work with him in Houston in one of the most prestigious and sophisticated centres in the world.

But there is more, much more - his enthusiasm to help medical students gain new experience abroad. It seems that his experience in the early years of his professional life in the USA convinced him that any intelligent and dedicated medical student deserves all the help and professional guidance he can get in his first steps in medicine. Initially students from the Medical Faculty in Ljubljana came "by chance" and only on their own initiative, but Professor Gregorič knew that more could be done for the students.

A couple of years ago we met and discussed the possibility of establishing an official basis for student and teacher exchanges, and also our common interest in research. He also organized a meeting between the Deans of the UT School of Medicine in Houston, Baylor College and the Ljubljana Medical Faculty. The meeting was very interesting, informative and fruitful. The first agreement between the UT and University of Ljubljana School of Medicine was signed last year, and the collaboration is already expanding to include other medical professionals.

Professor Gregorič is not just an excellent cardiovascular surgeon, he is also one of the leading scientists in the field of developing new surgical treatments for advanced heart failure. As a passionate researcher he proposed large-scale research on the effects of laminar flow of blood on vascular function and the function of various organ systems in experimental animals and humans. The project comprises scientists from the USA, Slovenia, Netherlands, and possibly Germany.

I see Professor Gregorič as a dear friend, excellent cardiovascular surgeon and scientist, and a friend and mentor for many students from our medical school. He also started a fund (by giving up his reward) to help students overcome possible financial problems while visiting and studying at THI. We are glad that we have the opportunity to work with such a great man."

there are research laboratories, rooms for educational activities and so forth. The passages between buildings are imperceptibly interwoven and linked, and the majority of corridors are imaginatively used for a wide variety of occasional or permanent artistic presentations. This is attractive for patients and visitors, as well as for employees – if of course they are not in a hurry.

Lost in labyrinths

Yet all these corridors endlessly twist and turn, and there are many of them. So it probably comes as no surprise that those employees who are engaged in rather more dynamic work, involving various departments spread around this conglomerate of buildings, prefer just to go straight to supper at the end of their working day, rather than head off to the gym. Gregorič's personal assistant Eva Pongratz, a kindly guide through these labyrinths, has probably already heard such and similar comments and questions countless times, regarding how many kilometres she covers in this way every day. But she still offers a broad, relaxed smile in response; still because it is understandable that in a job with a lot of duties, into the bargain her work space, somewhere in the middle of an oval corridor opposite the rooms of Prof. Gregorič and Prof. Frazier, serves as a kind of crossroads and unmissable contact point. A place where almost daily "Gregorič's" Slovenian interns stop by when they need something, have something to report, have just arrived or are leaving. So it is not surprising that in her small work space there is growing evidence of the tiny Slovenian land, with images of some of Slovenia's tourist attractions – in English; these are supplemented by miniatures of old Ljubljana, Idrija lace, and for immediate needs some "sweet sin" such as Prešeren chocolate balls or chocolate figs.

Texas Heart Institute soon to mark fifty years

As mentioned, THI was founded in 1962 by Dr. Cooley, the cardiosurgeon who two months after Dr. Barnard in South Africa performed the first heart transplant in USA in the spring of 1968. So by the end of last year at THI and St. Luke's Hospital, which is the focal point of his clinical work, more than 1,200 hearts had been transplanted, of which approximately 900 were transplanted by Dr. Frazier, and around 300 by Dr. Gregorič. These two leading surgeons in this field today have together installed approximately 500 pumps, the first one by Dr. Frazier for Christmas 1986. Over the last 25 years, as a former student at Baylor College, then in close contact with Prof. DeBakey, he can be credited with the development of numerous new approaches in treating severe heart failure.

It has been well known for some time not just among professionals, but also in the general public, that there are not enough replacement organs for all our needs, and they are never available quickly enough for the needs of certain patients. This disparity between need and possibility is only increasing with the ageing of the population, unhealthy lifestyle and for other reasons. It has been determined that each year in America some 550,000 new cases of advanced heart failure are diagnosed. It is therefore vitally important that physicians and of course patients in different situations have different possibilities open to them; when no treatment with drugs is effective any more and/or a heart transplant is not possible or not feasible, there should be the possibility of installing a reliable and safe artificial heart or auxiliary heart pump. The latter can be used either as a stopgap until a suitable heart can be found, or as temporary support for a worn-out heart muscle, which through being partially unburdened and with the right treatment can be revived.

Development of technology

It is therefore also understandable that parallel to the development of modern medical technology, equipment, aids and substitutes such as artificial hearts and auxiliary pumps, great attention is focused on regenerative medicine, where their researcher Dr. Emerson Perin is at the forefront, and to genetic research, while they are perfecting methods of vascular operations and procedures for preventing major haemorrhaging, the forming and removal of clots and so forth.

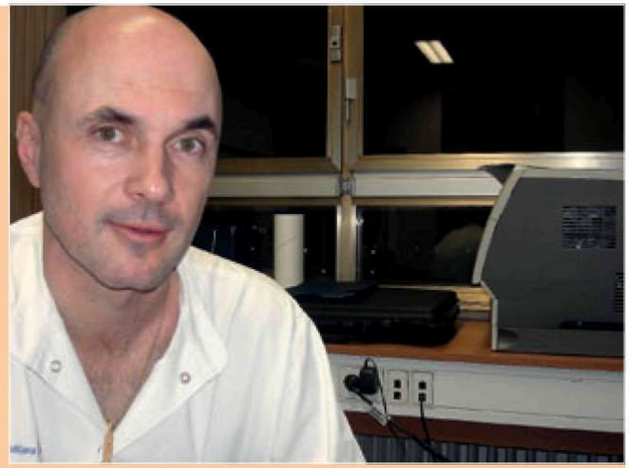
The mass of professional and popular literature and conversations with leading experts point to the exceptionally wide field of clinical and research work. Pioneering research is just what the word conveys – searching, charting new paths, even risky procedures, where only time will tell whether and to what extent the right decision was made. The first patients with transplanted hearts had a short time of survival, since in the initial period there were no proper tools to fight rejection by the organism, and only a greater number of operations and the exchange of experience contributed to a perfection of the methods. The same applies to the development of various types of artificial heart and auxiliary pumps, where every new type is tested for a long time in animals and only then placed in people. On this very point it is also known that the American FDA monitors very closely the results of this type of treatment in cardiology, and has strict approval procedures for the use of such technology.

At the top of the best American hospitals

Thanks to all these efforts and good results, last year for the 17th year they were placed on the famous list of "America's Best Hospitals", right at the top among the ten best hospitals in the USA.

"In order for a person to know where he is, and the quality of his work, he needs to go through critical professional evaluation in his field," says Dr. Gregorič, when we talk about clinical and research experience at THI, and also about a unique phenomenon

University Medical Centre of Ljubljana



Prof. Dr Borut Geršak: "Cooperation with THI actually started years ago with medical students being sent to this institution on a regular basis, to rotate their obligatory practical "surgical" training. Of course Dr. Gregorič was the main person on the American side, and he actually helped hundreds of our students with their first steps in the USA's medical universe. For them it was an experience to see that nowadays there are no fences any more, not just between countries, but more importantly, between human minds. Fortunately the contacts, which had previously been more or less on an academic level, intensified in 2006, with frequent visits of doctors from both sides (Slovenian and US) to both places. The primary driving force was of course the programme of left ventricular assist devices (LVAD) – in this field THI has the biggest experience in the world.

Not only were surgeons involved, practically the whole sphere of doctors dealing with advanced cardiac disease were there, including various other medical profiles. Cardiac surgery residents are sent on rotation (6 months) to THI, to familiarize them with another health care system, new rules, to meet new friends, new challenges, to see an international way of thinking and to perceive future success in their young surgical hands.

What should be the goal for the future – to exchange residents from both sides, so US doctors will be able to see new techniques developed by us Europeans, and to see the world of cardiac surgery from our eyes, from our perspective. Plans for the future? – no plans, because the future is already here, today. We just have to grab it in our hands, and put it into our hearts and minds – there are no borders, there are no limits, there are no bad results – just one constant driving force, which evolved us, humans – to master the world, to reach the moon and to touch the stars."

– more than a decade of opportunities for young Slovenian doctors and senior-year medical students to gain professional training at this distinguished institution. It began in 1999, when the first four students, Petra, Maruša, Urška and Sonja arrived in Houston. The young interns had to sort out the paperwork themselves, but of course in breaking new ground and throughout this time, in all these ten years, they were helped by Dr. Gregorič. The good experiences quickly spread among the young generation by word of mouth, and in a decade around 400 have come to Houston, representing practically ten percent of all Slovenian doctors.

And as for whether the view of the future is as optimistic – "The sky is the limit!" says our interviewee emphatically, without hesitation. This assertion, accompanied by a convincing smile is not significant simply because it was the only thing he said in English, it has another symbolic importance.

"In fact I see no limit at all, and I am certain that we will continue to work well and develop cooperation with Slovenian universities, something that we have ultimately also confirmed officially with the signing of an agreement. We have several new ideas and concrete research plans," explains Dr. Gregorič, and to reinforce the point he adds a fresh anecdote about a recent meeting between the legendary Dr. DeBakey and Dr. Frazier.

Ever since he and Cooley have become friends again, DeBakey likes to show up at THI in the laboratory for developing artificial hearts. Upon inspecting one of the newer models, DeBakey throws out: "Well, we'll see how this thing holds up after ten years..." Frazier looks at him slightly askance. This does not escape the distinguished veteran DeBakey in his venerable nineties, in fact almost in his centenary, and he condescendingly continues the dialogue with his more than 20 years younger colleague Frazier: "Yes, I hope you'll still be with us in ten years..."

And why the allusion to the sky being the limit has another symbolic significance is probably self-explanatory. After all, in this fourth biggest American city, Houston, less than an hour from the fascinating and rich centre with its high skyscrapers straining ever further towards the sky, is the famous space agency NASA.

Petra Hari, MD, intern at THI in Houston

I first came to Houston as a 6th year medical student in June 1999. The opportunity arose by chance. At Maribor General Hospital, where my colleagues and I were doing practical training in internal medicine and surgery, the traumatology surgeon, Dr. Batista, offered the chance of education in America. So that we could set up contacts, he gave us the fax number of Dr. Igor Gregorič. We received a rapid response, and thus began the "Houston chain reaction", recalls Petra Hari MD, an intern specialising in surgery from Murska Sobota, who had a wonderful opportunity to train in surgery, having now done ten shorter and longer training stints at the Texas Medical Center in Houston.

"I had the luck to meet Dr. Gregorič just before I travelled to Houston. He had come to Slovenia for a cardiovascular conference. The actual trip to Houston, however, was a journey into the unknown, and the only point of reference was Dr.Gregorič, who met me at the airport, arranged for a room in the student halls of residence, and even took me to the shops until I found my way around... Of course he also sorted out all the necessary paperwork and showed me around the hospital, which for me at that moment was quite a shock. An infinitely big building with complicated corridors in which I frequently got lost, or could no longer find my things. Fortunately all the staff were as friendly and helpful as could be, whether they were interns or distinguished elders of world renown.

"As a student I spent a lot of time in the first month mainly with Dr.Gregorič and his American interns, and I assisted in numerous operations, but the most shining moments were when during an operation I could hold a heart, or just before the end of an operation, when I sewed up the skin under the supervision of an intern, all under the watchful eye of Dr. Gregorič."

As Petra Hari further explains, she intended to stay in Houston just for one month, but then after encouragement from Dr. Gregorič and his then secretary, Houston native Sue Sauberli, who offered her a room in her house since the student halls were full, she extended her stay for another month. Thus, she says, she acquired her "American parents Sue and Dean Sauberli and a mentor and friend in Dr. Gregorič, and I had no doubt that I would come back often to Houston."

And she did every year. To begin with as a student, and later as a surgery intern, for Dr. Gregorič had made it possible for her to do a part of her internship at the prestigious Texas Medical Center. She spent quite some time with Dr. Gregorič on cardiovascular surgery at THI, she was present for heart transplants, the installing of mechanical pumps and major heart operations, and she felt increasingly at home at the enormous Texas Medical Center. She also spent a few months with a team of abdominal surgeons, of whom Dr. R. Patrick Wood and Dr. Claire F. Ozaki had previously taught Dr. Gregorič, and with Dr. Omar Barakat, who had joined the group a few years earlier. She participated in major operations to the pancreas and liver, which occasionally lasted late into the evening, while she spent most of her free time at the abdominal department in contact with patients and with Dr. Barakat, Dr. Ozaki and Dr. Wood. She emphasises in particular that the doctors were exceptionally kind, and that for her as well as other interns they would unstintingly explain the professional details with great energy, and encourage them to study and take part.

"As a surgery intern, with the support of my home hospital, the Murska Sobota General, I had the chance to spend some time on thoracic surgery at the world famous MD Anderson Cancer Center. I learned from thoracic surgery specialists, primarily Dr. Ara Vaporciyan and Dr. David Rice and their interns, the proper procedure for patients with lung and oesophagus cancer, and had the opportunity alongside classical procedures to see minimally invasive operations to treat lung and oesophagus cancer, which up until this year we had not performed in Slovenia. Dr. Vaporciyan and Dr. Rice also always made time to answer my numerous questions, and even taught me how to perform certain procedures on a simulator, while the interns made sure that I was kept informed about patients and planned operations."

2007/2 vol. 4

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ACTA GEOTECHNICA SLOVENICA

2007/2

ISSN 1854-0171

R&D in Slovenia

Quark 2008

(Page 40-188)

- The European Commission
- The Slovenian Government
- Institutes and Universities
- Industrial R&D and
- Enterprise Development

Jasna Kontler-Salamon
DELO

Janez Potočnik, European Commissioner for Science and Research

For the Presidency it is Worth Closing Ranks and not Exploiting it to Score Domestic Political Points

In recent times, "our" European Commissioner Janez Potočnik, responsible for science and research at the European Commission, has become a frequently mentioned political figure in Slovenia, in connection both with Slovenia's EU Presidency and with the approaching parliamentary elections in Slovenia.

At the beginning of the year, on your official website, you wrote in your blog that you were very proud of Slovenia's Presidency of the EU. What are your feelings and verdicts at this halfway stage of the Presidency, in your sphere and in other spheres?

Naturally none of the Commissioners has a detailed view of all spheres of the Presidency. For the most part each has a good view of his or her own sphere and of the priority areas, that is to say of significant events such as the Spring Summit. That was a success: it may not have included significant innovations but it was an important step in the right direction. Both with regard to the continuation of the Lisbon Strategy, and in terms of the energy and environment package. For me personally, the summit was extremely important because of the support for my proposal regarding the introduction of the "fifth freedom", the free movement of knowledge. It will probably take some time before we are fully aware of the importance of this decision for the whole of Europe. In my sphere there is, of course, considerable willingness and readiness to continue to develop the European Research Area. As I said at the beginning, we cannot follow all the details of what is happening in individual spheres, but personally I believe that the Presidency as a whole is going well. All the events I have participated in have been excellently organised – good organisation is generally something that comes quite naturally to us Slovenes...

Would you say, then, that in terms of organisation we are following the tradition of the German Presidency?

Yes, we are following the tradition of those Presidencies that have been well organised. The most important thing for us is, of course, how well we are going to acquit ourselves. It is still too early for a final appraisal, but even at this point we can say that after the Presidency ends at least one of the problems that Slovenia has had to date will have been resolved. Namely that we were not clearly recognisable on the map of Europe and the world. This is without a doubt the most important positive side effect of the Presidency. The Presidency is also excellent training for the domestic administration, in the same way that, for example, the pre-accession negotiations were.

You have probably also heard comments from your fellow Commissioners in connection with the Slovenian Presidency. Praise or criticism?

We Commissioners do not discuss abstract or general views on the Presidency of an individual Member State. I can say, however, that I have yet to hear any criticism, while some of my colleagues have spoken appreciatively about events at which they have been present. And all of them are very enthusiastic about Slovenia. But there is still plenty of time ahead of us to further consolidate this good opinion before the end of the Presidency and bring Slovenia closer to those who do not yet know it.

As luck would have it, our Presidency has coincided with parliamentary elections in Slovenia, a time when internal political disagreements and, of course, the divided opinions of voters, are more than usually evident. For the time being, though, this appears to be having almost no effect on Slovenia's attitude to the EU Presidency. Do you have the same impression?

The Commission refrains as a matter of principle from commenting on domestic politics, which of course is the only logical and correct position to take. There is no doubt that the Presidency is such an important test for every State that it is worth closing ranks and not exploiting it to score domestic political points, whether on the government side or on the side of the opposition.

In 2004 you spent a few months working with Günter Verheugen when he was Commissioner for Enlargement. In the light of that experience, how do you view recent events in the former Yugoslavia, both in Croatia and in connection with the declaration and recognition of Kosovo's independence? When can these countries expect to join the EU?

That is quite a complex question. To begin with it is worth emphasising that the perspective of the countries of the so-called Western Balkans is clear – they have, and must have, the prospect of membership of the EU, just like Turkey. In some cases it is not merely a matter of a transition process, as was the case with the majority of countries in our enlargement. There are also questions of status to be resolved. These are usually more difficult and long-lasting. Even the scars of the recent war are anything but healed. We merely need think of our own scars from the Second World War, which are still visible even after sixty years.

Light needs to be shed on the question of the enlargement of the Union to include these countries, both from the point of view of the Union and its members, and from the point of view of the countries of the Western Balkans themselves. From the European point of view, it is possible to say that enlargement has probably been the most successful European policy to date. Increasing stability, economic progress, the spread of values and democratic standards, and so on – all of these are processes to which enlargement has made a decisive contribution. I believe that all responsible politicians in Europe are aware of this. However, with the fall of the Iron Curtain, the motivation for further enlargement of the EU has also dried up to a certain extent. Questions of the reorganisation of the functioning of the EU (the Treaty) and confronting global challenges (the Lisbon Strategy) have come into the foreground. These issues are of course extremely important, but personally I am convinced that it would be a mistake if the question of the further enlargement of the EU did not remain among those issues to which most political attention is directed. The Western Balkans must become an equal part of the Union as soon as possible – not least because Europe is and will be in the long term only as strong and stable as its weakest link. The criteria for joining the EU have remained the same as they were at the time of our negotiations, although their verification is essentially double: for each individual chapter, as well as the final evaluation, the readiness of the country concerned is additionally checked. It is this that enables the start of negotiations. And of course this does not speed up the accession process. We should not forget that the candidate countries negotiate with the Member States and not the European Commission.

European Commissioner Janez Potočnik, responsible for science and research at the European Commission.

All of this creates the impression that we now have candidate countries of the first, second and third divisions...

No, no... I don't think there is any question of classification into different divisions, but there are, of course, differences between countries, and these influence the potential speed of their integration into the Union. In its last report the Commission found that in practically all countries progress could be better and quicker in many areas. Croatia undoubtedly stands out from the other candidates in terms of readiness, and it is the Commission's wish, recently clearly expressed by President Barroso, that negotiations with Croatia should be concluded in the coming year, or if possible even before the end of our Presidency. Naturally this depends above all on Croatia itself. As regards the other countries of the Western Balkans, the key is Serbia, which has refused the offer to sign an associate agreement. Serbia is witnessing a convulsive conflict between the past and the future. All of us hope that wisdom will prevail and that in future elections Serbia will choose a European future. There is no doubt that the country, and above all its proud people, weary of all the terrible events of recent years, deserve it. But at the same time we must not neglect other countries – and certainly not merely because they are not currently in a crisis situation.

The essential thing in these countries is to maintain the capacity for reform while maintaining support for further enlargement in Europe. Of course it is difficult to implement reform without

a clear assurance of entry to the EU, although it is true that things were not much different when we were negotiating. It is important to be aware and, above all, to believe that the EU keeps its word. I am convinced that it will continue to do so in the future.

The EU should also keep its word in the individual spheres of its work. In your sphere, significant growth in R&D investment has been predicted. According to the Lisbon objectives, investment should reach an average of three percent of national GDPs in the EU. It does not, however, appear that this objective is going to be realised, since for the time being the majority of Member States are devoting a considerably smaller share to development. Who has failed to keep their word? The Member States? Is the global economic recession to blame?

Development objectives should not be confused with promises. As regards the achievement of the predicted three percent, investment on the part of enterprises is of key importance. Enterprises should contribute around two thirds of all investments. Here, however, there is a paradox. Private investment in science and research and innovation is increasing in European enterprises, but their share of investment in Europe is not. Just as in the USA, enterprises are increasingly directing investment of this kind towards Asia. Economies are global and the success of European enterprises and the European economy is also based on investments outside Europe. Naturally, it would be a good thing if investment in science and research were also to increase in Europe, but for this to happen it will clearly be necessary to increase Europe's global attractiveness. Analysis shows that the key factors in enterprises' decisions on where to invest are available knowledge, the size and vicinity of the market, and the attractiveness of conditions. A systematic and long-term approach is therefore necessary in numerous areas, from the modernisation of universities to the provision of tax reliefs and State incentives, the proper orientation of calls for tender, the adoption of standards, transparency on the labour market, the availability of financial instruments, and so on. These are of course issues that concern the entire government, and all the Commissioners, and success depends precisely on the comprehensiveness and consistency of the approach.

Janez Potočnik

These issues are also discussed by your personal advisory group of leading economists from the sphere of knowledge for growth, which recently met for the first time in Slovenia. How much does their advice help you?

Exactly. The group helps me with many economic issues and their advice is extremely valuable. Above all, they help me connect the effects of knowledge, science, research and innovation with the real world – with development, growth, social standards, and so on. In my opinion, this connection has not been sufficiently clear and present in the past. The advisory group of economists in the sphere of knowledge for growth – I also like to call them "economists with knowledge", since it is really a group of economists from different spheres – formulates proposals and useful advice which I can then use in my work and decisions.

Do your advisers also include experts of other kinds or do you mainly rely on economists?

Naturally I also have advisers in other spheres. I used to have, for example, an advisory group of more than forty experts consisting of a balanced mixture of representatives of academia and the enterprise sector (EURAB). We are currently in the process of reforming it – we want to make it more effective and recognisable. Its work will be targeted more towards giving advice on strengthening the European Research Area. We have reduced the number of members to twenty-two but we have maintained the balance between the academic and business spheres. Letters containing my invitation to participate were sent out last week and I hope that the response will be good. As regards the sphere of cooperation with Africa, where I hope to improve cooperation and the effectiveness of EU aid, in April I will be advised by Professor Sir David King, who until recently was the Chief Scientific Adviser to the UK Government.

During your years as a Commissioner, a number of important new bodies have appeared in the sphere of European development policy, for example the European Research Council (ERC), which has attracted attention both for its autonomy and for the considerable funds of which it disposes via a European agency. You were initially enthusiastic about it. Is that still the case?

Yes, it is. The ERC is something of a revolution in the UE. Its foundation has had a considerable impact not only in Europe but around the world. I recently attended the Annual Meeting of the AAAS, the biggest annual meeting of researchers in the USA, and it was clear that they are closely monitoring changes in Europe, particularly the establishment of the ERC and the strengthening of the European Research Area. I am convinced that the ERC will develop into an institution that will really leave an indelible trace. I do not hide the fact that its work, and above all the establishment of the related Agency (the dedicated implementation structure), have also

encountered difficulties, but this is always the way with new institutions. We are all aware of the importance of the ERC, and therefore there is no lack of goodwill and understanding in the efforts to resolve thorny issues. And there is no doubt that it will be able to count on my full support in the future too.

You have recently been to America, and before that you were in India. What are these visits about? Is it a question of uniting research forces in the competitive struggle with the new centres of research, such as China?

Absolutely not. It is about the vital pooling of research potentials in the search for answers to the challenges of the future, such as climate change, available environmentally friendly energy, viral pandemics, and so on. The easiest way to find answers to these questions is to work together, and for this reason a strengthening of international cooperation is essential. In April I expect to be part of the delegation that President Barroso is taking to China for talks that will focus on the challenges relating to energy and climate change. In June we have a bilateral meeting and a ministerial meeting of the G8+5 group in Japan. This illustrates the EU's desire to cooperate with everyone. We are building an open European Research Area. And, of course, all of this is also important for the role of Europe in the globalised world in general.

The main share of the work of your Directorate General at the Commission falls under the Seventh Framework Programme (FP7), whose success it will not be possible to estimate even at the end of your term of office, since it continues a considerable way beyond it, to near the end of the next Commission's term of office. You can, however, give an assessment of the progress to date of FP7, and of whether its funding is in line with forecasts.

Funding is in line with forecasts and I see no difficulties with this in the future either, since the budget has been agreed for the whole of the 2007–2013 period. More difficult, of course, is the question of the efficient, transparent, responsible and lawful use of all the funds available. So far we have been successful. Despite the fact that this has been the first year of operation of the programme, we have used practically all the available funds and are working hard to ensure that there are as few mistakes as possible.

Janez Potočnik in a conversation with Minister Jose Mariano Gago

Your visits to Slovenia are relatively frequent. What is your main motivation for these visits?

As I have already mentioned, one of the important tasks of the Commissioners involves ties with their home country. Putting it simply, we are ambassadors of our own sphere throughout the EU and of all spheres in our own country. I am happy to do this and I do it consciously. I hope in this way to help encourage, at least indirectly, certain processes and decisions that benefit Slovenia, while constantly maintaining a clear awareness of the role and mission of the Commission.

What events at home do you like best?

I don't have any particular priorities.

It must have been a special occasion for you last Monday, when you visited your old gimnazija in Kranj with the prime minister, and then his old school in Ivančna Gorica, to talk to pupils about the EU.

Yes, that really was special. Young people are critical and uninhibited, as they should be. That means that a discussion with them is always colourful and different. And if it takes place at your old school, what could be nicer?

Were you interested in European politics as a schoolboy?

Not really. In those days I was mainly interested in girls and sport, or perhaps the other way round. I believe that it is similar with the present generation, although their time is different from ours. Their world is a world without borders and there are many opportunities. Europe, which for us was something foreign and distant, is home to them, it is their reality. If someone had said to me then that I would one day be European Commissioner for Science and Research, I would have considered such a comment to belong to the realms of science fiction. My ideas, desires and ambitions at that time were mainly to do with sport.

What about now, after all these years in politics, is there a political model or political figure that has particularly impressed you?

I would have to think hard before answering that question. The profession of politician is a hard one if one wishes to do one's job responsibly and seriously, and there are many people striving in this direction. In recent years, of course, I have mainly got to know politicians who are responsible for the sphere of science and research, and I am happy to be able to count some of them as my friends.

Things Need to be Set in Motion in Order to Free up Intellectual Potential

By Boris Čerin

This is of course something that we hear quite frequently. More interesting, however, is the fact that this is something we say in two totally contrasting situations: when we are successful in a project, to confirm our satisfaction at our success, or to emphasise the importance of our contribution, but also in the opposite situation, when we are unsuccessful in a project. In the latter case, of course, as an excuse for the fact that we ran out of steam, that although we did our best, it wasn't quite enough. The same words pronounced with a different intonation. Be that as it may, the need to set things in motion remains in the foreground. And this of course raises a question: how successful are we at this in Slovenia? More precisely, in the sphere of higher education, science and technology? We talked to the Minister of Higher Education, Science and Technology, Mojca Kucler Dolinar.

QUARK: You are the Minister of Higher Education, Science and Technology at the time of Slovenia's Presidency of the EU, which means a lot more meetings at the international level. Before being appointed Minister you spent three years as a Member of the Slovenian Parliament. The National Assembly first appointed you chair of the Internal Policy, Public Administration and Justice Committee and then made you a member of the Slovenian delegation to the Parliamentary Assembly of the Council of Europe. You have also been a regular participant at conferences called by the British Council. Has all of this helped you get used to making public appearances as a minister, or do you attribute your rhetorical skills more to your previous career, given that you are a lawyer by training?

Mojca Kucler Dolinar: It is probably a combination of everything. I certainly try to make use of the experience I have gained in my past work in everything I do, and that also applies to my job as minister. It is true that as a lawyer I need rhetorical skills. For this reason I don't have any particular difficulties with public speaking.

QUARK: Your predecessor at the Ministry of Higher Education, Science and Technology was Dr Jure Zupan, who was himself a scientist with many years of experience and also a university professor. In view of the fact that you are members of the same party, would it be fair to say that there have been few personnel changes since your arrival? What is your opinion of your current team? Can you rely on them?

Mojca Kucler Dolinar: The work of a minister cannot be a solo performance by an individual. Rather, it is the fruit of the hard and responsible work of the whole team. I am very happy with my team and together we are implementing a number of projects both at home in Slovenia and in connection with the Presidency of the Council of the EU. I should also mention the excellent work being done by our ministry in the context of Slovenia's one-year presidency of the international EUREKA programme of industrial research.

QUARK: The job of the Minister of Higher Education, Science and Technology requires you to work in two directions. On the one hand there are the efforts to provide financing for research and development activities from the national budget. In Slovenia these efforts need to be directed a little more towards increasing the percentage of funds from the national budget earmarked for research and development activities. It is not hard to find comments suggesting that this is actually the most important task of every ministry of science. Comments in the other direction relate more to taxpayers' money and how usefully it is spent. How do you assess the current situation? Where is more effort needed on your part?

Mojca Kucler Dolinar: I have no doubt that citizens will agree with me when I say that money invested in knowledge and science always pays dividends. Apart from that, the situation with the budget is like with one's own wallet: there is always less money than one would wish. It is encouraging that funds have increased in the adjustment of the budget for 2008 and 2009; both nominally and in the proportion allotted to our ministry in terms of the total budget. The awareness of this government is at a high level as far as knowledge, development, research and innovation are concerned. If we look at concrete figures we can see that the budget funds envisaged for 2008 have increased by 10.2% in comparison to a year ago. We have increased funds in the sphere of young researchers from the business enterprise sector by more than 48%; this is the concrete contribution we are referring to when we say that the university and the business enterprise sector are coming together. In 2009 an additional 60% will be earmarked for this purpose. Funds are also increasing in the sphere of the information society and for a number of other budget items. Greater awareness of the need for suitable financing is important, both among politicians and among the public. Additional financing has also been promised from the structural funds, on which our ministry is already successfully drawing.

QUARK: Do you intend to complete most of the projects planned under your predecessor Dr Jure Zupan?

Mojca Kucler Dolinar: Of course. Above all, this means the decree on the financing of higher education from 2009 onwards. In December we

opened the Dom Iris "smart home" at the Institute for Rehabilitation. This will be useful both for the disabled and for the elderly, since it presents technological innovations that can make their life easier all in one place. In the first weeks of 2008 we will be carrying out, for the third year, a campaign to familiarise pupils in the last years of secondary school with study programmes in connection with job opportunities. Just before the end of 2007, in conjunction with the TIA, we issued a call for applications from young researchers from the business enterprise sector and held an information day on this topic just after the New Year. We were pleased to see that the event attracted around a hundred participants. In January we signed a letter of intent with regard to the purchase of research equipment at the Chemistry Institute. This is a piece of apparatus worth over EUR 400,000 for which funds will be contributed by the Ministry of Higher Education, Science and Technology, the Ministry of Defence, the Ministry of the Interior, the Ministry of the Environment and Spatial Planning, the University of Nova Gorica, the Chemistry Institute and the Slovenian Research Agency. And of course in the first half of the year we will have our hands full with the Presidency of the EU Council. Our ministry will be one of the most active during this six-month period, if we look at the number of meetings of EU Councils which fall into our areas of competence. We are involved in three of the nine ministerial meetings of the Council: the Competitiveness Council, the Education, Youth and Culture Council, and the Transport, Telecommunications and Energy Council.

QUARK: Some of the initiatives of your predecessor encountered considerable resistance. How have you planned your approach to addressing the problems you have inherited?

Mojca Kucler Dolinar: I believe that I have been successful in renewing dialogue with higher education partners. This is a basis for continuing to work together in the future. I am convinced that with an attitude of partnership we will be able to achieve a great many common goals.

QUARK: Among the objectives of the Bologna Process from the Berlin Communiqué is the promotion of the mobility of students and of academic and administrative staff within the EU. But the realisation of this objective brings with it a whole series of conditions and requirements. Putting it broadly, the objective is to facilitate greater mobility within the EU than there has been to date within individual Member States, which will not be easy to achieve. There has been much talk about the standardisation of programmes, material, individual subjects and even marking in examinations. What will standardisation actually include? On the other hand, alongside the standardisation process, a process of diversification of individual curricula is supposed to be taking place. A greater breadth of choices will be available, enabling university faculties a certain degree of competition in terms of both quality and choice of subject matter. If we have understood correctly, the first years of degree courses will become increasingly uniform within the standards, while subsequent years will offer increasing variety, with completely different optional subjects. How are we responding to these initiatives and challenges in Slovenia?

Minister of Higher Education, Science and Technology, Mojca Kucler Dolinar

Mojca Kucler Dolinar: Slovenia is following the Bologna guidelines and university faculties are adapting their courses in accordance with these guidelines. Eventual changes in the technical and science spheres are progressing slightly more slowly than in the sphere of social sciences. It is however encouraging that there is considerable interest in the Bologna study programmes among the younger generation. The anxiety over the introduction of the Bologna Process was that it would merely involve formal changes to study programmes that would not take into account the ideas of the Bologna reform in terms of content. For this reason quality and the renovation of study programmes according to the Bologna guidelines must be inseparable. This is the objective that Slovenia's higher education area needs to set itself, as it strives to become competitive at the European level. In the 2007/08 academic year there are a total of 269 study programmes available in Slovenia, of which 101 are Bologna programmes, which represents over 37% of first-cycle study programmes. University faculties still have a great deal of work to do before the 2009/2010 academic year, the deadline for the adaptation of all study programmes to the Bologna criteria. Our ministry is also working to ensure the mobility of students and professors. Slovenia's higher education institutions have been participating in the Erasmus programme since 1999. That year 170 students from Slovenia took part. Last year the number reached almost 900, which signifies a five-fold increase. It is also encouraging that the number of students coming to Slovenia from abroad is constantly growing. The same applies to teacher exchanges. In all the years to date, over 3000 students from Slovenia have taken part in the Erasmus programme. Preparations are already under way in Europe for the second phase, Erasmus Mundus II. In the sphere of higher education we will be discussing this very important dossier – which is good evidence of how the Union can benefit citizens in practice – during Slovenia's Presidency of the EU Council. It involves exchange programmes for students and teachers and university-level cooperation with third countries that are not members of the EU. The new generation of this programme envisages widening it to include doctoral studies, more cooperation among universities, more mobility schemes, and more financial

support (almost three times as much money as in the first generation – EUR 950 million). The cooperation on an equal footing of the countries of the Western Balkans is also envisaged.

QUARK: The EU conceives its openness to the outside world in terms of programme-oriented activities. Slovenia is already involved in one of these broadly conceived initiatives, the Mediterranean University project. In what areas is it particularly active? What aspects are particularly interesting for Slovenia?

Mojca Kucler Dolinar: Above all widening the recognisability of Slovenia and making it interesting for students, teachers and researchers from Europe and further afield.

QUARK: Academic institutions are investing considerable efforts in promoting links with the business enterprise sector, but there is a suggestion that the additional effort is not resulting in a corresponding increase in the volume of cooperation with the business enterprise sector, although they also have visible results and years of experience of links of this kind. Do you see a possibility for additional incentives on the part of your ministry or the ministry of the economy?

Mojca Kucler Dolinar: Our ministry is constantly working in this direction. I do not entirely agree with you that cooperation between academic institutions and the business enterprise sector is not as good as it should be. On the contrary, I believe that it continues to grow. The project involving young researchers from the business enterprise sector is a good example of this. Links between universities and other academic institutions and the business enterprise sector are likewise a good example. The purchase of expensive research equipment at the Chemistry Institute, which will serve both academic institutions and the business enterprise sector, is further evidence

Successfully concluded negotiations between MHEST and education union

Negotiations have been successfully concluded at the Ministry of Higher Education, Science and Technology (MHEST) on an annexe to the Collective Agreement on Research Activities. The annexe was initialled by the Minister for Higher Education, Science and Technology, Mojca Kucler Dolinar, and by Janez Stergar on behalf of SVIZ, the education and science workers union.
The annexe served to define and rank in pay brackets positions and job titles in the area of research activity and accompanying jobs.
Thus the average basic salary of a researcher should rise by 12.6 percent, with the rise for leading positions such as scientific associate, senior scientific associate and scientific councillor amounting to around 17 percent.

of this government's awareness of the importance of connecting the triangle of knowledge. Slovenia wishes to be a knowledge-based society. It devotes 1.6% of GDP to science, research and technological development. This percentage represents roughly EUR 500 million of public and private funds invested in research and development. We can boast 388 research organisations. I believe that the successful transfer of knowledge and research to the business enterprise sector, the creation of good working conditions for researchers, and research mobility are all important for the future.

QUARK: How do you rate inclusion in the 7th European Framework project? Have the capacities of Slovenia's research and development potential been well exploited to date, or do you believe that more will need to be done in the future with a better organised approach? Perhaps you incline more towards the view that better quality work at all levels will in itself promote such associations of individual groups of researchers and enterprises that they will have more opportunities for successful inclusion in European Framework projects?

Mojca Kucler Dolinar: As a candidate for membership of the EU the Republic of Slovenia took part in the 4th Framework Programme for the period 1994–1998, in the 5th Framework Programme for the period 1998–2002 and in the 6th Framework Programme for the period 2002–2006. Slovenia was enabled to take part in the 4th Framework Programme of the EU as a central European state and EU candidate country without financial obligations under the "project by project" system, which means that Slovenian organisations were able to take part in all projects in which they were accepted by partners from the EU, while the European Commission covered the financial participation of the Slovenian partners on the basis of signed contracts from a special fund for third countries. During the course of the 4th Framework Programme, Slovenian organisations took part in a total of 124 projects. In the 5th Framework Programme Slovenia was an official full participant for the first time, on the basis of a resolution of the EU-Slovenia Association Council, with the obligation to pay a membership fee. It was successful, since it received 2.4 times more funds than it paid. In the 5th Framework Programme a total of 481 Slovenian organisations took part in 385 projects, which means that Slovenia participated in 2.2% of all projects implemented as part of this programme. Slovenia took part in the 6th Framework Programme as a full member even before joining the EU. The number of contracts with Slovenian participants was around 450 and the total number of Slovenian participants exceeded 550. The 7th Framework Programme is still under way and therefore we do not yet have any figures regarding the participation of Slovenian enterprises.

Handover of the Chairmanship of the EUREKA initiative from Slovenia to the next Chairman country, Portugal

Ministers Mojca Kucler Dolinar and Jose Mariano Gago

EUREKA – The Industrial Research Driver

Developments and Ambitions of the Slovenian EUREKA Chairmanship

Aleš Mihelič

Dr Aleš Mihelič, Director General
Ministry of Higher Education, Science and Technology,
EUREKA Chairman 07/08

Over the last few years, public and private research entities have been steadily realising that, to sharpen Europe's competitive edge in a global market, they need to come together to address the fragmentation of research in Europe. For 22 years, EUREKA, the intergovernmental initiative for industrial research and development (R&D), has been successful in bringing together national funding for collaborative European projects and has used its network to support industrial research. The objective has been to fill the gaps in close-to-market, industry-led research and build critical mass on the international scale on the level of individual projects and also in the form of clustering projects, built around specific subjects.

Since its creation, over 3,000 industrial R&D projects have been carried out within EUREKA, with the overall amount of public-private investments exceeding EUR 25 billion. More than 13,400 partners from the industrial and academic sectors have been involved. As the bottom-up initiative, EUREKA is also well suited for industry, and this is also shown by the more than 70% share of industrial partners in EUREKA projects. The EUREKA network is proud that nearly 45% of project partners are from small and medium-sized enterprises (SMEs).

In July 2007, on behalf of Slovenia, the Ministry of Higher Education, Science and Technology, took on the year-long chairmanship of EUREKA. The EUREKA programme was created in 1985 on the initiative of the West German Chancellor Helmut Kohl and the French President François Mitterrand as a peaceful response to US President Ronald Reagan's "Star Wars" project. At that time, Europe decided to build its competitiveness on a peaceful platform i.e. industrial applications and development. The European Heads of State and Government in March 2000 in Lisbon reconfirmed this by adopting the well-known Lisbon Strategy. It aims to boost growth and employment and to make Europe the most competitive and dynamic knowledge-based economic area in the world by 2010. In addition, the 2002 Barcelona European Council specified objectives in the area of research and development, focussing on private investment (two thirds of the overall objective of 3%).

By pooling national public sources and a great amount of industrial R&D money, EUREKA is one of the important contributors to the realisation of the Lisbon goals. In addition, the results of EUREKA projects are constantly paving the way to European competitiveness. To mention only a few examples: smart cards, digital television, an online airline and travel global reservation system, car navigation, infrared car applications and detection, cancer diagnosis with new generation antibodies, soil pollution monitoring, tools for detecting digital crime, tests for child allergies, etc.

Currently, EUREKA includes 37 countries and the European Commission as the 38th member.

A member of EUREKA since 1994, Slovenia has been involved in 69 completed EUREKA projects with a total budget of EUR 26.8 million. 50 SMEs are among 122 Slovenian participants involved in EUREKA. Slovenian companies, research institutes and universities are working on projects in a variety of areas from medicine, biotechnology and the environment to information technology and transport. Recent success stories include an easy-to-apply test to assess immune system robustness in poultry, a new material and coating to reduce clogging in vascular implants and extend life expectancy, eco-friendly composite materials, Omega 3 and Omega 6-rich pork meat, plant-based waste water treatment devices and methods, etc.

Speech by the Prime Minister at the EUREKA ministerial conference on 6 June 2008 in Ljubljana.
From right to left: Prime Minister Janez Janša, Dr. Aleš Mihelič, Dr. Janez Potočnik, Minister Mojca Kucler Dolinar, Director of the EUREKA Secretariat Luuk Borg

The main goal of the Slovenian EUREKA chairmanship is to carve a niche for EUREKA in the European Research Area (ERA). EUREKA with all its projects, clusters and umbrellas, already represents an important player in the field of European research. With its wide network and its effective bottom-up approach, it has the potential to increase competitiveness in Europe. One of our main objectives is to define EUREKA's position within the ERA as one of the most important pillars. Moreover, we want to combine the advantages of the EUREKA Chairmanship and the Slovenian Presidency of the EU Council along with co-operation with the EUREKA network and the European Commission, to make a significant contribution to European research policies. From its creation, EUREKA has always been effective in SMEs and this group is particularly important for the future.

Beside the preparation of the new EUREKA strategy and action plans, another important objective is to simplify and synchronise EUREKA internal procedures and to promote a proactive approach to project end-users. This also includes improved communication with target groups (companies, national authorities, the European Commission, and other important players such as technology platforms, ERA-NETs, the media, etc.).

We would like to enlarge EUREKA's geographical boundaries to the Western Balkans, including Bosnia and Herzegovina, FYR of Macedonia, and Montenegro – extending our network's potential for collaboration on innovative projects.

Eurostars, EUREKA's new project based on article 169 of the EU Treaty, a joint programme mechanism of 27 countries, co-funded by the European Commission, is also likely to become a reality during the Slovenian chairmanship. With Eurostars, EUREKA, and its experienced network of National Project Co-ordinators, is on the verge of assuming a significant and ambitious role in the ERA. Everything will focus on playing this active role, not only on a programme or project level but also on a political level. There is much to expect from EUREKA's Ministerial Conference, taking place in Ljubljana on 6 June 2008.

The ministerial debate will focus on novel ways of supporting industrial research, opening innovation space to third country participation, defining improved R&D results communications and finally on the adoption of a new strategy on the future development of the EUREKA initiative. It is expected that, in addition to ministers responsible for R&D and the economy, Slovenian Prime Minister Janez Janša and Slovenian Commissioner Dr Janez Potočnik will also attend the conference.

We are confident that the Slovenian EUREKA chairmanship and EU Council presidency will leave a lasting imprint on the development of the oldest intergovernmental initiative for promoting industrial research and will provide a successful example of joint programmes in member states for the benefit of SMEs – Eurostars. Finally, projects generated will also greatly contribute to the future strengthening of a joint European R&D area, and the vision and realisation of a development-oriented Europe.

Conversation with the Director of Slovenia's Public Research Agency, Dr Franci Demšar

The Quality of our Science will be Even More Visible

Jasna Kontler-Salamon
DELO

"I believe that after this year's evaluation of programmes and the presentations of the work of the programme groups, the quality of our science will be even more visible"

Programme evaluation, on the basis of which the programmes that will receive budget funding in subsequent years are defined, will undoubtedly be one of the most important decisions for the research sphere in Slovenia during this year. Expectations are so much the greater because certain important changes are promised. This was also the reason for our conversation with the director of the Slovenian Research Agency (ARRS), Dr Franci Demšar.

Before you became the director of the ARRS you were involved in its founding. Now, owing to the complications surrounding the creation of Slovenia's independent higher education agency, which has won recognition at the European level, the question of how independent an agency founded under our legislation can be is once again a topical issue – Dr Peter Jambrek claims that it depends on the government. What is your opinion?

First I would draw attention to the reason why changes of government do not usually cause dramatic upheavals in western European countries. This is mainly due to the independent institutions that, where the democratic system functions well, enable a swift and painless change of government without this threatening the effectiveness of the functioning of the State. For Slovenia, however, independent agencies and funds are still a relative novelty and a particular effort is needed for them to be established. In the case of the ARRS, I can say that this effort has been successful, and that a degree of independence very comparable to that of kindred European agencies has been established. I believe that this will remain the case. This does not however mean that it was easy for us to achieve this.

You yourself are one proof of the independence of the ARRS, since as its director you have already "survived" several ministers and several governments. When the agency was founded, Dr Gaber was still minister...

That's true, but that was only a few months before the change of government. Otherwise, "survived" is not the right word. I have never understood it like that. The work of the agency should not depend on who the minister is.

To what extent is the agency actually "attached" to the government or the relevant ministry?

As provided by law and the founding charter, the point of the ARRS's work is that it should work in the way that is best for the country and in accordance with its strategic documents. And of course in accordance with the policy of the relevant area of government. The transparency of our work is therefore very important, and I believe that we have managed to establish this.

So in no case does the government or the ministry influence your expert decisions?

No, there is and can be no such influence. Concrete decisions are taken by the agency alone, although the government does of course have an influence on strategy, or rather it provides a framework for our work.

A financial framework above all?

Naturally a financial framework, but not only that. Each of our calls for proposals refers not only to the Regulations but to two other documents as well. The first document is the strategic orientations of the ministry. These explain in a transparent manner what the ministry wishes to achieve with a given call for proposals. For example, the priorities such as telecommunications, information technology, new materials or the revitalisation of specific research fields. In the last call for proposals, for example, the ministry insisted that at least one project must be awarded to academies of art. The second document is the evaluation methodology, which is the exclusive responsibility of the specialist bodies of the agency, i.e. of the scientific councils of individual disciplines, which coordinate all the details, and the scientific council of the ARRS, which actually adopts this methodology.

Among researchers I have heard the comment that in Slovenia, too, the distribution of money for research ought to be entrusted to more than one body, not merely to one agency, which consequently has a kind of monopoly.

I have always been – and will continue to be – in favour of the development of other institutions of this type. Above all, I believe that our technology agency needs significant development and that it should obtain more funds. But this is the job of the government, which in the past has been a little behind in this sphere.

As a result of the way in which the technology agency has been bounced back and forth among ministerial departments, the sphere that this agency should be looking after is undoubtedly the most deprived. But have you at least partially made up for this deficit?

Franci Demšar is 48 years old and holds a PhD in physics. He was born in Žire and educated at Bežigrad gimnazija and Ljubljana University, where he took his bachelor's and master's degrees in physics and in 1987, at the age of just 27, his doctorate. He completed the majority of his doctoral research in the USA, where he spent a total of two years. The subject of his doctorate and his subsequent research was magnetic resonance. His first job was as a physics teacher at primary and secondary schools. He then obtained young researcher status at the Jožef Stefan Institute (IJS) – obtaining a special commendation as the first IJS young researcher to earn a PhD – where he remained until his entry into politics in the mid-1990s. His first political appointment was as state secretary at what was then the Ministry of Science and Technology. He later served as defence minister and as ambassador in Moscow to Russia, five other Central Asian countries and Belarus. In 2004 he became the first director of the Slovenian Research Agency (ARRS), a post he still holds today.

Photo: Primož Sark

Director of the Slovenian Research Agency (ARRS), Dr Franci Demšar

It is true that for the time being the ARRS is performing some activities that the technology agency could also perform. For example we fund projects that are on the borderline of development projects, where an important element in the decision on their funding is how much the business enterprise sector contributes for their implementation. If the technology agency were to assume its role in full, some of these projects would be transferred there, which we at the ARRS would be happy to support.

The previous call for proposals for programme funding, which is of key importance for the work of research institutions, was adopted immediately before the creation of your agency. This means that you are now facing this process for the first time, and we may assume that this is also the biggest challenge the ARRS has faced to date. Have you been preparing for this for a long time?

Of course. The result of our work is now visible to everyone in the call for proposals published last Friday. Very detailed application forms are available on the internet and there is also a description of the methodology of the evaluation procedure. It is the scientific excellence and the relevance of these programmes that will be evaluated above all. The history of the programmes will be reviewed, how they have worked to date, what scientific advances the members of the programme groups have made, and what these programmes have contributed – and what they are expected to contribute – to the overall development of Slovenia. The questionnaires for the evaluators have been drawn up following the British model, with very descriptive evaluations. They will also evaluate what a given programme group intends to do – what scientific breakthrough it is planning and how it imagines it will incorporate itself into the economic or cultural development of Slovenia. The evaluators will receive a chart showing the work of the programme group over this five-year period: what they have published, how they have been cited, how much funding they have obtained from the business enterprise sector, how much from Europe, what have individuals from the group contributed to this. Outstanding publications will be particularly highlighted. An important new feature is that in the evaluation we will encourage the interconnection of institutes and universities in such a way that the programme groups of institutes whose members teach at universities will score higher, and similarly programme groups from these spheres at universities will also be stimulated. Since we wish the evaluation to be as objective as possible, last year we asked public research institutes (PRIs) to evaluate their own programme groups themselves, and we have received some very interesting and comprehensive documents. Self-assessment, which is also a very important technique in other countries, has been tackled by PRIs with the utmost seriousness and in very inventive ways. Some institutions, for example, have even involved some of the very distinguished experts from other countries with whom they collaborate. We believe that this will give a clear picture that will enable an objective evaluation.

What will your main intention be in classifying programme groups?

This process will send a message to the research sphere, and the main part of

this message will be that the evaluation of programmes is extremely important, and that those research groups that we believe will continue to be topical for at least ten years or more should share in these funds – as set out in the Regulations. The first programmes are celebrating their tenth anniversary at this moment, since two programme periods are already behind us. It should be stressed that programmes are not five-year projects. It is about having an instrument that provides researchers in a given sphere with long-term stability and, consequently, continuity of research in a given sphere.

But they are re-evaluated and re-verified each time?

Yes. This year the programmes will be evaluated again. Some will be cancelled and some will be re-admitted. But the bulk of them will of course be these programmes that are already in progress. The main result of the evaluation will not be so much more or so much less money, but the stability of the contract. Approximately a quarter of programmes will get a contract for six years, while roughly the same share will get a contract for five, four or three years. Up until now, all of them have had five-year contracts.

Why have you introduced these differences and what will happen to those programmes whose contracts are due to expire in a few years?

There are two reasons for this decision. The first is that a great deal of funds are involved in programme funding, and so it does not make sense to make decisions on the long-term distribution of these funds all at once. It is better to wait and see how things develop. On the other hand the quality evaluation of 300 programmes in one year represents an enormous organisational burden for the ARRS – quite apart from the fact that we also have other calls for proposals and calls for tenders. Now after a lapse of three years we are going to have annual evaluation and this will also enable greater flexibility if specific additional funds appear for programme funding. As regards the expiry of contracts, these programmes will of course have every chance of having their contracts extended, but before that they will have to go through the application and evaluation programme again.

What will be the share of foreign experts in the evaluation?

We will present all the collected documents to foreign reviewers, and they will also be present at the public presentations held by all the programme groups. This will also be an opportunity to promote Slovenian science. There will be around 70 foreign evaluators.

When is the evaluation process expected to be complete?

We plan to start the presentations in the middle of the year, and the final decisions will be taken after the summer holidays.

Will the evaluation you have described be significantly more expensive than the evaluation to date?

Because of the presence of foreign evaluators the evaluation will certainly be slightly more expensive, but this is unavoidable if we wish to be comparable with other European countries.

How comparable are we with others in terms of the quality of Slovenian science and also with regard to the money that science receives from the State?

With regard to money, it is well known that we are still lagging behind in terms of the percentage of GDP for research and science. With 1.5 % of investment in science we are still a long way from the target of 3% of GDP we have set ourselves in accordance with the Lisbon Strategy. And judging by the growth trend to date, we will not reach this target for many more years. We can also say that for the time being the business enterprise sector has more understanding than the State does with regard to investment in research. On the other hand, as regards the quality of our research, we can be quite pleased with ourselves. According to our analysis – and this is another of the agency's jobs – there has been an extraordinary jump in the quality, scientific production and relevance of Slovenian researchers over the past five years. In terms of growth in the number of publications and citations we are above the European average, and the situation is similar with regard to the growth in the number of patents and the obtaining of funds on the basis of contracts with the business enterprise sector. Here, too, we are well above the European average and are even among a small group of countries with the highest growth of this type in the world.

Are these growth results so good because we were so bad before? How do we score if we measure achievements and not merely growth?

It is true that we are still well below the European average, but at this pace of growth we will catch up quickly provided that the public funds earmarked for science also begin to grow significantly more quickly. I believe that after this year's evaluation of programmes and the presentations of the work of the programme groups, the quality of our science will be even more visible.

TIA – Slovenian Technology Agency

Sandra Stermšek

"The Government of the Republic of Slovenia founded the Public Agency for Technological Development of the Republic of Slovenia (TIA for short) to perform specialist, developmental and executive functions in the sphere of promoting technological development and innovation.
We work in accordance with the adopted national research and development programme and other national programmes in the sphere of technological development and innovation. We are the executive institution for the implementation of programmes and measures designed to encourage competitiveness and technological development and for the promotion and encouraging of a culture of innovation. Our agency is also a member of the European Network of Innovation Agencies (TAFTIE) and participates in international projects. The main function of the TIA is above all to encourage connections and the transfer of knowledge between knowledge institutions and the commercial sector." This introduction to the TIA was provided by Dr Franc Gider, the Director of the TIA. Our conversation with him is reproduced below.

Dr Franc Gider, the Director of the TIA

The Agency is becoming an increasingly important executive institution for the achievement of the objectives set in strategic programming documents such as the Resolution on the National Research and Development Programme for 2006–2010 and the Strategy of Development of Slovenia for 2007–2013.

That is true. The TIA has greatly strengthened its role as the leading executive institution in the sphere of technological development and innovation; the total value of the six public tenders envisaged in the agency's Programme of Work and Financial Plan for 2008 is around 75 million euros.
As well as the documents you have mentioned, there is also the framework of economic and social reforms to increase prosperity in Slovenia, the Lisbon Strategy, the Programme for Promoting Technological Development and the Information Society for 2007–2012 and the Programme of Measures to Promote Enterprise and Competitiveness 2007–2013.
The fundamental mission of the agency is to connect Slovenia's economic and research potentials in order to raise the country's level of technological development and innovation in the direction of intensive and sustainable economic development and higher economic growth. The basic mechanism of the TIA involves technology/innovation programmes or instruments implemented in conjunction with the Ministry of Higher Education, Science and Technology, the Ministry of the Economy and the Ministry of Defence.

Your main action programmes include direct incentives for joint development/investment projects.

Here I should mention the "direct incentives for joint development/investment projects" instrument, which is partially co-financed by the European Union, from the European Fund for Regional Development. This instrument will be implemented within the

context of the Operational Programme for Strengthening Regional Development Potentials for 2007–2013. Within the context of the instrument, the TIA, in conjunction with the Ministry of the Economy, will co-finance joint development/investment projects of enterprises representing the development of a new product or service or the development of a significantly improved product or service with higher added value. Support will be given to the R&D activities of enterprises and related investments in R&D equipment and the highly complex technology and equipment necessary for the successful implementation of test production and the collaboration of enterprises with research groups on R&D activities. The purpose of the instrument is to encourage enterprises to increase investment of their own resources in development in the direction of technological development and innovation in order to strengthen their competitive position on European and foreign markets, and to forge connections and develop collaboration with research groups.

This also includes incentives for R&D projects.

The "strategic R&D projects" instrument is partially co-financed by the European Union, from the European Fund for Regional Development. The instrument will be implemented within the context of the Operational Programme for Strengthening Regional Development Potentials for 2007–2013. The purpose of the instrument, which the TIA will implement in conjunction with the Ministry of Higher Education, Science and Technology, is to support R&D projects:

- which correspond to the development priorities identified by national technology platforms and/or
- which show a connection of the project to the strategic plan of an enterprise or group of partners on collaboration with partners abroad, or a connection with ambitions to implement important R&D activities in conjunction with international partners who are trend-setters in a specific sphere or represent a major R&D connection that will enable the further economic growth of the Slovenian partners and/or
- which show a connection of the project to the strategic research plans of the European technology platforms identified in the 7th Framework Programme for research and development.

Your agency also provides support to young researchers from the commercial sector via the "young researchers from the commercial sector" instrument, which is partially financed by the European Union, from the European Social Fund.

The instrument will be implemented within the context of the Operational Programme of Development of Human Resources for 2007–2013. The additional funds from the European Union will enable a significant increase in the annual number of new young researchers from the commercial sector in comparison with previous years. While in the past two years the status of young researcher from the commercial sector was approved for 56 candidates each year (and for a total of 233 candidates in the period 2001–2006), it is envisaged that in the period 2007–2010 the status of young researcher will be approved for 130 candidates each year. The subject of the instrument, which the TIA will implement for the Ministry of Higher Education, Science and Technology, is the co-financing of the costs connected with the research work of young researchers from the commercial sector until they obtain their PhD. The more specific purpose of the instrument is to enable young researchers to obtain quality experience through working on basic research for the needs of the commercial sector during postgraduate studies leading to a PhD – experience which will equip them to face the challenges in the commercial sector when they have completed their studies.

In conjunction with the Ministry of Higher Education, Science and Technology, the TIA supports the activity of technology platforms representing a forum for collaboration between the commercial sector and the scientific research sphere.

The company Optotek d.o.o. produced the prototype LIDARJA to detect chemical and biological agents, as part of the TP PEACE project "DALJDET"

The emphasis in the activity of technology platforms is above all on their active inclusion in European technology platforms.

You are also implementing the TP MIR technology programme, through which the Ministry of Defence aims to encourage the commercial sector in Slovenia to participate more actively in the development of military technologies.

Here it is important that these technologies also have a civilian component, which is apparent in the sphere of protection and rescue in the case of natural and other disasters. Enterprises will also be able to use many findings of research projects in their own products and services which they offer on the market. Through the implementation of the programme, an increase in investments in R&D on the part of enterprises is expected. New jobs are envisaged in the projects, and the establishing of connections between the commercial sector and knowledge institutions will strengthen Slovenia's technology hinterland. The project implementers will also be able to take part in the programmes of a number of European institutions (e.g. the European Defence Agency (EDA), which is expected to provide a boost to Slovenia's reputation in the international environment.

Your programme definitions also envisage co-financing of the work of organisations supporting innovation activities.

In conjunction with the Ministry of Higher Education, Science and Technology we aim to foster a supportive environment for those who are active in the sphere of innovations, in such a way as to help them development and protect innovations and put them to use.

The TIA is also active in international projects. In most cases these are projects financed by the European Commission and related to the development of new methodologies, policies and instruments to promote technological development.

In 2008 the TIA is taking part in several international projects, including two in which it is particularly active.

The first of these is VALOR. The TIA is one of fifteen partners from all over Europe involved in this project. The aim of the project is the preparation and testing of a methodology for the more efficient transfer of technologies and knowledge to the market, known as the "valorisation process". On the basis of experience and recommendations, we will try to realise between 30 and 45 pilot examples of the commercialisation of knowledge in the participating countries, with the help of national calls for proposals and international criteria. The financially supported projects will have the opportunity to grow on the market and will also be eligible for the other services of the support environment in the individual country and in the EU for which they were not eligible during the pre-seeding phase.

The second project is STARNETregio, in which the TIA is one of twelve partners from Italy, Croatia and Slovenia. The objectives of the project include increasing the influence of regional actors from the technology sphere in the "sea economy" sector on the development of the sector. The result of the project will be a joint European action plan to increase regional economic competitiveness. The four-phase project identifies a cluster of actors in the sea economy sector (knowledge institutions and enterprises), analyses the regional development plans of the participating coastal regions (Friuli Venezia Giulia, Slovenia and Rijeka), formulates proposals for knowledge transfer instruments and prepares a joint action plan to improve the process of integration.

As regards the activity of the TIA in the future, I would also like to mention our efforts, in conjunction with domestic and international partners, to develop new services connected with the promotion of technological development in Slovenia.

EUROSTARS Aleš Mihelic,
Chairman of EUREKA and General Director of the Slovenian Ministry of Higher Education, Science and Technology

New era for EUREKA

International Press Centre, Résidence Palace, Brussels

Brussels
2 October 2007

eurostars

The Slovenian Science Foundation is a not-for-profit national institution intended to accelerate and promote science and research.

The Slovenian Science Foundation in 2007

Dr Edvard Kobal

The most important Slovenian organisations from the fields of science and higher education, industry, trade, banking, media and the civil sector, as well as the Government of the Republic of Slovenia, were founder members of the foundation in 1994. Their founders' roles ensured the institution's successful start, which has been the basis for its ongoing respect and presence within Slovenian society. The foundation's membership in the European Science Foundation, the European Foundation Centre and in the European Science Events Association proves its pro-European orientation; co-operation with the World Federation of Scientists, as well as with specialised organisations of the United Nations (UNESCO, UNDP), further proves its participation in global affairs.

From 1994, new donors to the foundation have included those organisations which realise their responsibility towards the development of the environment in which they operate and on which their business success co-depends. Since 2007, such organisations have been able to acquire the title "Institutional Friend of the Slovenian Science Foundation" on the basis of their annual financial support.

Since 1998, individuals who help the foundation to realise its annual (and longer) programmes through their donations in the form of financial contributions or works of art, as well as through their volunteer work, have also been joining the circle of friends of the foundation.

In the forefront of the efforts of the Slovenian Science Foundation are its efficient responses to the varying needs of all active generations of Slovene researchers, as well as young people in education who are interested in occupational research activity. The foundation is aware of the power of the ideas, knowledge and experiences of Slovene researchers, and also of their ability to change the world and to co-shape history. Therefore, it encourages organisation of financial to assure financial support, encourages public-private partnerships in science, and rewards researchers who are the authors of promising ideas and proposals for problem-solving. The foundation strives to respond differently from the public organisations in Slovenia that offer institutional support to Slovene researchers. The foundation

Dr Edvard Kobal, Director of the Slovenian Science Foundation.

offers independent financial support to researchers and to young people in education for their personal growth into competent researchers, as well as for their development within the international scientific community. The purpose of independent support to Slovene researchers is Europeanisation of an image of the researcher, broadening their knowledge and abilities. The foundation strives for a more durable connection of researchers from academic environments (universities, research institutes) with their more frequent clients i.e. economic and other kinds of organisations. The foundation also aims to connect researchers at home with their compatriots operating abroad and with researchers from other countries.

The Slovenian Science Foundation aims to meet the needs of development in all fields of science, including new areas: we cannot turn back time and limit the growth of knowledge. Further, the foundation is aware of the necessity of broadening its portfolio because of the needs of the researchers regarding content, as well as the financial resources that can favourably influence the scope of new scientific findings. The foundation aims to reward the developers of interesting ideas – the researchers. To ensure this, it connects economic organisations, and specialised international and supranational organisations alongside citizens, into financial schemes within the framework of funds which assure independent financial support for Slovenian researchers.

The foundation has been developing institutional support of a financial nature since its establishment in May 1994. The oldest types of support to Slovenian researchers and students are defined in the foundation charters; those developed later, however, are defined in medium-term strategic documents and rules. Until 1998, the majority of financial resources for investments in people were assured by the state budget. Since 1998, however, they have largely been assured by the private sector and foreign, mostly international, organisations. Due to this change in the financial environment, the support of the Slovenian Science Foundation has become effectively independent and thereby a direct contribution "for more science in Slovenia". Slovenian researchers have gained a "second chance to assure financial support for their personal growth by means of advanced scientific study abroad or active co-operation at scientific meetings or within the framework of the projects of the European Science Foundation". Without the financial schemes of the foundation, the market for financial support for researchers and young people in education would have become even poorer.

The Slovenian Science Foundation is a grant-giving and programme-running organisation. Along with financial support, it also plans and delivers a programme of promotion and popularisation of science and, in this manner, raises awareness among citizens of the Republic of Slovenia of the developmental role of science and research in modern Slovenian and European society.

The foundation promotes science and its creators – researchers of all active generations – by organising one-day or several-day events, such as the traditional annual Slovenian Science Festival, Noordung Forum, and Thanksgiving Day, for donors, sponsors and friends of science. The foundation also co-operates in European events, such as the European Science Festival, the Night of European Researchers, etc. The foundation educates Slovene researchers and teachers in communicating science, and in planning and managing research projects. It provides the Slovenian market with original scientific and popular science publications as well as guidance literature. At the same time, it assists Slovene researchers in editing such works for various publishers.

In 2007, the foundation ended its first five years of co-operation with the World Federation of Scientists; it also organised the 6th Noordung Forum and the 13th Slovenian Science Festival, with international participation and the motto "Joy with Science for All Generations". At the annual festival of science, the foundation celebrated 300 years from the birth of the natural scientist and doctor Carl von Linné, 150 years from the death of the "universal innovator" Josef Ressel, 130 years from the birth of the Slavist Rajko Nahtigal, and 115 years from the birth of the visionary on space travel and living in space, Herman Potočnik Noordung.

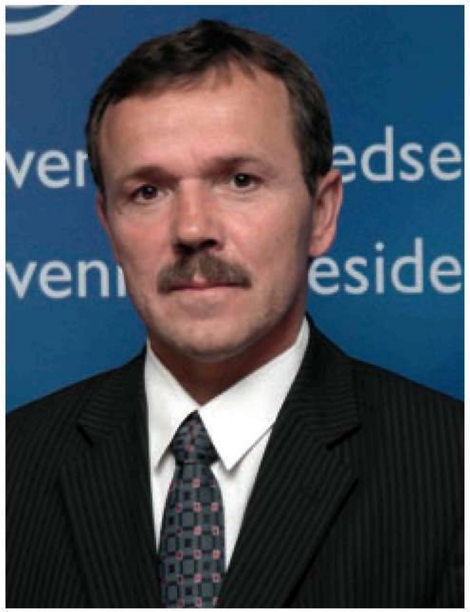
Joy with science 2008

Research and Development Activities at the Ministry of Defence of the Republic of Slovenia

Franc Pojbič

Slovenia has traversed a long path from independence to full membership of NATO and the European Union. At the beginning of last year it adopted the new common currency of the euro, and in the first half of this year it is holding the Presidency of the European Union. All these have been extremely important steps taken by the Slovenian state, and these steps must also be followed by the development of our defence system, something that has great influence on the possibilities and opportunities for the Slovenian economy and institutions of knowledge.

The purpose of this article is to familiarise domestic and foreign audiences, and especially representatives of commerce and research organisations, with the substance of the research and development activities at the Slovenian Ministry of Defence.



Franc Pojbič, Undersecretary, Head of military technology, research and development division in Ministry of defence Republic of Slovenia.

In the changing security environment, the Ministry of Defence, and thereby in particular the Slovenian Armed Forces (SAF), must constantly adapt to the changes and prepare to carry out various assignments and operations. For this very reason the emphasis is increasingly on systems that enable high technological and security standards and provide for personnel and units a rapid, safe and reliable flow of information and the possibility of effective action.

At the Ministry of Defence we are aware of the continuously increasing importance of scientific research and technological development in the further development of the defence system and defence capacities of the Republic of Slovenia. This awareness is also evident in the ministry's financial plan. More than 5 percent of all defence spending is aimed at research and development, which is considerably more than is envisaged in the Lisbon Strategy. With this proportion of defence spending on research and development, Slovenia is among the top countries in Europe. The average in comparable countries in the European Union and NATO is 1.5 percent of defence spending on research and development.

Headquarters of the Ministry of Defence of the Republic of Slovenia.

Through research and development programmes we are seeking to promote the further development of research and technological development, in line with the modern technological, defence and security challenges, with an emphasis on the defence system and the system of civil protection and disaster relief. In this way we will strengthen the role and influence of Slovenia in the European Union and NATO, and support the development of capacities to ensure peace, stability and security in the international community. It is also important that in common projects we link up with other countries within the European Union and NATO, specifically in fields where Slovenia lacks sufficient knowledge or technology, while we wish to develop

Karel Erjavec, Minister of Defence of the Republic of Slovenia

Promoting and investing in research and development for the defence system and the system of protection and disaster relief is exceptionally important in ensuring peace, stability and security, both within the country and in the international community. The development of defence capacities and innovative technologies is one of the key elements of ensuring effective defence in line with the modern security challenges. The Ministry of Defence of the Republic of Slovenia has for a number of years successfully promoted and cofinanced research and development activities in companies as well as in educational and scientific institutions as part of the MIR technology programme and the Targeted Research Programme of Science for Security and Peace. I am pleased that in terms of the proportion of defence funding invested in research and development, Slovenia is among the top countries of the European Union, since the fruitful research and development activity is at the same time also an opportunity to strengthen the role of Slovenian companies and institutions of knowledge in the defence industry and the standing of Slovenia in the wider international community. The Ministry of Defence will therefore continue in future to support research and development projects in the field of defence, and will strive to facilitate their fulfilment and implementation at home and as part of our international integrations.

Karel Erjavec, Minister of Defence of the Republic of Slovenia.

certain capacities or where in Slovenia we have competitive knowledge which we can share with partners around the world.
Making the field of research and development at the Ministry of Defence as effective, rational and economical as possible is something ensured by the Department for Military Technology, Research and Development, which falls within the Equipment Office of the Logistics Directorate. The area of research and development is regulated by special Rules on research and development activities at the Ministry of Defence.
Research and development activities at the Ministry of Defence comprise activities categorised into four basic areas.

First area:

These are what are called the Target Research Programmes "KNOWLEDGE FOR SECURITY AND PEACE" in the period 2006 to 2010. This programme finances basic research, the results of which are a public good, meaning that they are exploited and applied not just by the defence sector for the purposes of defence preparations, training and enhancing, logistics and command and control support, but also by other institutions as a source for the preparation of textbooks, laws, regulations and similar. Moreover through the realisation of projects via TRP PEACE (CRP MIR) we are raising the quality of scientific work and increasing the competitive ability of Slovenian institutions of knowledge for the needs of the domestic and international environment.

A cooperation agreement for the PEACE Technological Programme (TP MIR) was signed by the director of the Slovenian Technology Agency (TIA), Dr Franc Gider, and Franc Pojbič, Head of the Military Technology, Research and Development Division at the Slovenian Ministry of Defence.

DEVELOPING A MODEL OF PREVENTION AGAINST STRESS AND A SYSTEM OF PSYCHOLOGICAL HELP IN THE FIELD OF PROTECTION FROM NATURAL AND OTHER DISASTERS

Matija Svetina, Robert Masten, Matej Tušak, Maks Tušak
Faculty of Arts and Faculty of Sport

In this project, interest was focused on researching the organisation of models of prevention against stress and offering psychological help in Slovenia, and also on seeking possibilities for establishing the most appropriate model in education and training for rescue and relief workers at the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (URSZR). The method in the project involved three major steps which were sequential in time. The analysis of the existing situation and systems of psychological help comprised an analysis of literature and experience at work and in organizing relief workers in the system of protection in Slovenia and in certain European countries. We were interested in an analysis of the existing situation, which includes analysis of the issue of stress and confronting stress, analysis of literature in this field, analysis of written and current issues in the area of preparing for stressful events and actions, and the impact on the effectiveness of carrying out such assignments, analysis of training programmes for people to react in crisis interventions and stressful events, and preparation of people for participation in relief work in actions where they encounter fatalities etc. In line with the research we also delved into the organisation and implementation of relief worker education programmes for the area of prevention against stress and offering psychological help to those affected. Throughout the period of the project we held seminars and workshops on the topic of stress and methods of confronting stress for different groups of relief workers and employees at URSZR, by means of which we obtained research data. As a final step we envisaged the elaboration of a model of psychological help.

The extensive research involved the participation of representatives of the forces for protection, relief and assistance working in the field of civil protection and disaster relief in the entire territory of Slovenia. Testing was conducted regionally by groups of relief workers. This involved 408 representatives of the firefighting rescue service, 46 representatives of the ambulance service, 85 emergency phone (112) operators, 30 mountain rescuers, 19 cave rescuers, 27 canine rescue service personnel and 95 underwater rescuers, giving a total of 710 rescue workers, of whom 656 were male and 54 female. Testing tools included an array of the following psychodiagnostic tests: Critical Incident Inventory – CII (Beaton, Murphy, Pike, & Jarrett,1995), General Health Questionnaire - GHQ-12 (Goldberg, 1972), General Perceived Self Efficacy – GPSE (Schwarzer & Jerusalem, 1993), Big Five Inventory - BFI (John, Donahue & Kentle, 1991), DRS-II – Dispositional Resilience Scale (Sinclair & Oliver, 1989), Coping Response Index – CRI - scale (Billings & Moos, 1981) and a short questionnaire relating to the work of the rescue and relief workers. Testing took place from March to July 2006. Testing was conducted at the headquarters of the competent services and was mainly allocated by regional location. Testing was by prior appointment (telephone notification and prior arrangement) with the leading representatives of the protection, relief and assistance forces. Testing was conducted mainly in the afternoon. The time required for completing the psychodiagnostic material was 30 – 60 minutes (depending on the individual) and was not limited. In order to satisfy the standards of the psychological code of practice and the personal data protection act, those being tested did not give their names and surnames, but just a code. The research highlighted many specific problems and the stressfulness of the situation in individual groups of relief workers. Based on the results we can conclude that in further work with relief and rescue workers, special attention should be given to firefighters, 112 phone operators, members of the ambulance service units and mountain rescuers, and in particular older relief workers and those who have served for a long time.
A closer analysis confirms the problem of confronting stress and the damaging consequences of stress in all groups of relief workers, but most prominently among firefighters, for whom there is all the greater need to formulate a programme of work in the area of coping with stress, which leads to the issue of guided coping strategies (e.g. making up work plans, seeking solutions, weighing up decisions etc.). The situation is very similar for mountain rescuers. Firefighters suffer most frequently owing to the "causing of trauma to self", contact with "multiple instances of victims", "medical trauma", contact with traumatised children and to some extent also owing to questionable tactical operations. "112 operators" are most exposed owing to problematic tactical operations and contact with children. Mountain rescuers need special attention owing to the danger of their own injuries and medical trauma, and members of ambulance units owing to contact with multiple instance victims and the possibility of their own traumatisation. Equally, for instance, we have found certain differences between the genders (women, for instance, deal with stress better, but it leaves them more drained). For male rescue and relief workers we propose the encouragement of possibilities for emotional emptying, in other words methods of reducing tension.

These characteristics, together with the experiences of workshops and conversations with relief workers, have dictated the establishing of a proposed model of psychological help for relief workers. In the proposal we set out two variants of the model, one more complex, which presupposes a more broadly organised system of help via three routes. There is the preventive organisation of workshops for relief workers, heads and the psychological counselling service for counsellors in the field, and the organisation of seminars for acquiring knowledge to hold debriefings. This is followed by support for relief workers in terms of debriefings by activity, and the organisation of psychotherapeutic support for relief workers after traumatic events or with serious psychological consequences. Finally we also propose activities in the field in the event of large-scale disasters, comprising debriefing for relief workers and psychological first aid for those affected in the form of talks with psychologists in the field. In the proposal we also set out the time frame for establishing the model of psychological help and proposed topics through which we could keep up the continuing education of relief workers. Topics include continuing the issue of stress and methods of coping with stress and forms of self-help, learning and the ability to coordinate debriefings, cases of resolving stress situations in practice and seeking solutions to the problem, team work and communication in a group and the psychological characteristics of experiencing disasters (loss of life, making sense of it, self-image, characteristics of group behaviour and aggressiveness) and other psychological topics.

The results of the project can be measured through the implementation of year-long seminars and workshops on stress for relief workers, via the qualification of relief workers for the first form of self-help with stress, through extensive seminar material which the group has prepared for all participants, an audio CD with psychological preparation for stress, which is available to all employees, and the conducting of extensive research, which has covered more than 700 relief workers and offered many results that have served as a framework for the proposed establishing of a model of psychological help for rescue and relief workers at the URSZR.

Work on validation of the development project (whether it has been executed according to regulations).

TRP Knowledge for Security and Peace 2006-2010

MOTIV

The report produced and delivered is the result of a research and development project under the Target Research Programme "Knowledge for Security and Peace 2006-2010", which lasted from June 2006 to November 2007.

The basic purpose of the project was to study the existing system of education in the Slovenian Armed Forces (SAF) and to elaborate a model by means of which we would gradually introduce a more integrated, higher quality and primarily a "more publicly valid" system of education in the SAF, specifically in the light of tertiary education.

In the development sense, we wished through the project to contribute new knowledge and systemic solutions in the area of modelling the link between different types and methods of education and learning at various places and institutions, in different life periods of the individual and with varying formal and public validity.

As part of the project we examined the education programmes for non-commissioned officers and officers, the organisation of programmes in the SAF, and the number and structure of participants in military education and training.

In addition to this we also determined the personnel structure, the characteristics of courses for those attending military education and training abroad and the inclusion of foreign teachers in SAF programmes.

Parallel to this we analysed the international comparison of education provided at higher education institutions with selected members of NATO. Here we analysed the courses and how their implementation is organised. At the same time we compared the SAF courses with those of certain higher education institutions, such as the Faculty of Social Sciences (Ljubljana), Faculty of Logistics (Maribor), Faculty of Police and Security Sciences (Maribor), Faculty of Organisational Sciences (Maribor), Koper Faculty of Management (Primorska University), Faculty of Science in the Environment (Nova Gorica) and the Commercial and Technical Faculty (Nova Gorica).

The purpose and applicable value of the project for the SAF was the construction of alternative models of education with public validity in the SAF education system. We studied the selected models in terms of legal frameworks, economic efficiency of the system and the necessary time for introduction of the model in practice. Here we defined in particular the strategy for introducing the "optimal" model. In view of the analysis to date, we need to analyse thoroughly the advantages and dangers in establishing a public higher education institution for the needs of the Slovenian Armed Forces.

Compiled by:
Dušan Sušnik, spec.
Date: 17 December 2007

PROJECT M6-180: MILITARY – CIVILIAN RELATIONS IN SLOVENIA BETWEEN THE TWO WORLD WARS

The attitude of the Slovenians towards the military during the Kingdom of Serbs, Croats and Slovenes – Yugoslavia – and vice versa, the attitude of the military towards the Slovenians has to date been poorly or only fragmentally researched in Slovenian historiography, and for this reason a more detailed and comprehensive treatment of this issue was needed.

The purpose and aim of the project was to provide a historical reconstruction, interpretation and analysis of the attitude of the Slovenians towards the armed forces and vice versa between the two world wars. Scientific findings have been published in scientific and professional articles. As part of the infrastructural project being prepared by the Institute for Recent History, the publication of part of the scientific findings and major documents is envisaged on the Internet.

The project was carried out by 11 experts: Dr Jurij Perovšek researched the attitude of the liberal political camp in Slovenia towards the armed forces in the first Yugoslavia; Jure Gašparič investigated the attitude of the Catholic political camp in Slovenia towards the armed forces in the first Yugoslavia; Dr Vida Deželak researched the attitude of the Marxist camp in Slovenia towards the armed forces in the first Yugoslavia; Dr Ervin Dolenc explored the attitude of intellectuals towards military issues in the first Yugoslavia; Dr Žarko Lazarević researched the role of the armed forces in the economic life of the first Yugoslavia; Dr Petra Svoljšak researched the attitude towards the armed forces after the experience of the First World War; Dr Damijan Guštin investigated the attitude of the armed forces of the Kingdom of Serbs, Croats and Slovenes towards the 2nd military district; Mojca Šorn researched the social dynamic among members of the armed forces and civilian population in Slovenia in the first Yugoslavia; Dr Marko Zajc researched the attitude of the armed forces towards Slovenians in the first Yugoslavia; Dr Jerca Vodušek Starič explored the relations between the civilian population and the military intelligence service of the Kingdom of Yugoslavia in Slovenia during the period of preparation for the Second World War and on the outbreak of war; and Dr Bojan Godeša researched the experience of the capitulation of the Kingdom of Yugoslavia in the eyes of Slovenian political actors following the occupation of Slovenia in 1941.

The project was carried out in three six-month phases, in which the experts performed research work in archive institutions and libraries in Slovenia and abroad, analysed the acquired data and prepared scientific discussions on the issues researched within the project.

The fulfilment of the project helps both professional circles and the public in recognising the character and history of the past attitude of Slovenians towards the military, and in this way, based on the aforementioned historical experience presented by the project, it is contributing importantly to the formulation of the views held by the Slovenian of today regarding the armed forces of the Slovenian state.

Lieutenant Colonel
Asst. Prof. Dr Tomaž Kladnik
Head of the Military Museum of the Slovenian Armed Forces

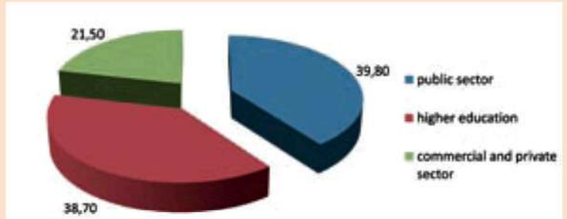
Tanja Korošec

The Target Research Programme

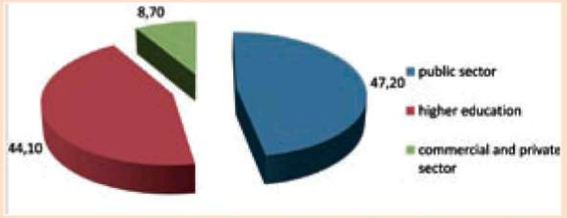
was created back in 2001 as a new system of interdepartmental linking in planning and implementing network research and development projects in individual areas of public interest. The aim of the Target Research Programme (TRP) is therefore to ensure targetted research support in preparing documents for long-term development planning and systemic solutions for their implementation on the national level and by individual, interdepartmental and interdepartmentally defined priority areas, in the monitoring and evaluation of the fulfilment of the fundamental orientations of these documents and systemic solutions and in adjusting or changing their goals and the measures for implementation relative to the changed circumstances in the domestic and/or international environment.

The Target Research Programme finances basic research, the results of which are a public good, meaning that they are exploited and applied not just by the defence sector for the purposes of defence preparations, training and enhancing, logistics and command and control support, but also by other institutions as a source for the preparation of textbooks, laws, regulations and similar. Moreover through the realisation of projects via TRP PEACE (CRP MIR) we are raising the quality of scientific work and increasing the competitive ability of Slovenian institutions of knowledge for the needs of the domestic and international environment.

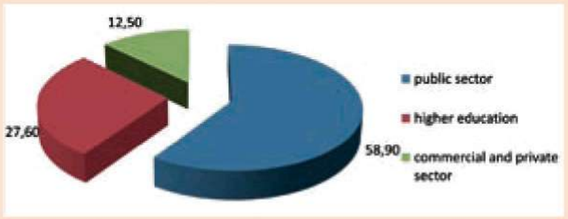
The selection and financing of the research project is tied to a public tender, which precisely defines the research topics and the criteria for project selection within the tendered topics. The first public tender was carried out at the Ministry of Defence in 2004 on the basis of a decision on the implementation and financing of the Target Research Programme "KNOWLEDGE FOR SECURITY AND PEACE" 2004 to 2010, which was signed by the then defence minister and the minister for education, science and sport. After the tender, 55 contracts were concluded with project providers. All the projects were successfully concluded in 2005 and 2006. The total value of contracts amounted to 9,094,000 euros.



TRP PEACE 04: proportions of allocated financial means by sector



TRP PEACE 06: proportions of allocated financial means by sector



TRP PEACE 07: proportions of allocated financial means by sector

The next tender was in 2006 (TRP PEACE 06) and was based on the decision to implement and finance the Target Research Programme "KNOWLEDGE FOR SECURITY AND PEACE" in the period 2006 to 2010, signed by the Minister for Defence Karl Erjavec, the Minister for Higher Education, Science and Technology Dr. Jure Zupan and the director of the Slovenian Research Agency Dr. Franci Demšar. This resulted in 92 contracts concluded in a total value of 15.3 million euros. The contracts run for 1–3 years and are in progress.

This year too, based on the Guideline for preparing the public tender of the Target Research Programme "KNOWLEDGE FOR SECURITY AND PEACE" 2007 (TRP PEACE 07), signed by the Minister for Defence Mr Karl Erjavec and the Minister for Higher Education, Science and Technology Dr Jure Zupan, a public tender for TRP was held in the value of 7,057,000 euros. Of 208 applications received on time, 42 were selected, and these are being implemented. The provider of tasks relating to the implementation and financing of TRP PEACE 06 and TRP PEACE 07 is the Slovenian Research Agency, with which the Ministry of Defence has signed a contract.

Second area:

These are what are called the technological programmes "Technology for Security and Peace" (TP PEACE [TP MIR]) in the period 2006 to 2012. This programme provides subsidies with which we carry out projects for the purpose of helping Slovenian commercial companies and institutions of knowledge to promote the defence industry and increase their competitive ability in the international environment.

Third area:

These are what are called Procurements for development within which the minimal conditions are ensured for technical and laboratory testing of newly developed assets and systems, and user testing on the part of the client. By ensuring funds for research and development projects, we make it possible for the Slovenian Armed Forces, the Administration for Civil Protection and Disaster Relief and other organisational units of the ministry to achieve excellent technical capacities, which are the condition for carrying of its own capacities only in the sense of user application. Through this programme the MOD therefore supports the technological development and scientific research work of those companies that demonstrate an interest, offer attractive product lines and are capable of developing the products that they need. The programme covers all the developmental phases, from analysis, initial studies and conceptualising of possible solutions and on to setting up pilot capacities, their user and technical testing and additional gradual development or improvements to existing capacities.

PURPOSE AND OBJECTIVES OF THE TP MIR PROGRAMME THROUGH 2012

Srečko Jakše

By subsidising projects pursuant to the Decision on implementing and financing the technological programme, signed by Defence Minister Karl Erjavec, Minister for the Economy Andrej Vizjak and Minister for Higher Education, Science and Technology Dr Jure Zupan, the Ministry of Defence (MOD) is striving through promotion of the development of the defence industry to help Slovenian companies and to increase their competitive ability in the international environment. In this way the MOD is contributing directly and long-term to the creation of an adequate and stable defence technology base.
Means for promoting technological development are aimed primarily at development and testing of military equipment, weaponry and systems for the necessary capacities. The MOD has no production of its own, but has several development departments, although it researches or develops and tests military equipment and weaponry as part of the development

GENERAL ASSESSMENT OF PERFORMANCE IN ACHIEVING LONG-TERM OBJECTIVES

The establishing of a different method of collecting proposals, through prior public calls, and a more direct approach to representatives of the commercial sphere and institutions of knowledge, has already yielded results evident in the greater harmonisation of registered projects with the areas under tender, in the greater current relevance of projects relative to the identified needs of the MOD and in a more realistic time frame for project execution. With the introduction of the technological programme, the scope of registered and approved projects has already exceeded some expectations. It has exceeded the previously established practice of procurement. The time for project preparation and decision-making and tender procedures have become significantly shorter. There has been a noteworthy success in that the creation and training up of development units of the Slovenian technological base have also increased the capacity to link up commercial subjects and institutions of knowledge in Slovenia and in the international environment.

PRESENTATION OF THE EFFECTS ON THE ECONOMY THROUGH THE TENDERS HELD IN 2006 AND 2007

On the basis of the Guidelines for the preparation of the public tender in 2006 a tender was held, and on that basis 21 contracts were signed for projects with a total value of 7,958,069.00 euros. The contracts run for 2–3 years. We have not observed any serious problems in their implementation.
Those selected for the PEACE Technological Programme (TP MIR 06) are: 1 sole trader, 5 micro companies, 8 small companies, 5 medium sized companies and 2 large companies.

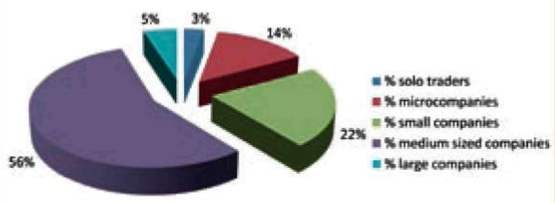
Implementation of the selected projects involved 26 commercial companies, 20 public research institutions and 4 private research institutions. For the needs of project implementation, a total of 20 new jobs were envisaged at contractors.

On the basis of the Guidelines for the preparation of the public tender in 2007 a public tender was held, and on that basis 19 contracts were signed for projects with a total value of 9,641,851.75 euros. The contracts run for 2–3 years.

Those selected for the TP MIR 07 include: 10 micro companies, 2 small companies, 4 medium sized companies and 3 large companies.

MONITORING IMPLEMENTATION OF PROJECTS AND SUPERVISION

Monitoring of TP MIR projects is conducted on two tracks. Those with substantive authority over the project



on behalf of the MOD monitor and confirm the substantive implementation of the project, while TIA contract administrators monitor project implementation from the formal aspect through selected project contractors. For the purpose of project monitoring, substantive managers and TIA contract administrators work in Supervisory and Steering Groups.
Project supervision is carried out on the basis of contractual provisions on the implementation and subsidising of projects, and is performed by authorised persons from the auditing institution, the Slovenian Public Agency for Technological Development and the Ministry of Defence.
In line with our competence and the contract, we have also carried out three announced checks on project implementation at contractors, and we found no significant deficiencies.

ACHIEVING OBJECTIVES AND REALISATION OF FUNDS

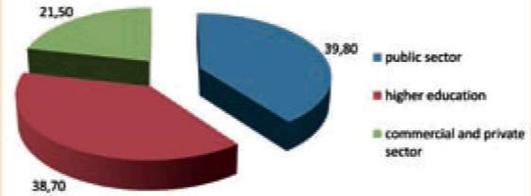
TP MIR 06: By the end of 2007, out of a total of 21 projects, 5 had been successfully concluded. The average level of achieving objectives at the end of 2007 and beginning of 2008 was 69%, taking into account here the financial part of the realisation and the timeliness and achievement of set objectives by project.

The following projects were concluded:

MLAB RKB – Mobile chemical laboratory for detection of poisons, the results of which were presented at the Modern Defence fair at Gornja Radgona.

The project was finalised with a study of technical feasibility by issue: analysis of the needs of potential users, review of comparable projects in NATO, research of various methods of remote detection for individual fields of use, the creation of a functional model, elaboration of a proposed appropriate laboratory system of apparatus and methods for work in the field in conditions of war, in situations of terrorist attack and in ecological disasters, and a definition of technological requirements for apparatus and procedures.

WEBGiSZiR – Study and implementation of a data access system and elaboration of a "Director's IT system".



The aim of the project was to design and develop a single system for access to CPDR data and elaboration of a "Director's IT system", ensuring the basis for use of the spatial information system e-GIS UJME in the overall system of civil protection and disaster relief including outside the protection and relief administration (URSZR), ensuring controlled access to data and providing information on the content of data. In addition to this, the system will allow users to communicate the latest information. In this way the system will be prepared for wider use and linking with other IT systems.

NCeVZiR – Study of vertical interoperability of the content of CPDR plans (municipality, region, country).

The objectives of the project are as follows: analysis of the user needs in connection with the preparation, maintenance and use of plans for civil protection and disaster relief (CPDR), feasibility study for merging data, the interoperability of CPDR content and maintenance of the data system on different levels (municipality, region, country), modelling and elaboration of a plan of integrating processes of collecting and aggregation of data. The results will serve as the basis for the elaboration of an organisational model and then for its implementation for various purposes in different environments.

RFD IS PINK – Development of IS PINK functional add-ons (Information System of Command and Control).

This project involved a technical feasibility study of the use of rapid application development (RAD) methods for the rapid adaptation of information systems to the variable needs of the end user. In addition to this, analytical studies were made, with proposed changes and the development of technological and methodological components of the RAD system. With the aim of detecting all the necessary conditions and given limitations, the analysis of use, and the acquisition and defining of user needs were carried out in three small groups of a real information system with known real end users. Development of the technological components and testing were carried out in laboratory conditions, separate from the operating system.

OSPRVIS – Formulation of standard procedures of developing military information systems.

Systems of command and control have become increasingly reflected in the digitalisation of the battlefield through new capacities such as COP (Common Operating Picture) and COE (Common Operating Environment), and they have brought entirely new methods of work, which have also been clearly reflected in the transformational efforts of the NATO pact, where one of the three main objectives relates to network warfare, NNEC (NATO Network Enabled Capability). The new technologies present considerable challenges for the Slovenian Armed Forces (SAF), since in the coming years the SAF will need to develop battle systems so that alongside functional needs, they also fulfil all the requirements of interoperability. The scope of the task requires from development teams of the SAF a standardised approach to the development of IT systems of command and control, which was the subject of research in this successfully concluded project.

TP MIR 07: In 2007, the first contractual phase of project implementation was completed in all 19 projects, and this related to establishing a Supervisory and Steering Group and coordination and verification of Project Implementation Plans. In individual cases, project contractors have already started their analysis of MOD requirements and their elaboration of proposed final solutions.
The average level of achieving objectives at the end of 2007 and beginning of 2008 was 20%, taking into account here the financial part of the realisation and the timeliness and achievement of set objectives by project.

out defence activities both at home and on missions abroad.

Fourth area:

International cooperation

We are cooperating in the research and development activities of the European Defence Agency (EDA), NATO activities (AC/323-RTO) and bilaterally.

European Defence Agency

Under the aegis of the EDA we are cooperating in the joint investment programme "Force Protection (JIP FP) in accordance with the decision of the Slovenian Government in the total amount of 720,000 euros (the programme is worth 55 million euros and 20 countries are participating in it). The programme is being carried out in accordance with the programme agreement concluded between all 20 countries, and there are no problems in its implementation.

Results of the first tender

With regard to the report of the evaluators and the recommendations, after long and arduous coordination efforts the meeting of the administrative board adopted a unanimous decision in favour of the selection of 5 projects for financing under the first tender within the budget of the JIP FP programme. It is significant that in one of the selected projects (GUARDED-CBRNE DETECTION) which will be financed from the JIP FP fund by the EDA in the amount of 20.1 % the Jožef Štefan Institute of Slovenia is participating. In this way we have ensured Slovenian participation in line with the PA in the nominal amount of 442,859.60 euros. In this way we are on the right track to achieving the 720,000 euros that Slovenia contributed to the fund, since there are three (possibly even four) tenders remaining and there are sufficient opportunities. Alongside Slovenia, this project enjoys the participation of Austria, the Netherlands and France.

Given the cooperation with the EDA and NATO, new opportunities are opening up for the concrete cooperation of Slovenian companies and institutions of knowledge in the European defence industry and NATO projects.

NATO

We are members of the Research and Technology Organization (RTO) and members of the Research and Technology Board with voting rights. Furthermore we are members of all seven panels within the RTO. The actual activities of the RTO are increasingly geared towards specific programmes and projects which will yield direct medium-term or long-term results for the needs of NATO capacities.

Atomic Energy Commissariat (CEA) of France

We are also collaborating with the French Atomic Energy Commissariat (CEA). Also participating in this project are the Ministry of Higher Education, Science and Technology and the Slovenian Research Agency.

PROCUREMENT OF RESEARCH AND DEVELOPMENT PROJECTS AS PART OF PUBLIC PROCUREMENT WITHIN THE MINISTRY

Dr Mojca Videnič

FROM PROPOSAL TO PROJECT INVESTMENT DOCUMENTATION

In line with their own plan of work in the field of R&D, the organisational units of the ministry draw up a list of project proposals, in which alongside the titles there is a brief delineation of the content of the R&D projects, the grounds for the proposed project, the anticipated results of the project and their application at the ministry and the proposed time frame for completion of the project proposal. Project proposals are confirmed by the Committee for the Defence System and the System for Protection and Relief at the ministry. Every year by the end of March at the latest, proposals for the next year must be submitted to the organisational unit competent for R&D. These types of proposals are implemented through all the legally required investment documentation (document identifying the investment project, the investment programme, pre-investment plan) and confirmed as an investment in a development project, which becomes the basis for the implementation of the plan of development programmes (hereinafter PDP). The investment documentation must conform to all the valid legal acts.
The organisational unit competent for R&D then through the substantively documented investment documentation and plan documents proposes to the finance department within the ministry, to the Ministry of Finance and then also to the Slovenian Government the envisaged use of funds within the PDP. When the Slovenian Government approves the PDP, it thereby ensures the funds and the organisational unit competent for R&D can issue a proposed project procurement to the organisational unit competent for procurement at the ministry.

FROM PROJECT INVESTMENT DOCUMENTATION TO PROCUREMENT

In the form of a professional group comprising substantive monitors, a project group and commercial manager, the organisational unit competent for procurement embarks on the implementation of the tender documentation and independently carries out the public procurement in accordance with the legal regulations. The process of public procurement is well established and is conducted according to the already prescribed phases of the Public Procurement Act (ZJN-2), unless the act provides otherwise for an individual type of procedure as follows:

1. preliminary informational notice, where this is appropriate (only in the event that in public procurement it intends to reduce the deadline for acceptance of bids – Article 60 of the ZJN-2) ;
2. a decision initiating the procedure;
3. preparation of tender documentation;
4. publication of a notice on public procurement;
5. submission and opening of bids;
6. review and evaluation of bids;
7. decision on the awarding of public procurement;
8. publication of the notice on the awarding of public procurement.

FROM CONCLUDED CONTRACT TO SUCCESSFUL OUTCOME

A contract is concluded with the selected bidder, and an annexe to such contract is the project implementation plan (hereinafter: PIP). The PIP is an updated document important for the implementation and monitoring of the project, which through phases of the project at certain milestones draws attention to the risk in the project and thus reduces the risk of inappropriate subject of handover and the risk of inappropriate use of funds for the entire time of carrying out the development. Upon every concluded phase the provider must produce a report and deliver the subject of handover to the substantive monitor at the client. This person is competent for substantive monitoring, supervision and confirmation or rejection of each phase of the project. Where an individual phase is rejected by the client owing to

non-fulfilment of the client's demands, the provider must eliminate the faults, otherwise the client may at any time cancel the contract with the provider.
The provider may thus only after successful completion of the phase receive a confirmation from the authorised representative of the client, and on this basis issue a bill for services rendered or for the supply of equipment urgently needed for implementation of the development up to the level of a prototype for the client.
We would emphasise that the finances provided for R&D projects cannot be used to purchase equipment, since the funds are intended exclusively for research and development of technology up to the prototype level. Upon the successful handover of the final phase of development, the provider in cooperation with the responsible user within the ministry carries out technical testing and eliminates possible faults. After education and training, application testing must also be carried out, and this, if it is successful, ensures the successful conclusion of the R&D project.
Some R&D projects are substantively more demanding and require several years. In cases where the time interval for project implementation exceeds the budget year, the organisational unit competent for R&D must renew the annual PDP plan document. This generally happens at least once, immediately after the contract, when the more detailed allocation of funds is known.

SOME EXAMPLES OF SUCCESSFUL RESULTS OF PUBLIC PROCUREMENT

SIGLA project

In 2006 a development project with a prototype simulator for training shooters on the IGLA system was successfully completed for the 9th Air Defence Battalion, which carries out tasks of airspace protection and air defence of units and key facilities important for defence. Training in light portable rocket systems will therefore be easier, more effective and cheaper with the help of the computer managed simulator, which is based on any simulation of events and supervision and control of the response of operator troops.

VIDEOKRAS project

The Slovenian Administration for Civil Protection and Disaster Relief (URSZR) performs tasks of organising the system of monitoring, notification and alarms. Providing a wide variety of information in a given area is based on input information supported by various records and software solutions, including the web application GIS UJME, which was developed via the TRP PEACE programme. In order to secure higher quality acquisition and processing of data and the provision of such data to users in the system of protection from natural and other disasters, it was decided to continue the project via public procurement.
The URSZR thus successfully acquired a modern, advanced video surveillance system, which through more effective methods enables continuous day and night monitoring of the area for fires, and through the development of applications specifically for this purpose it is linked to the existing software in selected monitoring centres. The first part of the project, which was concluded in 2006, physically covers the territory of Postojna and Sežana. In 2007-2008 similar systems are being set up in the area of Koper and Nova Gorica.

INZE KPL project

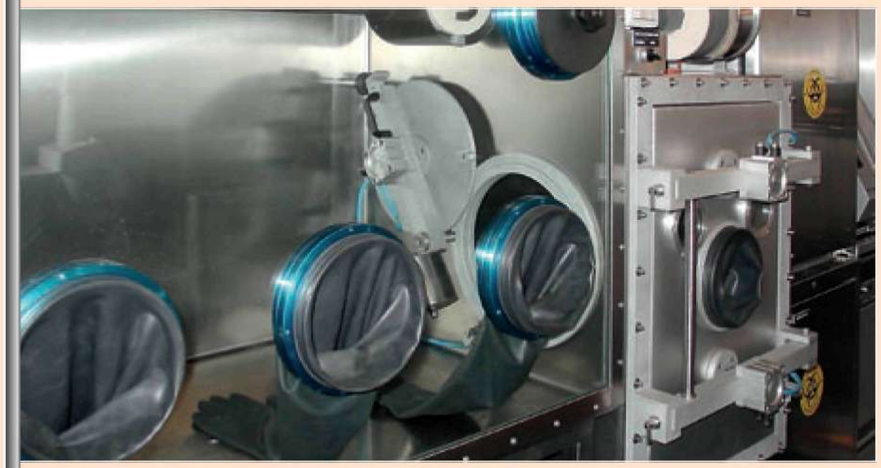
Through the project of Engineering Sets, the title of which suggests a limitation to the supply of equipment, which is not the case, with the help of the provider, who is involved in precision technology, engineering units have acquired modern and efficient engineering non-combat and technical means, or rather have acquired one prototype set of means. Since such assets cannot be purchased on the market and are adapted to special tasks requiring the rapid and safe, and especially timely carrying out of tasks in the area of impeding, reinforcing, ensuring movement and disguising, development was required within the borders of Slovenia. Through development it was possible to pursue the properties of the assets, which are: even more effective, more robust, with even more reliable operation, even simpler modular exchanging of sets and simpler and safer handling. In this way the 14th Engineering Battalion was provided with a prototype set of engineering assets which through funds allocated for equipment can be expanded into the supply of a larger number of sets, which would functionally ensure the successful implementation of the tasks of the individual soldier and SAF units in national defence, the alliance and protection and relief.

RKB URSZR project

Through the development of mobile laboratory equipment for protection from nuclear, biological, chemical and radiological contamination, taking into account the latest achievements in the development of equipment for the work of special purpose forces and analytical work in the field, via a development project the URSZR was enabled to achieve an improvement in the general and specific readiness for protection and relief in the event of military attacks, acts of terrorism and other security risks. Providers developed for already existing mobile laboratories adequate equipment for detecting, analysing and protecting from the effects of weapons of mass destruction. At the same time, methods were developed in parallel for monitoring nuclear, chemical and radiological dangers.

MobiKemLab and MobiBioLab projects

Through the development of a mobile chemical laboratory for detecting battlefield poisons and TIC the 18th Battalion for Radiological, Chemical and Biological Defence of the SAF attained the capacity to operate in the event of the use of chemical weapons and other chemically hazardous substances for military and terrorist purposes, as well as ensuring assistance in the event of accidents with such substances in industrial processes, in storage and transport. The advanced, technically and user tested system enables work in an uncontaminated or contaminated area, in extreme temperature conditions and in the presence of high energy electromagnetic impulses. The platform enables relocation from one location to another in the shortest possible time. This equipment, developed especially for the qualitative and quantitative analysis of samples of substances in solid, liquid or gaseous aggregate state achieves a level of confirmation for presence or absence as well as identification of battlefield poisons and other hazardous chemical substances with a high degree of forensic probability in the results of analysis.
The developed mobile biological laboratory for detection of biologically hazardous substances enables the identification of biologically hazardous substances and poisonous industrial toxic biocompounds, and ensures all other technical capacities as provided by the aforementioned chemical laboratory.
Both laboratories have the additional capacity to make direct communication with the command centre, as well as the possibility of communication with other analysts who are not directly present at the place of contamination.



MobiKemLab

MobiKemLab

MobiBioLab

FROM SUCCESSFUL RESULT TO NEW IDEAS

In 2006 a total of 8 R&D projects ranked as applied research were successfully concluded through procurement via the internal organisational unit competent for procurement, plus 5 R&D projects ranked as experimental development. In 2007 one R&D project ranked as applied research was successfully concluded, along with 7 R&D projects ranked as experimental development. There are currently 10 contracts concluded by 31 December 2007 for which projects will be completed in 2008 and 2009. An additional 16 projects are planned, and these are currently in the phase of investment document preparation or at the stage of tender documentation preparation. The process of procurement is continuous, as is the implementation of results in practice and the sequential implementation of project continuation, so it is important that funds are assured for the R&D field with emphasis on sustainable development.
In accordance with the regulations and internal acts governing the aforementioned areas at the ministry, the publication and promotion of results and data that can be made public is within the competence and responsibility of the organisational unit competent for R&D and the responsible users of projects within their own area of competence.

Not just by our words, they shall also know us by our deeds. (Latin saying)

Slovenia's Protected Areas

By Ana Kristanc

Triglav National Park

- "where eternal beauty takes one's breath away...";
- named after Mount Triglav, the country's highest mountain and a symbol of Slovenia;
- a typical Alpine national park with the highest peaks in the Slovenian section of the Julian Alps, deeply incised valleys, vertical rock faces, inaccessible ravines, rushing water, mixed forest, carpets of Alpine flowers and characteristics of high-mountain karst;
- the European watershed between the Mediterranean and the Black Sea;
- the border between two building cultures: of stone and of wood;
- the country of the emerald river Soča, home to the endemic and threatened marble trout (Salmo marmoratus);
- the first UNESCO-MAB area in Slovenia;
- awarded the Council of European Diploma of Protected Areas in 2004.

Triglav National Park has national importance for Slovenians while at the same forming part of the country's international profile. A variety of activities are constantly taking place in the park and attracting large numbers of visitors. The park also collaborates with other national parks around Europe and is preparing a number of new features and projects. For example, visitors can set off on cycling excursions along various routes or learn something new on the Barje Goreljek nature trail, where they can see how peat bogs form and encounter interesting organisms such as carnivorous plants.
The park tries to connect nature protection, agriculture and tourism. This last is an important sector: in recent years, the park has received between 2 million and 2.5 million visitors annually. Professional guides are available for themed routes and the high mountain area.

The park covers an area of 83,807 hectares. It contains 25 settlements and hamlets with a total of 2,200 inhabitants. More information is available at www.tnp.si

Photo: Matevž Lenarčič

Biodiversity is part of Slovenia's wealth

Biological diversity is a precious resource that is still much undervalued. It has formed over the course of millions of years through evolution and includes all forms of life, from the smallest microbes to the largest plants and animals, our habitats and ecosystems from forests, deserts and wetlands to agricultural land and city parks, and also the reciprocal influences among different living creatures and their connections with the environment. This mosaic of myriad factors that took so long to be created is in itself very fragile, vulnerable and exposed to human influences.

Thanks to biodiversity, we can provide ourselves with various goods and enjoy benefits such as food, energy, materials, products that protect our health, alongside ecological services that are provided by the balance of natural process, such as fertile soil, clean water and air, and the regulation of the climate.

The conservation of biodiversity in Slovenia is linked to the extraordinary variety of ecosystems and landscape models in a relatively small area measuring 20,254 km2. Its main characteristics are:

- the interweaving of the biogeographical regions of the Alps (30%), the Dinaric range (30%), the Pannonian Plain (30%) and the Mediterranean (10%) as a reflection of the interweaving of geological and climate factors;
- variety in climate, geological basis and soil types, and hydrography and hydrology, as the basis of an extraordinary variety of ecosystems;
- about 22,000 plant and animal species recorded, with total estimates ranging between 50,000 and 120,000 (which proves the very great variety in a small area) including endemic and threatened species, which are especially important from the point of view of maintaining biodiversity, and which, taking into account Slovenia's geographical position, occupy a relatively high share of the total;
- the Karst, which covers approximately 44% of the national territory and is characterised by great diversity and endemism of species, and in particular by a relatively high number of subterranean animals in

Photo: Matevž Lenarčič

The importance of parks in Slovenia

Janez Podobnik

Preserved nature is part of the fundamental identity of a country and its population. It is a thing of value in itself, and involves such important components of the territory, and of our national and regional identity, that it is practically priceless. At the same time, it can also be an important resource of considerable economic importance.

Our opportunities for development depend in part on how sustainably we are capable of managing our valuable natural features. Proof that we are capable of this is provided by our sustainable management of forests, which in terms of extent and function are one of Slovenia's most valuable resources.

The production of high-quality food is a very important development opportunity offering possibilities for the development of modern agriculture and an opportunity for the successful marketing of healthy food grown in Slovenia. Parks can help in this, in the development of brands and in providing a recognisable geographical origin.

The greatest economic effect of protected areas cited in literature and in examples of good practice from other European countries is tourism. A diverse natural environment attracts ever more demanding visitors and is therefore an important stimulus to the development of tourism. Tourism and catering in Slovenia generate 9% of GDP and employ approximately 52,000 people. Natural beauty is a key element of tourism in Slovenia and an important point of contact between economic development, nature conservation and environmental protection. More than 30% of foreign tourists come to Slovenia above all because of its natural beauty, 30% of Slovenes spend their free time in natural spaces, and the number of nature-lovers in Europe is growing all the time.

Visits to certain natural sights prolong the tourist season, and, thanks to longer stays by foreign visitors, the circle of activities enjoying the benefits of sustainable development is widening. Protected areas offer the opportunity for conserved nature to become an internationally recognised advantage of Slovenia. It is estimated that the protection of biodiversity indirectly generates four to six times as many jobs as it generates directly. Even property prices are usually higher in protected areas.

However, protected areas are only a development advantage if they are recognised as such, and if development potentials are suitably exploited in the context of development based on the principles of sustainability. The principal operators in sustainable development are the inhabitants of protected areas.

The full exploitation of the development potential of protected areas requires, alongside nature protection, a key role to be played by regional policy, spatial planning policy and economic policy, and also by other sectors. The main task of the state should thus not be weighing up the advantages and costs of protecting these areas, but measures to encourage development opportunities and the training of interested parties for their sustainable exploitation.

The advantage for the local population of a development policy co-ordinated in this way lies, above all, in the pooling of resources from a system of different types of support. The European Union channels many development programmes towards park areas in the form of regional development, support for local communities, agri-environmental programmes, tourism, training the local population for self-employment, nature protection, conservation of cultural heritage, etc.

Parks today are not only active in the sphere of nature protection, they also look after cultural heritage, implement development projects, provide unique opportunities for tourism, educate, and support international promotion of Slovenia.

Janez Podobnik, Minister of the Environment and Spatial Planning

Photo: Matevž Lenarčič

comparison with other karst areas around the world;

- agricultural land covers 33% of the territory and includes a whole range of extensively exploited agrarian ecosystems important for maintaining numerous threatened species and their habitats;
- freshwater and coastal wetlands, which cover only a small percentage (less than 1%) of the territory but which are extremely important for maintaining biodiversity;
- the mountainous nature of the territory with high biodiversity value;
- particularly notable is the high level of forestation – forests cover 62% of the territory and relatively large and self-contained forest ecosystems, which are also extensively exploited, are the habitat of vital populations of large mammals threatened at European level.

However, this richness is threatened: research points to an accelerating fall in the number of plant and animal species in Slovenia. Of the 3,200 known species of pteridophytes and spermatophytes, 330 are on the World Conservation Union (IUCN) Red List of threatened species. Of the 423 known vertebrates in Slovenia, 238 are threatened. Species are threatened above all because of:

- fragmentation of ecosystems and habitats;
- degradation and destruction of the habitats of plant and animal species;
- disturbance of animal species in their natural environment at times of the year that are key for their survival;
- genetic "erosion" and merging of species.

For some decades now, the world has been seeing a strong downward trend in biodiversity (around 50,000 plant and animal species are estimated to disappear from the face of the Earth forever each year). Existing measures to reduce the problem of the loss of biodiversity have long ceased to be sufficient to reverse current trends, and therefore an integrated and internationally co-ordinated approach to the conservation and sustainable use of biodiversity has become urgently necessary. In 1992, more than a hundred countries, Slovenia among them, signed the Convention on Biological Diversity in Rio de Janeiro. The purpose of the Convention was to achieve sustainable development through realisation of the main objectives of the Convention, which are:

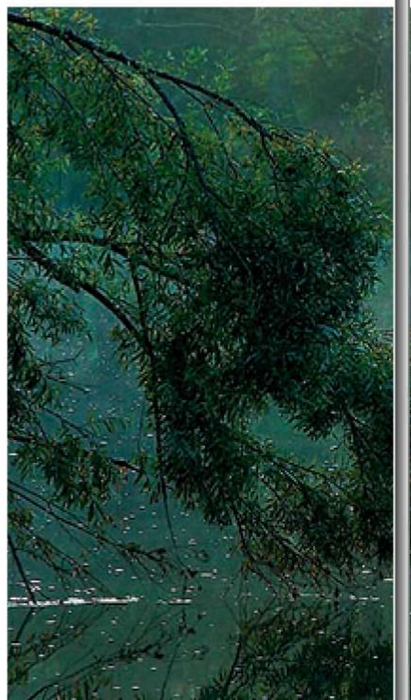
- the conservation of biological and landscape diversity at the national and local levels, and the sustainable use of their components,
- the incorporation of the principles of conservation of biological diversity into all sectors and other levels of the state,
- suitable inclusion of the public in the conservation of biological diversity and landscape variety,
- fair and equitable sharing of the benefits from the use of biodiversity such as access to genetic resources, the transfer of relevant technology and sharing of revenue.

Slovenia ratified the Convention in 1996. By ratification, a State Party also assumes responsibility for its implementation, which also includes the preparation of a national biodiversity conservation strategy including all sectors (forestry, agriculture, fisheries, power, transport, spatial planning) that through their activities have an impact on biodiversity.

Kolpa Landscape Park

- based around the Kolpa, one of the cleanest rivers in Slovenia, with a well conserved riverbed, gravel beds and rapids;
- a gallery of biodiversity and landscape variety with beech woods, a characteristic fern, carefully tended fields and vineyards, cultivated terraces and dolines, old waterside willows, karst springs and thermophilous (heat-loving) plants on the steep rock walls;
- a safe haven for otters within the Kolpa and its tributaries;
- home of authentically conserved living traditions of various local crafts and a characteristic cultural tradition;
- a park with the only strict nature reserve in Slovenia – Hrastova Loza: a stand of beeches with nesting sites of the grey heron (Ardea cinerea).

Kolpa Landscape Park covers 43 km² and contains 28 settlements with a total of over 1,700 inhabitants. More information is available at www.kp-kolpa.si



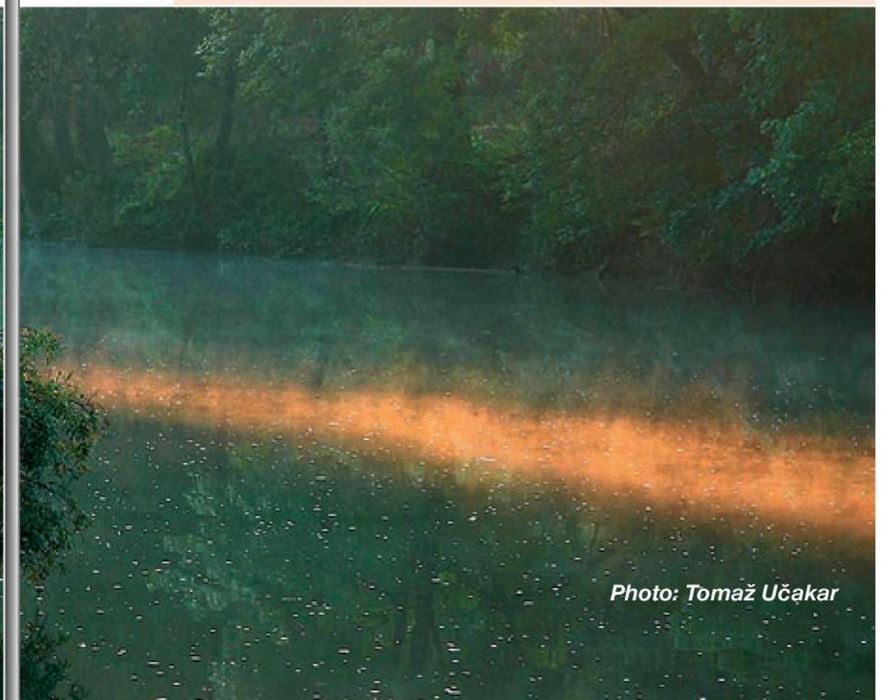


Photo: Tomaž Učakar

Conserved biodiversity guarantees a higher quality of life for the individual and offers resources for development for numerous activities. For this reason, conservation of biodiversity should be in the interest of the majority of people. Thus, conserved biodiversity is a development value, which facilitates, for example, the development of tourism. As a rule, the conservation of biodiversity and other activities seek common interests in protected areas/parks.

The protection of an area is one of the most important and oldest *in situ* nature protection measures. Protected areas create a basis for integrated nature conservation; they are at the same time the hubs of the ecological network and a fundamental element in the conservation of Slovenia's great diversity of ecosystems and landscapes.

In Slovenia, as elsewhere in the world, parks, as extensive ecosystemic wholes, are extremely important for the conservation of ecosystem variety and landscape diversity, while above all supporting sustainable management of natural goods, and thus becoming an increasing opportunity for the basic developmental interests of the local population.

The history of parks in Slovenia

Throughout the world, parks are created to protect biodiversity and the natural environment. In Europe, the first nine national parks were founded by Sweden in 1910. Slovenia became the fifth country in Europe to designate a national park when, in 1924, it protected the area around the Triglav Lakes.

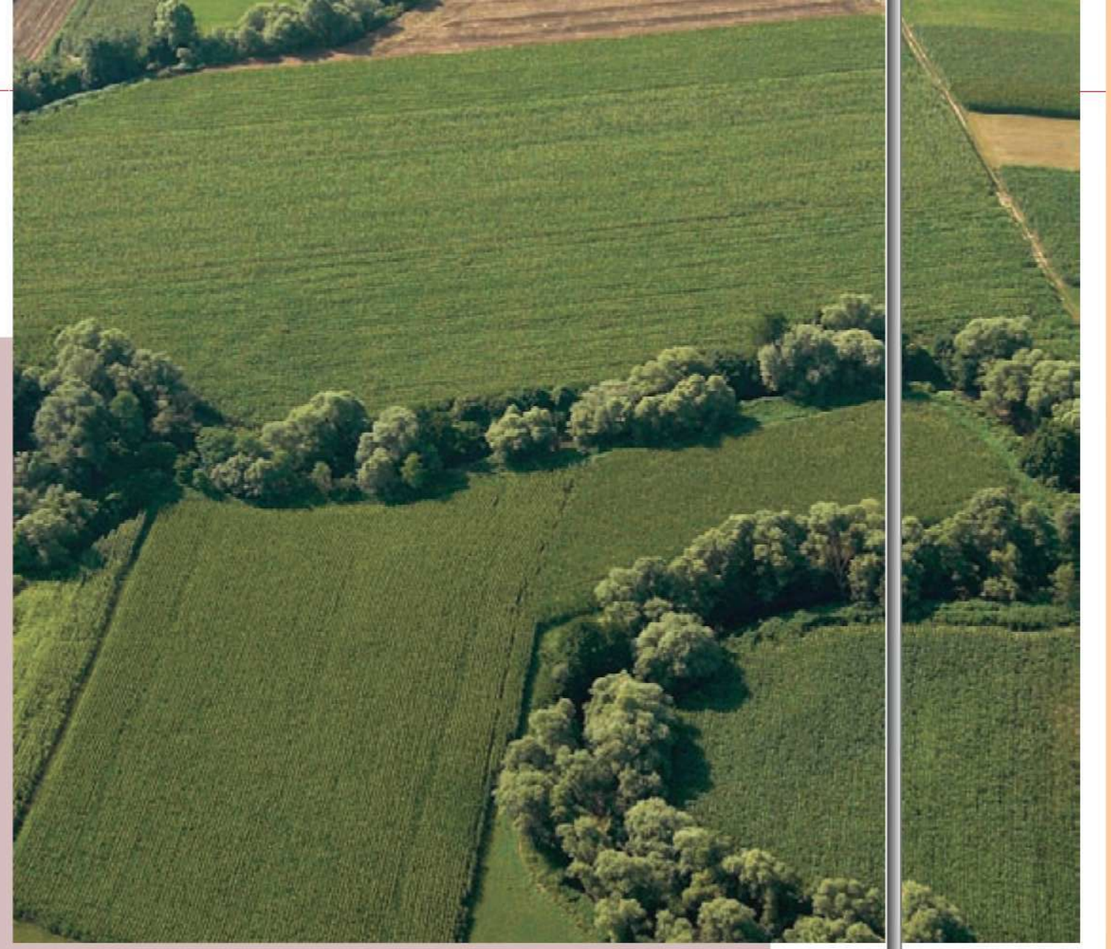
Since these beginnings, the number of protected areas in Europe has constantly increased, so that there are now just under 600 different categories and more than 42,000 protected areas in the Member States of the European Union.

In Slovenia, the Nature Conservation Act divides protected areas into small and large areas and defines six catego-

ries. Small protected areas are strict nature reserves, nature reserves and natural monuments; large protected areas, also known as parks, are national parks, regional parks and landscape parks. While small protected areas are mainly concerned with the implementation of nature protection measures, parks have a considerably broader

Kozjansko Regional Park

- at the point of transition between the stormy Alps and the placidity of the Pannonian Plain;
- a landscape of characteristic hills on the southeastern edge of the Alpine world with a mosaic of fields, orchards, vineyards, flowering meadows, forests and hidden streams;
- a land of many faces with many cultural monuments and ethnological peculiarities;
- an ancient and historically rich area, known in antiquity as Polis norikon, with characteristic settlements atop apparently inaccessible hills;
- contains the thickest oak (Quercus robur) in Slovenia with a trunk diameter of 8 metres;

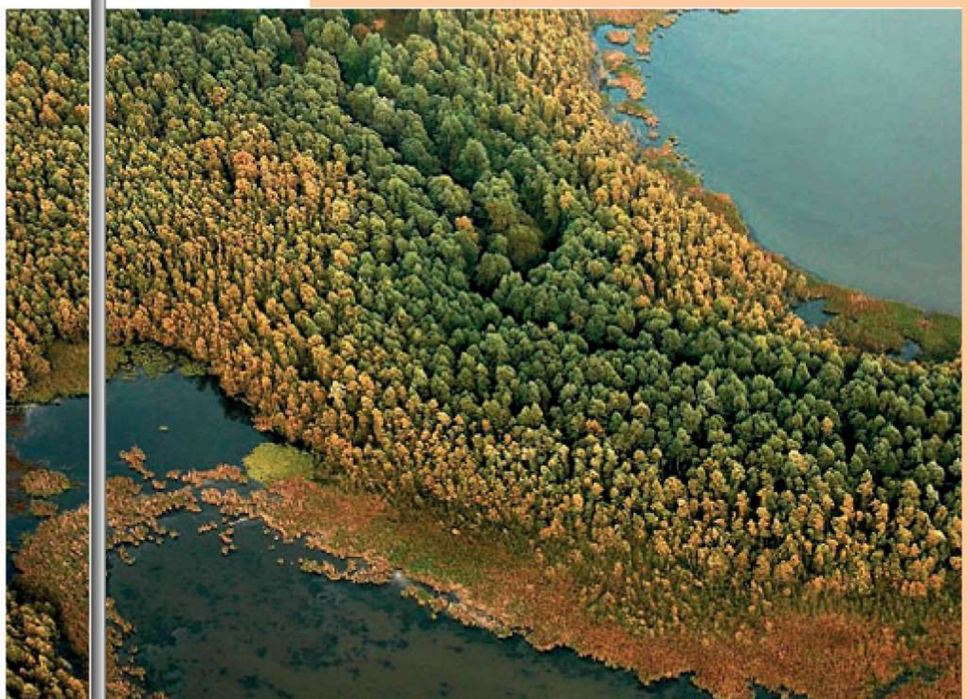


- includes sub-Alpine mountains, hill vineyards, the plains along the river Sotla and varied natural features with a rich cultural heritage The park contains the Rudnica geological trail and numerous other footpaths and wine routes. It also hosts the Kozjansko Apple Festival, an international event presenting organic farms. Podsreda Castle, a centre of cultural and social activity in the wider area, is a famous attraction.

Kozjansko Regional Park receives around 35,000 visitors a year. It extends over an area of 206 km2, and contains 82 settlements. More information is available at www.gov.si/kp

Goričko Landscape Park

- "a pastoral symphony with echoes of the undulation of the Pannonian Sea";
- a trilateral cross-border park straddling three countries: Austria, Hungary and Slovenia;
- a typical dry landscape with the most continental climate and lowest rainfall in Slovenia;
- a splendour of biodiversity with an interweaving of mixed forests, willow groves, dry, wet and extensive meadows, wetlands, old orchards, vineyards, fields and mineral springs;
- a landscape of old field crops: pumpkins, buckwheat, rice, spelt, sunflowers, wheat and barley;
- a landscape with its own traditions;
- one of the most important international areas of migration routes and wintering quarters for birds;



- the area with the most important population of otters (Lutra lutra) in Slovenia.

Goričko Landscape Park, in the northeast of the country, is a protected landscape park. It contains a mixture of cultivated and natural areas, popular with cyclists and ramblers. Goričko boasts many masters of traditional local crafts including thatching, Easter egg decorating, corn fibre crafts, pottery, blacksmithing and crochet-work.

The park covers an area of 462 km² and contains 90 villages with a total of 23,000 inhabitants. More information is available at www.park-goricko.org

role, namely the conservation of the biological wealth of plants and animals and their ecosystems, and also the conservation of landscape diversity. Parks also take into account and facilitate development opportunities for the population, and spiritual relaxation and enrichment of people's lives.

The idea of the park in Slovenia thus follows the "Parks for Life" concept which was supported by the IUCN in 1994. In this concept, parks become centres or models for the implementation of sustainable development, with an emphasis on the economic opportunities that such development offers, above all to the local population.

Protected areas are one of the measures of nature protection. The Nature Protection Act defines the following types of protected areas:

Large:

- A national park is a large area with numerous valuable natural elements and high biodiversity. Nature in its original state, with conserved ecosystems and natural processes, is present in the greater part of the park, while a smaller part of a national park may also contain areas of greater human influence, which is however harmonious.
- A regional park is an extensive area of regionally characteristic ecosystems and landscape with large areas of natural features in their original state and areas where such features interweave with areas where human influence is greater, although in balance with nature.
- A landscape park is an area where the interaction of people and nature over time has produced an area of significant ecological, biological or landscape value.

Small:

- A strict nature reserve is an area of naturally conserved geotopes, habitats of threatened, rare or characteristic plant or animal species, or an area important for the conservation of biodiversity where natural processes take place largely without human influence.
- A nature reserve is an area of geotopes, habitats of threatened, rare or characteristic plant or animal species, or an area important for the conservation of biodiversity which is also maintained through human activity in balance with nature.

Photo: Matevž Lenarčič

Sečovlje Salina Nature Park

- "where culture and a 700-year tradition have shaped an element of natural value, and where the air smells of salt, the energy of the sea enchanted in crystals";
- site of the northernmost traditional salt pans in the Mediterranean, home to 45 threatened Slovenian IUCN Red List plant species;
- because of the traditional salt-making process, used here for 700 years, salt pans feature the "petola", a living carpet cultivated by the saltworkers to prevent salt mixing with the soil, and where salt is collected every day;
- due to the salt, an area of special ecological conditions in which only the most adaptable species live, including numerous halophytic (salt-tolerant) plants;
- an internationally important migration area, nesting site and wintering ground for various species of birds;
- a Ramsar Convention area.

Sečovlje Salina Nature Park conserves the tradition of salt-making. Numerous autochthonous plant and animal species have found their home in it. Every year, the park hosts the Saltworkers' Festival, which illustrates key events in the process of making salt. Artistic events and presentations are also organised, in an effort to conserve the numerous species and habitats in the Šečovlje salt pans. The park contains a nature trail. At weekends guides accompany visitors along the trail free of charge. The cultural heritage of the saltworkers is presented at the Museum of Salt-Making.

The park receives around 27,000 visitors a year and covers an area of 650 hectares – of which 552 are covered by water and 98 are on dry land. There is no human habitation in the park. More information is available at www.kpss.soline.si

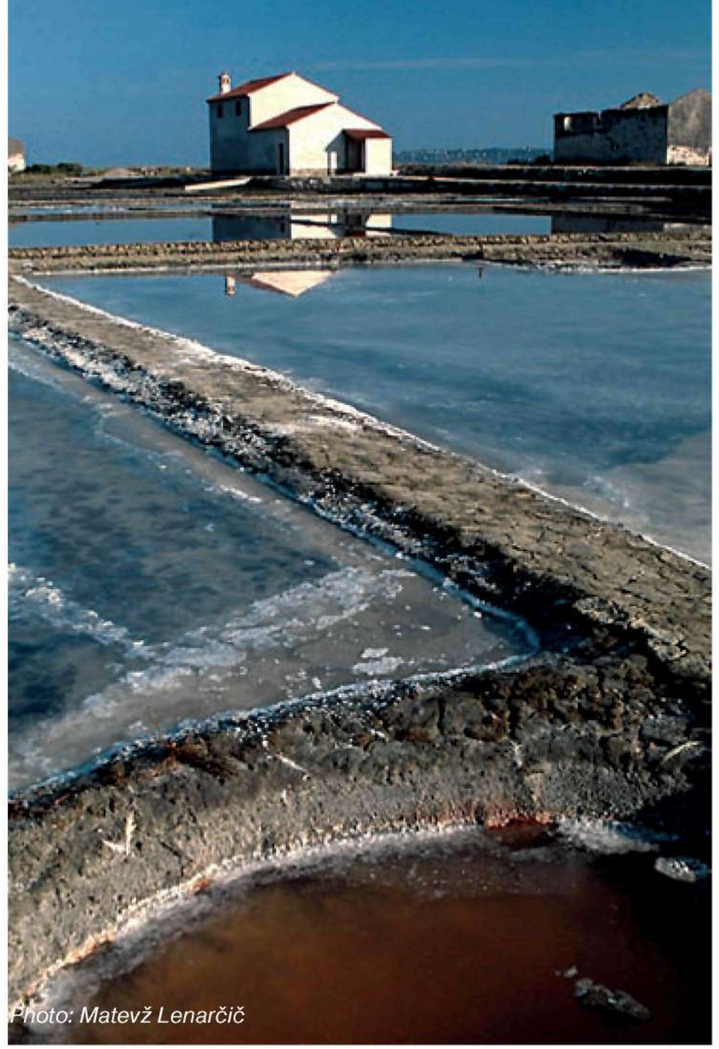


Photo: Matevž Lenarčič

- A natural monument is an area containing one or more natural features that are outstanding in terms of form, size, content or position, or are a rare example of a natural feature.

Slovenia currently has 1 national park, 3 regional parks, 42 landscape parks, 1 strict nature reserve, 52 nature reserves and 1185 natural monuments.
The large protected areas – parks – currently cover 2,300 km², which is more than 11% of the national territory.

Development opportunities in parks

The most naturally conserved areas of Slovenia are located in areas where, owing to natural conditions, development opportunities have been and still are limited, and where it is usually very difficult to envisage alternative development programmes.

In view of the limited opportunities for development of these predominantly agricultural areas, parks are one of the models of regional development and a focus for resources while taking into account one of the few comparative advantages – nature and a unique landscape.

Perhaps this is also because, for the most part, parks lie in areas where development opportunities are very small. There are few jobs and these areas suffer a significant "brain drain" and population exodus in general. It is precisely because of these specific characteristics that municipalities are taking noticing of the development opportunities in proclaiming an area as a park. There is also great potential in tourism, since many Slovenians enjoy relaxing in nature and a large number of foreigners visit Slovenia precisely because of its natural beauties.

Parks are therefore active in the sphere of nature protection, while at the same time contributing to protection of cultural heritage, implementing development projects, providing unique opportunities for tourism, education, and supporting international promotion of Slovenia.

Agriculture in parks

Within the European Union, in the many places in these areas where natural conditions do not enable intensive agricultural production, the future of agriculture is only possible in connection with nature protection (e.g. agri-environmental programmes).

The park is, above all, an opportunity for activities that are tied to local resources (e.g. agriculture, tourism, recreation), both for those directly connected to the park (supervision, guiding visitors) and for those that are encouraged by the presence of the park (complementary activities on farms, diverse tourism-related activities, recreational activities).

The improved possibility of development of these activities also brings help in reducing unemployment and population loss. With suitable exploitation of the concept and attractiveness of the park, and of activities compatible with development, it is possible to create new jobs both inside and outside the park.

In the sphere of agriculture, parks bring opportunities for:

- forming local markets;
- sale of produce under the park brand name;
- complementary activities on farms (park guides, catering, local produce);
- financial incentives for the conservation and maintenance of the landscape.

In the sphere of tourism, an orientation towards ecotourism and other forms of tourism for which a conserved natural landscape represents a priority development opportunity can be successful. Possibilities in this sense include:

- tourism services in the form of farm tourism, small guesthouses, etc.;
- organised recreation and organised recreational infrastructure (more visitors and longer stays by guests);
- marketing natural features.

Other service activities to meet the needs of visitors include:
- park guides;
- hire of equipment, services, reviving traditional crafts;
- additional park infrastructure (nature trails and other specialist trails);
- use of existing abandoned buildings for the needs of the park information network, museums or collections, to help conserve cultural heritage.

Parks and funding

The European Union channels many development programmes towards park areas in the form of regional development, support for local communities, agri-environmental programmes, tourism, training the local population for self-employment and additional qualifications, nature protection and conservation of cultural heritage, etc. Individual Member States have very different direct and indirect forms of funding parks or support for suitable sustainable development within parks or on their margins. In other Member States, such sources include:
- state subsidies;
- international support;
- donations from non-governmental nature protection organisations;
- dedicated funds.

In Slovenia, the funding of parks is tied to the state budget in cases where parks are founded by the Government. This funding is directly intended exclusively for the operation of "park institutions" founded by the state in order to manage an individual park. In this way, the independence of their status is guaranteed, and thus a correct attitude to management which is oriented to the public interest. This method is the same as, or comparable to, that adopted by other European countries. Other resources for the development

Škocjan Caves Regional Park

- a UNESCO World Heritage site, the only one in Slovenia; a UNESCO-MAB biosphere area;
- a symbol of Slovenia's hidden and mysterious underworld;
- a typical karst landscape with all the characteristic karst phenomena and specific vegetation;
- one of the deepest underground gorges in Europe;
- the first recorded underground wetland in Europe, a Ramsar Convention area;
- a labyrinth of underground passages, chambers, shafts, collapse dolines and the disappearing river Reka;
- a rich archaeological area with a famous Bronze Age cult and sacrificial site.

An automatic meteorological station is in operation in Škocjan, monitoring rainfall, wind, temperature and humidity. The park also has a science centre with archaeology, geology and biology collections and a science classroom. The main attraction of the park is naturally the Škocjan Caves, a jewel of the underworld. Other attractions include the Škocjan nature trail and the museum collections housed in renovated barns. The park is also home to bats, which are a threatened group in Slovenia.

The park receives almost 90,000 visitors a year. The total park area includes 413 hectares of protected area and 45,000 hectares of area of influence. The park contains 3 settlements with 69 inhabitants. More information is available at www.park-skocjanske-jame.si

Notranjska Regional Park

- home to the intermittent Lake Cerknica, "the most mysterious lake in Europe", which drains and fills each year;
- the lake was described as "nature's greatest wonder" by polymath Johann Weichard Valvasor in 1686;
- extraordinary biodiversity owing to the cyclical repetition of a changing natural phenomenon: the draining and refilling of the lake;
- a refuge and habitat for numerous threatened animal species of Europe-wide importance;
- a paradise for birds of various species;
- an enchanting cultural landscape with an ever-changing face thanks to its intermittent lake;
- a Ramsar Convention area.

Notranjska Regional Park covers an area of 210 km². Settlements are excluded from the park.
More information is available at www.notranjski-park.si

Photo: Matevž Lenarčič

Photo: Matevž Lenarčič

of the local population (state aid for the development of agriculture and enterprise) includes:

- research and development aid;
- environmental protection aid;
- aid to small and medium-sized enterprises;
- employment aid;
- regional aid;
- agricultural aid.

International co-operation of existing park institutions

Park institutions are very active in the sphere of international co-operation. All are full members of important international organisations such as the EUROPARC Federation (formerly the Federation of Nature and Natural Parks of Europe), the IUCN, the Alpine Network of Protected Areas (Alparc), the International Show Caves Association (ISCA) and others. More and more parks are also involved with UNESCO's Man and the Biosphere (MAB) Programme.

Logarska Dolina Landscape Park

- "a valley at the end of the world and the beginning of sublime beauty, where time stands still in the sound of silence";
- a glacial valley cultivated on a human scale;
- a living valley with active farms and local people who manage their own nature park;
- a natural jewel and the most beautiful Alpine valley in the Kamnik-Savinja Alps;
- a valley with a characteristic appearance that every visitor will remember;
- a favourable habitat for the most beautiful orchid in the Alps, the Lady's Slipper (Cypripedium calceolus).

The park covers an area of 24 km^2 and contains farms of with a total of 35 inhabitants. More information is available at www.logarska-dolina.si

The Škocjan Caves are the only location in Slovenia inscribed on the UNESCO World Heritage list. The caves were also the first underground site in the world to be inscribed on the Ramsar List of Wetlands of International Importance (the Ramsar Convention covers wetlands that are of international importance, particularly from the point of view of supporting waterbirds). The Sečovlje saltpans also appear on this prestigious list.

The parks and their projects are candidates in numerous international programmes such as LIFE-Nature, PHARE, GEF, CORINE-Biotopes, Avalon, Euromontana, MedWet, all of which provide important financial resources for development projects in park areas.

Many direct forms of partnership co-operation and exchange of experience take place between Slovenia's parks and parks in other countries, above all with regard to methods of work and management, but also in the form of expert consultation on specific problems. These include the following: Triglav National Park has been co-operating intensively for a number of years with Parc National des Ecrins in France, Snowdonia National Park in the United Kingdom and Parco Naturale delle Prealpi Giulie in Italy. The co-operation of Kozjanski Park with Naturpark Ober Bayerischer Wald has also been very fruitful. Škocjan Caves Park has in past years forged contacts with parks in Italy, Austria, France and Croatia. Goričko Landscape Park is a part of a cross-border trilateral park with Austria and Hungary.

Table 1: Categories of protected areas

	category	IUCN	founder
SMALL PROTECTED AREAS	Strict nature reserve	I	· State/Government
	Nature reserve	I or IV	· State/Government · Local community
	Natural monument	III	· State/Government · Local community
LARGE PROTECTED AREAS	National park	II and II/V	· State/National Assembly – Act
	Regional park	V/III	· State/Government
	Nature park (protected landscape area)	V	· State/Government · Local community

Opportunities for the future

Interest in widening the park network has been increasing among the general public in recent years. With assumption of the main responsibility for park management at the national level, especially following the entering into force of the Nature Conservation Act, initiatives to establish larger parks have begun to spread. To date, accords have been signed or agreements adopted between municipalities and individual government departments on working together on the founding of individual parks.

The founding of a park is not a one-off action but a process in which, through creative dialogue between local communities and state institutions, ideas and objectives for the further development of the area are formulated, along with proposals for their implementation.

At the national level, several projects involving the founding of new parks and protected areas are under way. At present, most activity centres on projects to found Kamnik-Savinja Regional Park, Ljubljansko Barje Landscape Park and Radensko Polje Landscape Park

Stricter protection regimes, which as a rule exclude human activities, are limited to the strict nature reserve areas and the central area of the national park (IUCN category II). The other categories, with regimes designed to conserve biological diversity, landscape variety and natural features, above all support sustainable management of natural resources, and thus guarantee the fundamental development interests of the local population.
With the exception of the national park, which is founded by the state by means of an Act, protected areas are either at the national level by means of a Government decree or at the local level by means of a bylaw.

Ecoremediation and Slovenia's Development Programme

Sustainable Preservation and Treatment of the Environment

Gregor Pucelj
DELO

Ecoremediation techniques are natural systems for the protection and renewal of the environment. They can also be defined as the sustainable preservation and treatment of the environment, since their use increases the environment's ability to defend itself. Through different ecoremediation processes we can create or recreate the conditions that are characteristic of natural systems, i.e. diversity of biotopes and maintenance of ecosystemic balance.

We discussed ecoremediation with Dr Danijel Vrhovšek, who has been involved in the fields of water ecology and constructed wetland systems for a number of years. "Awareness of the importance of ecoremediation is spreading among an ever wider circle of people," claims Dr Vrhovšek. "In technical terms matters are clear. People know what we want and that we have to treat the environment differently from how we have treated it in the past. We still have a great deal more work to do before this becomes a way of life, for ecoremediation principles to be built into regulations, and for us to observe them consistently."

Dr Ana Vovk Korže of the IPVO (Institute for the Promotion of Environmental Protection) in Maribor, who in conjunction with Dr Vrhovšek has recently written a booklet entitled *Ecoremediation for effective environmental protection*, adds the following: "Building ecoremediation into regulations is actually already happening. At the start of 2006 the environment ministry adopted a resolution on the inclusion of ecoremediation as a standard in all documents and strategies dealing with the environment. Naturally this does not in itself mean the implementation of an ecoremediation approach in practice. The main obstacle probably lies in the fact that many of those responsible for making decisions on developments know too little about ecoremediation. That is why we also devote particular attention to education, from practical training to education at the university level. Informing the public is a chapter unto itself. Here we have to show as best as possible how every individual can use various forms of ecoremediation in his or her everyday life. I am convinced that – with the appropriate support of the state – we also need to promote ecoremediation as a development opportunity for Slovenia. We want to bring Slovenia over the next few years into the company of the most developed countries. In our opinion one of the ways to achieve this is through ecoremediation techniques. In Slovenia they represent the best possibility for environmental protection, and this is a starting-point for the development of ecotourism, spa tourism, sustainable agriculture, and so on."

The main difficulty in the use of ecoremediation methods in practice lies in the fact that they require changes to certain systemic solutions and established procedures and, in many ways, a change of mentality. Interestingly, in all environments facing environmental problems (mainly municipalities), there is agreement with ecoremediation principles. The problem is that the various contractors equipped with heavy machinery offer old solutions. And regulations also allow this...

Help for nature

"A few years ago," explains Dr Vrhovšek, "if you searched for the term 'ecoremediation' on the web you would only get a handful of hits. Today a search returns hundreds of pages. Ecoremediation essentially means the transfer of natural systems and processes for the protection and renewal of the environment. If something goes wrong, or if you feel that something is going to go wrong, you use ecoremediation. You actually look at nature, how it reacts to specific events, and then you help it in the direction in which it would go anyway. We know, for example, what plants are best at purifying sewage water and we plant them in constructed wetland systems. We know what plants are best at absorbing heavy metals, and we plant them to purify seepage from landfills. We know what plants are best at retaining moisture along drainage ditches. If we know that Celje, for example, is at risk from flooding, then it does not make sense or rather it is too late to build defensive dykes in Celje. Instead the water of the Savinja has to be retained up in Logarska Dolina and slowly released downstream. Ecoremediation does not only relate to the water environment but to all processes that nature tries to remedy itself: human beings merely channel them and accelerate them. And because we are using natural processes, we actually have countless possibilities. The properties of nature can even be adapted – if we know enough about it. We can retain more water, we can increase its ability to purify itself, we can increase biodiversity or do all these things at once. Whatever we need in the given situation."

Drainage ditches are a typical example of how not to proceed. Today in Prekmurje, in northeastern Slovenia, the water level is getting lower and lower. We should be retaining this water, increasing its ability to purify itself and last but not least restoring the habitat so that it can maintain individual animal species, be this the otter, the black stork or something else. Multiple purpose of use is one of the advantages of ecoremediation techniques. As Dr Vrhovšek explains, "in past centuries man did many things correctly, in harmony with nature – until the technical revolution arrived. Then it seemed to him that he could solve all difficulties with machines and he forgot about natural processes. A good

Different types of ecoremediation processes

- natural ecoremediation; pools, waterfalls, meanders
- old ecoremediation; basins, pools, hedges
- new types of ecoremediation; constructed wetland systems, ecological drainage ditches, wind barriers, buffer zones
- ecoremediation for the remediation of irregular developments; revitalisations, renaturations, phytoremediation, purifying drinking water sources.

If nature is given time, it generates its own rich vegetation, which increases.

The maintained stream becomes a drainage channel which does not perform the natural functions of a watercourse (above). With the return of vegetation, the watercourse regenerates the natural self-cleaning functions. The aquatic and surrounding ecosystems once again become a habitat for numerous animal species.

Treatment facilities based on vegetation do not require extensive and costly construction works.
At the same time they efficiently purify various waste waters.

example of this are the retention basins on the Karst, known as *kali*. The Karst-dwellers knew how to retain water in them and to purify (recycle) it with the help of plants and then, during the dry season, use it to water their livestock and irrigate their crops. Typical plants began to grow there, individual species of animals came and created a diverse habitat. This was actually a fine example of ecoremediation, except that they were not aware of it. Today they simply sink their pumps in the nearest stream and pump almost all of the water out of it..."

Over millions of years nature has developed extraordinary defences of its own. The point of ecoremediation is that we take advantage of these complex natural systems for individual remediations or for preventive procedures. In doing so we have the assurance of natural "experience" to tell us that it works. When using ecoremediation procedures it is impossible to get it completely wrong.

An opportunity for Slovenia

"Slovenia is one of the last countries in Europe to still have relatively well preserved ecosystems," explains Dr Ana Vovk Korže. "In other countries such as the Netherlands and Germany these have long since been destroyed by intensive industrialisation. For this reason we have the opportunity to protect our ecosystems, through ecoremediation. As much as half of the territory of Slovenia is protected in one way or another (Natura 2000, regional parks, protected landscape areas, national park). Where we have already destroyed the natural balance, we can re-establish sustainable environments. And Europe is very interested in seeing such processes and getting to know them in a real environment. And this is an additional opportunity for us. Because of our small size, we can act as a kind of ecoremediation pilot project for the whole of the EU, where ecoremediation is currently a hot topic. The whole of Europe is moving into renaturation processes, and we have the knowledge and natural conditions for this. If we fail to use this opportunity, someone else will overtake us."

Last but not least, it should be noted that ecoremediation does not take business away from existing "hydroengineering" companies. Ecoremediation systems need to be maintained after being installed. "In the revitalisations that are being carried out in Prekmurje," says Dr Vrhovšek, "they are employing individuals from the difficult-to-employ category. And these are long-term jobs. With ecoremediation you are not dependent on foreign technologies either."

Given the undoubted advantages of ecoremediation techniques, why are they being put into practice so slowly? The main obstacle is that investments in ecoremediation give a return over the long term. There are no overnight profits. If you start protecting groundwater today, the results will be evident after a decade or even two. This means that ecoremediation is not interesting to investors. An investor who has the money to build an extensive water supply system, with long pipelines, is not interested in the ecoremediation of polluted village springs.

"That is why we want ecoremediation, which is the only sustainable method of environmental protection, to be a legally regulated possibility or alternative in developments of this kind, and in others too," explains Dr Vrhovšek.

A difficulty and yet at the same time an advantage of ecoremediation activities is that they require the involvement of different sectors. Waters polluted by pesticides are not only an issue for the agricultural profession, but for hydrologists, the medical profession, lawyers, and so on. "At the national level," explains Dr Vovk Korže, "there is already interest in trying to interconnect things. But these are lengthy processes. Our very concrete contribution to this will be an ecoremediation project supported by the Ministry of the Environment and Spatial Planning in the municipality of Muta, which is an example of the integrated regulation of a catchment area. There we are not merely addressing past problems. Instead, we will show how it is possible to develop a specific area holistically, since ecoremediation is also (or above all) a development component, and not merely a remediation method. Next it will be the turn of Radlje ob Dravi, and we will continue all the way to Maribor. Even in urban environments there is interest in ecoremediation for individual nature protection segments."

Some examples of ecoremediation

Naturally what interests us most are the ecoremediation projects that have already been carried out. There are already quite a number of these. In Velika Nedelja (near Ormož) a constructed wetland system (CWS) was built in 2000 to treat municipal wastewater from settlements for 400 pollution units (PE). The same year a similar CWS was built in Sv. Tomaž, also in the vicinity of Ormož. In Središče ob Dravi, a CWS for the treatment of industrial wastewater and sewage from the Gosad food processing plant (Droga Portorož) has been operating since 1991. In 2000 a CWS was built for the treatment of seepage from the municipal waste dump in Ljutomer. In 2002 sustainable remediation was carried out of the Dobrava municipal waste landfill (Ormož). The remediation includes a plantation of trees acting as a water barrier, constructed wetlands for the treatment of seepage and an irrigation system to exploit the purified water. This year a CWS for municipal wastewater with a capacity of 300 PE began operating in Motovilci in the Goričko region. Also in Goričko, in Gerlinci, a pilot CWS for the conditioning of microbiologically contaminated water from the well has been installed by Limnos. There are already more than 60 constructed wetland systems operating in Slovenia too.

The best proof of the effectiveness of ecoremediation is the return of wildlife, for instance the small white heron, to the aquatic environment.

Photo: Davorin Tome

Department for Pediatric Surgery and Intensive Care,
University Medical Center Ljubljana.

Air and Ground Transport of Critically Ill Neonates and Infants in Slovenia

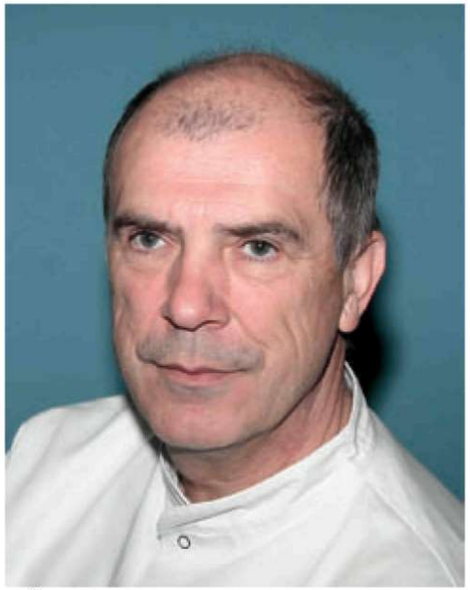
– 30 Years of Experience

Štefan Grosek, and members of the transport team*

*Members (MD and RN) of the transport team:
MD: Metka Derganc, Rudi Branko Gaber, Andreja Gostiša Kornhauser, Štefan Grosek , Gorazd Kalan , Silvester Kopriva, Inka Lazar, Janez Primožič, AndrejaŠkofljanec, Ivan Vidmar;
RN: Mojca Jakomin, Zdenka Janičijevič, Anica Kovač , Tatjana Kranjec, Milinka Petrovič, Zdenka Poljanšek, Mateja Trtnik, Mihaela Verbič , Marija Vesel

Introduction

In 1974, a new multidisciplinary neonatal and paediatric intensive care unit (ICU) was opened at the Department for Pediatric Surgery, University Medical Center Ljubljana (UMCL), Slovenia. The decision to start a programme of inter-hospital transport of critically ill neonates and infants into the ICU was made. The aim was to transfer all critically ill neonates from all maternity hospitals in Slovenia to our ICU, to offer them the best available intensive care treatment and to decrease a high perinatal mortality rate. Between 1976 and 2006, nearly 5,000 (exactly 4,596) newborns and infants were transported. Ground transportation was first organised in 1976, and, in 1978, air transportation followed, provided by a helicopter and fixed wing aircraft.



Dr Štefan Grosek, Assist. Prof.

It was then decided to transport only neonates and infants less than six months old; this has been the practice since. For older children, an anaesthesiologist from a referral hospital supervises the transfer by ambulance or helicopter.

A transport team is on-call 24 hours a day, and two teams are ready if necessary to transport critically ill neonates or infants. We provide transport of critically ill neonates from all Slovenian maternity and paediatric hospitals. If an extremely premature newborn (weight below 1500 grams at birth) is born in a regional maternity hospital because "in-utero" transport was not provided on time, our team transfers the baby to a tertiary perinatal centre situated in the maternity hospital in Ljubljana, UMCL. In the rare case of overcrowding at our ICU, we have to transport critically ill neonates to one of the two other ICUs in Slovenia. One is located in the aforementioned maternity hospital, and the other in the paediatric hospital of the University Medical Centre, Maribor.

Figure 5. Loading of the transport incubator into the police helicopter from the Trbovlje regional maternity hospital

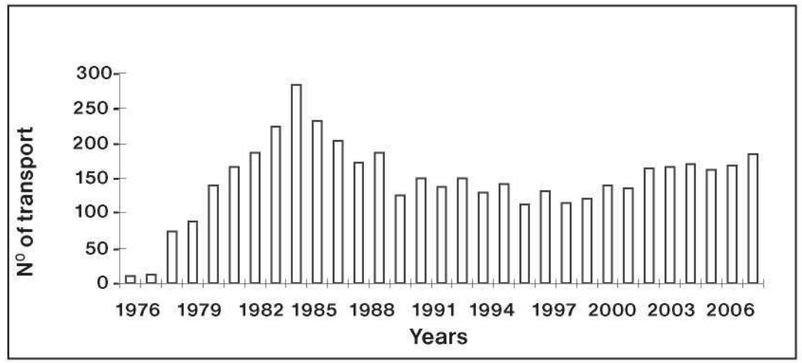


Figure 1. The number of transports between 1976 and 2006.

How does organised transport work in Slovenia?

Slovenia is a country with two million inhabitants within 20,256 km² and averages about 18,000 deliveries per annum. Fourteen hospitals provide obstetric care. Figure 1 shows the number of transports into the ICU between 1976 and 2006. Figure 2 shows the number of helicopter transports.

The transport team for neonates and infants for the whole country consists of a doctor and nurse from the ICU, on-call 24 hours a day (i.e. an "on-call system"). The hospital ambulance service provides ambulances for ground transport, and the state police provides helicopters specially adapted for the transportation of critically ill neonates and infants. Due to traffic jams in Slovenia, we use helicopters for transport from 12 out of 14 maternity hospitals (only the maternity hospitals in Kranj and Postojna are reached using solely ground transport, because they are less than 40 km from UMCL). If, however, an infant must be transported to a foreign country, helicopters or fixed wing aircraft are used. In these cases, we rent an aircraft from a Slovenian air company. The equipment used is Draeger Transport Incubators 5300 and 5400, equipped with a neonatal ventilator, EGC monitor, pulse oximeter and blood-pressure monitoring device.

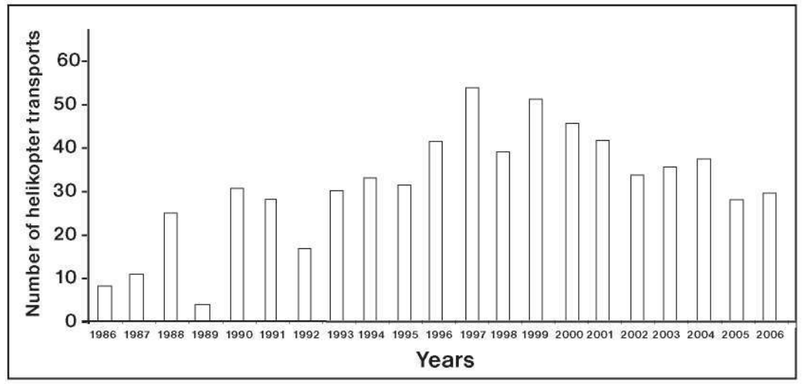


Figure 2. The number of helicopter transports between 1986 and 2006.

What is the responsibility of a doctor working at a referral hospital?

We strongly encourage doctors from referral hospitals to take proper pri-

Successful return of transportation team

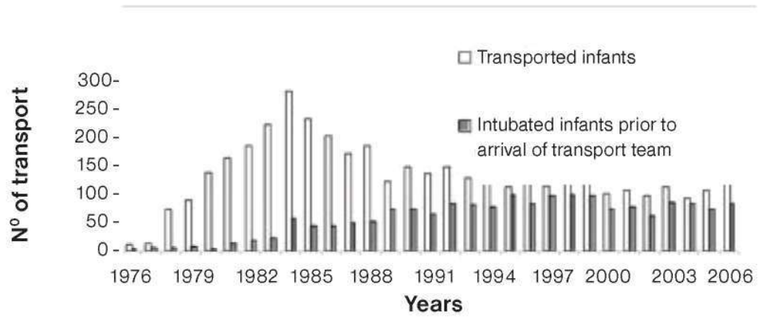


Figure 3. Infants intubated and ventilated prior to the arrival of our transport team.

mary care of critically ill neonates. We strongly advocate that the referral doctor intubates and hand-ventilates the critically ill infant prior to the arrival of our transport team. The further stabilisation of the critically ill child by medical teams in a referral hospital is also strongly advised before our arrival. Every minute is important, and with early stabilisation we decrease the chance of the development of multiple organ failure syndrome. The success of our efforts can be seen in Figure 3, which shows the increased number of infants intubated and ventilated prior to the arrival of our transport team in the last few years.

Communication between hospitals and organisation of transport

The transport starts from the time that a call from a referral hospital reaches a doctor in the admitting hospital (Figure 4). We have an open "red telephone" line in the ICU, which is never obstructed by other unnecessary phone calls, 24 hours a day. The referring doctor gives a brief report on the clinical status of the patient to be transferred, and a summary of treatment to date. If all necessary measures have been taken for the critically ill infant, we confirm the acceptance of the call and give an estimate of time required to reach their hospital. If more can be done to help the infant during the wait, we propose measures. After receiving all relevant information from the referring doctor, the transport doctor informs a transport nurse about the child's condition. She/he is then fully responsible for organising the transport and decides between ground or helicopter transport. She/he contacts the ambulance, the helicopter team and the police to co-ordinate all services needed for successful transport, and makes a brief survey of every piece of equipment to make sure it is ready.

Communication between referral doctor and transport team.

Retrieval of a critically ill child and transport to the ICU. Hazards to be aware of during transport.

Of course, we have been fully aware of possible hazards and complications since the start of our critical care transport. Though these patients may be considered "stable," their physiological reserves are often limited. Even minor adverse physiological changes in these patients during transport may cascade into life-threatening complications. Therefore, it is essential for everyone involved in the care of critical patients to have a basic understanding regarding the transport environment, personnel, equipment, and vehicles. Even with the best planning, personnel, and equipment, there may be times during transport when monitoring may be difficult and the ability to manage emergencies may be limited, especially when a critically ill child is being transported by helicopter (Figure 5). Our transport team consists of both a highly experienced and well trained paediatric and neonatal intensive care specialist and a registered nurse, both with years of experience in the field of neonatal and paediatric critical care medicine. We follow guidelines for safe patient transport, including planning in advance for a safe transfer and prevention of delays through co-ordination and communication, making appropriate selection and utilisation of personnel, vehicles and equipment, ensuring patient stabilisation prior to transport, inserting all tube and lines and verifying that they are functioning and well-secured. All of this provides safe transport not only for the patient, but also for staff treating any changes in status, etc.

Figure 6. Delivery of a child to ICU personnel

Informing parents about the transport of their critically ill child

Whilst speaking about transportation, let us not forget the people who are the most affected when a critically ill child is transported and taken into critical care – the parents. Before a patient is transported, we ensure that they are contacted to check whether they saw their child before transport. Furthermore, we asked them not only to see their child but also to photograph him/her before transport. From our medical team, they also receive all necessary written and oral information about visiting their child in the ICU, contact telephone numbers and names of responsible doctors and nurses.

Delivery of a child to ICU personnel

After a transport team delivers a critically ill child to the ICU, medical staff give a thorough report on clinical status, problems before and during transport, and therapy given. The transport team also completes a protocol of transport.

Audit of transport

We have been collecting data about response time, duration of transport and adverse effects during transport since the beginning. The last audit of our transports was done between May 2006 and 2007. During that period, we transported 178 newborns and infants, and a simple questionnaire provided data on axillary body temperature, blood gases prior to transfer and immediately after admission in the ICU when the baby was still in the transporting incubator. The main results of this audit were that the welfare of critically ill children during the transport was not compromised.

Conclusions

Transporting almost 5,000 newborns and infants during a period of 30 years has given us enough knowledge and background to ensure safe transports for both the critically ill neonates and the medical team. Without the full co-operation of the ground ambulance service and state police providing helicopters, we would have never been able to look back on 30 such successful years in Slovenia.

Acknowledgements

We thank the intensive care doctors and nurses of the ICU, ambulance drivers and helicopter pilots for their dedicated work.

Transportation team in the ICU

By Dragica Bošnjak DELO

Tissue Engineering in Slovenia
Treatment with Cultured Cartilage Cells and Bone Tissue

Dr Nevenka Kregar Velikonja, Managing Director of Educell Ltd.

Three-dimensional cartilaginous replacements for simpler operating procedures in treating cartilage injuries, bone replacements for treating injuries to the jawbone, inserts of autologous cartilaginous cells to prevent contraction of the intervertebral space and the use of autologous cartilaginous cells to treat vesicoureteral reflux, which is a major cause of chronic kidney infection. These are the main development projects, some of which have also successfully been implemented into clinical practice, recounts Dr. Nevenka Kregar Velikonja, managing director of Educell, the cell biology company.

As a biologist, our interviewee devoted her master's studies to human genetics, and in her doctoral work she focused on biotechnology, and she falls into the group of experts who a little under a decade and a half ago in Slovenia – among the first in the world – took pioneering steps in the area of tissue engineering, or regenerative medicine. The basic activity of the company Educell is the development of tissue engineering methods for the regeneration and treatment of injured or worn out tissue. It operates as a research organisation, and its composition includes a cutting edge research team. The company is owned by the holding Novoline and is also a member of the Ljubljana Technology Park.

Today, when certain procedures such as obtaining and implanting autologous chondrocytes, in other words, treatment of injured joint cartilage using the patient's own cells cultured in the laboratory, have long since become routine clinical practice, we need simply to recall the group of expert enthusiasts who with vision, expertise and enormous energy take the credit for setting the foundations of today's successful image of Educell: consultant Damjan Radosavljevič, an orthopedic specialist, brought the idea of cartilage tissue engineering to Slovenia and put the method into clinical practice; Asst. Prof. Dr. Matjaž Jeras started to develop the technology of preparing tissue engineering products in the laboratory; Asst. Prof. Dr. Miomir Knežević saw in this project an entrepreneurial challenge and successfully headed the company in the first five years, while Asst. Prof. Dr. Primož Rožman worked with the team to weave together a vision of developing regenerative medicine. In time the circle of (external) associates has expanded significantly, and includes research, clinical institutions and academic institutions, while it also extends far beyond the borders, for instance to Columbia University in the USA.

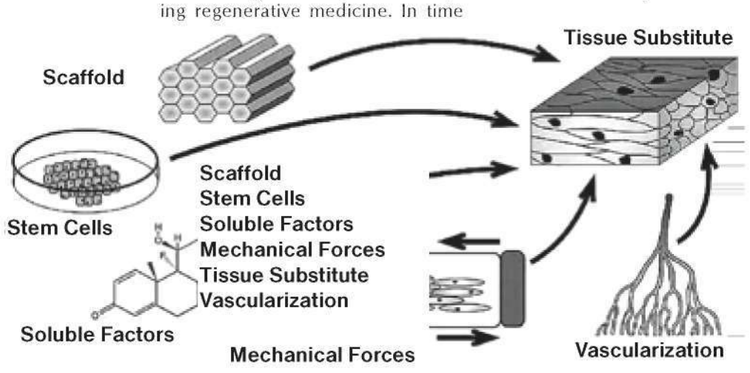


Figure 1: Components of engineered tissue prepared with adult stem cells (Barrilleaux et al., 2006)

Tissue Engineering and Stem Cells

Dr Ariana Barlič, Head of R&D, Educell

Tissue engineering has been defined as "an interdisciplinary field that applies the principles of engineering and the life sciences toward the development of biological substitutes that restore, maintain, or improve tissue function" (Langer and Vacanti, 1993). It consists of culturing cells in an in vivo-like environment that promotes growth, differentiation and 3-dimensional (3D) organisation.

Growth and differentiation factors are added to the culture medium, and cells are encouraged to form 3D tissue within engineered scaffolds of biological or synthetic origin that resemble an extracellular matrix (ECM).

Production of this engineered tissue necessitates the use of large quantities of cells, but this requirement can be difficult to satisfy with dif-

Dr. Miomir Kneževič, one of the pioneers of tissue engineering in Slovenia and the first director of company Educell.

Preparation of bone replacement in a protective microbiological chamber, which ensures an aseptic procedure (photo: Hana Krečič Stres).

Educell, Cell Therapy Service Ltd.

Dr Nevenka Kregar Velikonja

The origins of Educell© d.o.o. date back to July 1997, when the company was founded with the goal of introducing cell therapy and tissue engineering to human medicine. In 10 years of our operation we focused on development of tissue engineering methods for repair of damaged tissues such as cartilage and bone that fail biological healing and treatment of pathologic conditions as vesicoureteral reflux. Clinical applications are developed in tight collaborations with clinicians.

Implantation of autologous chondrocytes for treatment of damaged knee cartilage ChondroArtTM is routinely performed in University Clinical centre Ljubljana since 1999. Cell product used for this treatment has undergone development from classical 1D product (cell suspension) to 2D (cells seeded on collagen scaffold) and 3D gel product (cells encapsulated into gelly scaffold, mimicking native environment of cartilage cells), that was recently introduced into clinical practice. The product is being further developed to improve the quality, simplify surgical procedure and cover broader clinical indications.

In this year, also treatment of vesicoureteral reflux with endoscopic implantation of autologous cell product UroArtTM, became routine procedure for selected indications. The procedure has been developed in collaboration with UKC Ljubljana, Department of Urology.

Facing limitations of differentiated cells (such as chondrocytes, osteocytes) as cell sources for cell therapies, we started with investigation of different stem cell sources, mainly multipotent mesenchymal stem cells from bone marrow and adipose tissue, but we are searching for alternative sources of multipotent cells. All R&D projects are performed in collaboration with research group of Blood Transfusion centre of Slovenia. We are expert in the cultivation of human cells and routinely perform procedures such as isolation, propagation, freezing, transfection, subcloning and phenotypic characterisation of cultured cells. Cells and tissue constructs are cultured and manipulated in modern, well equipped laboratories considering all necessary standards and guidelines in field of cells and tissues.

Regulatory frame for cell and tissue based therapeutic products is still in progress. In years 2006-2008, EU Directive about the quality and safety of human tissues and cells intended for treatment, was implemented in Slovenian legislation. It also regulates an individual procedure for a custom made products for an individual patient, used within the same Member State in a hospital under the exclusive professional responsibility of a medical practitioner. At the same time, EC has implemented the Regulation on Advanced therapy medicinal products that will regulate cell and tissue based products and enable patients across Europe to have access to safe and effective therapeutic treatments.

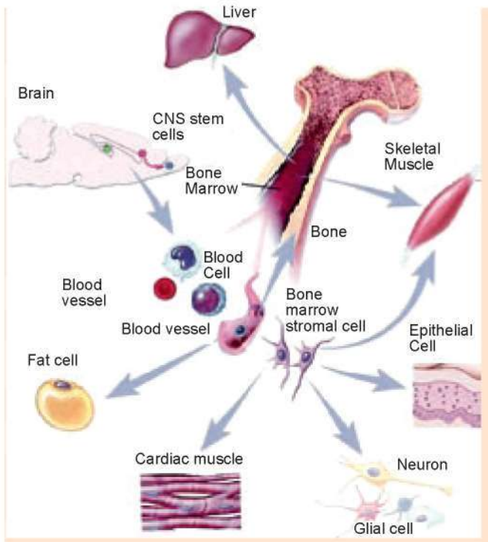


Figure 3: Plasticity of adult stem cells (http://stemcells.nih.gov/info/basics/)

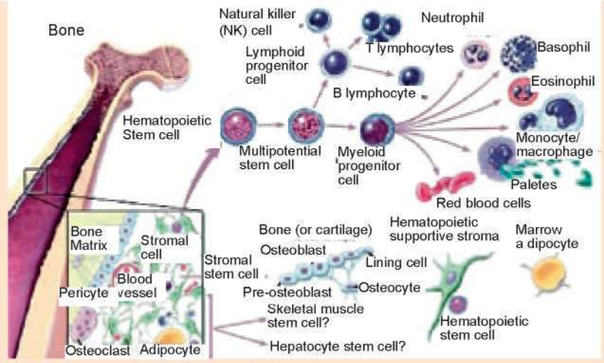
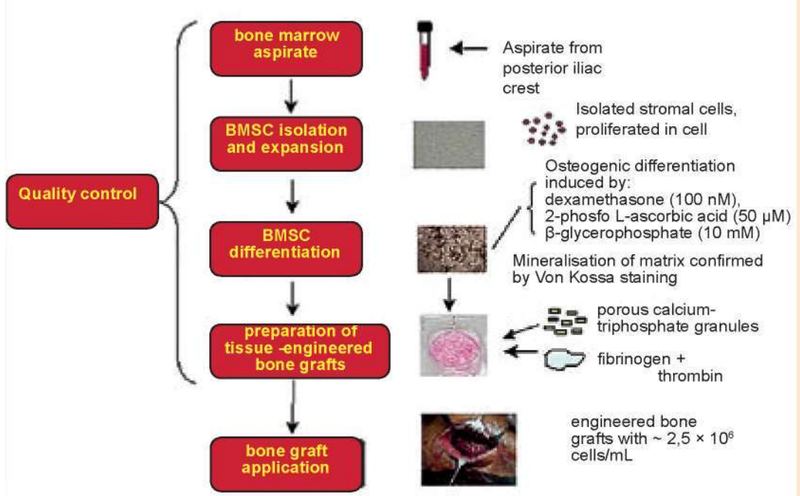


Figure 2: Hematopoietic and stromal stem cell differentiation (http://stemcells.nih.gov/info/basics/)



Schematic diagram of tissue engineered bone graft production and implantation (by Hana Krečič Stres, Educell d.o.o.)

ferentiated cells that exhibit limited doublings in culture. One solution to insufficient cell supplies is to prepare engineered tissue with stem cells.

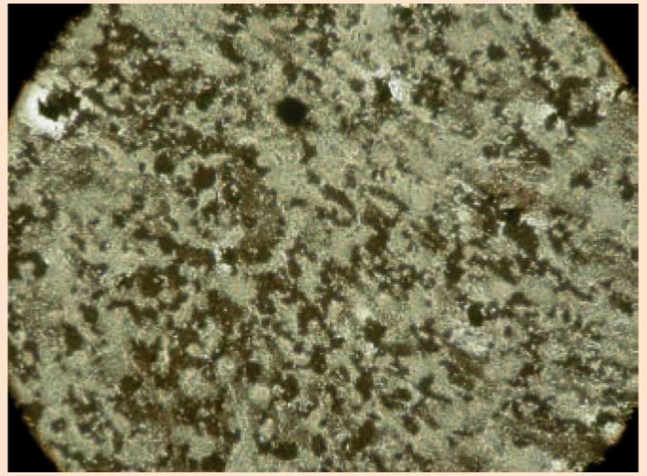
Stem cells have two important characteristics that distinguish them from other types of cells. First, they are unspecialised cells that renew themselves for long periods through cell division. The second is that, under certain physiological or experimental conditions, they can be induced to become cells with special functions. They have the ability to differentiate along one lineage (unipotent), into multiple cell types (multipotent) or into cells derived from all three embryonic germ layers (pluripotent).

Scientists primarily work with two kinds of stem cells from animals and humans: embryonic stem cells and adult stem cells, which have different functions and characteristics. Both types of stem cells have advantages for therapeutic use; however, problems with teratoma formation and immune rejection must be overcome before pluripotent embryonic stem cells may be applicable for therapeutic use. The benefits of using adult instead of embryonic stem cells to prepare living tissue substitutes include immuno-compatibility of autologous cells, ease of inducing differentiation to a specific lineage and specially availability.

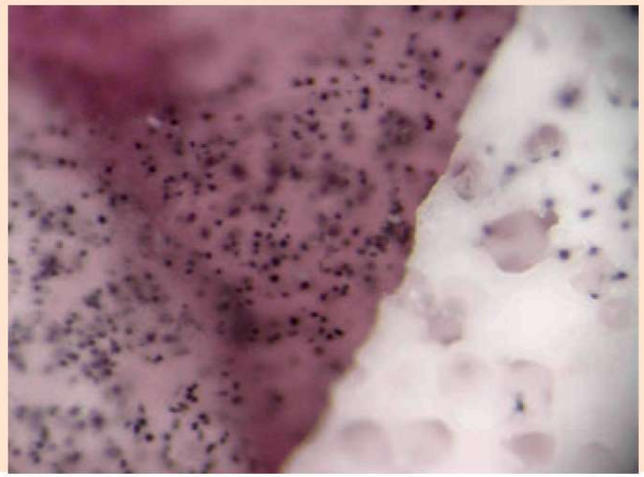
Multipotent adult stem cells have been found in many tissues, including bone marrow, adipose, skeletal muscle, cerebral cortex, olfactory bulb core, placenta, gastric epithelium, retina, inner ear, hair follicle bulge, ovary epithelium, testis and others. Aspirates from bone marrow and adipose tissue have been used, because of their mesodermal origin, to engineer such tissues as cartilage, bone, adipose and blood vessels. In addition to cells of mesodermal origin, stem cells from the other two embryonic germ layers, including ectoderm and endoderm, have also been successfully used to engineer tissues.

Under certain circumstances, it would be desirable to harvest autologous stem cells from tissue other than

Mesenchymal stem cells in bone marrow create colonies in the cell culture (photo: Nevenka Kregar Velikonja).



Osteogenic differentiation of mesenchymal stem cells appears as an accumulation of mineralised intercellular matter in the cell culture (photo: Hana Krečič Stres).



Testing the survival and metabolic activity of cells in tissue engineered bone replacement with an MTT staining (photo: Hana Krečič Stres).

the targeted tissue to be regenerated, when, for instance, the targeted tissue is diseased or when extraction would cause irreversible trauma. The ability of stem cells to differentiate across the embryonic germ line boundaries is called plasticity. The existence of plasticity has, however, been debated heavily in the past several years (for example, conversion of adult mesenchymal stem cells into cells with a neural phenotype).

Within one research group in Educell d. o. o., we have been working with stem cells from bone marrow for some years. We are developing tissue-engineered bone substitute based on these cells for treating long-bone defects, in collaboration with surgeons of UMC Ljubljana within a project co-financed by the Slovenian Ministry of Defence through the Technology For Security And Peace (TP-MIR) programme. Like other researchers, we are confronting the problems of vascularisation/nutrition of these extensive tissue-engineered constructs. In each step of the procedure from cell isolation to bone graft, quality control measurements are performed.

Facing the limitations of differentiated cells and also bone marrow-derived multipotent stem cells, we started another project (funded through TP-MIR) with the aim of analysing different sources of stem cells in adult human tissues and exploring their differentiation potential. As cell sources, we have chosen bone marrow (in collaboration with the Blood Transfusion Centre of Slovenia), adipose tissue (in collaboration with UMC's Department of Plastic Surgery) and follicular liquid (in collaboration with University Medical Centre's Department of Gyneacology). We are analysing differentiation of the isolated and proliferated stem cells into specific cell types (osteocytes, chondrocytes, adipocytes, endotelial cells, neurons, etc.) to evaluate their suitability for different clinical applications.

National Institute of Biology
Department for Genetic Toxicology and Cancer Biology

From Cancer Prevention to Cancer Development

Metka Filipič

Doc. dr. Metka Filipic
Head Department for Genetic Toxicology and Cancer Biology
National Institute of Biology

Introduction

The Department for Genetic Toxicology and Cancer Biology at the National Institute of Biology was established in 1995 by Prof Tamara Lah as the Department for Molecular Biology. At that time, the research was mainly focused on studies of basic mechanisms of cancer invasion and metastasis, in particular the role of cystein proteinases in these processes. A year later, when Dr Metka Filipič joined the group, the research was expanded to the field of genetic toxicology, which deals with the study of environmental and lifestyle factors which induce genetic alterations leading to cancer initiation. In 2001, researchers from the group for ecotoxicology and ecotoxinology, whose research is focused on the impact of environmental pollution on water ecosystems, joined the department. Currently, the department is headed by Dr Metka Filipič and has nine researchers with PhDs, six PhD students and two technical assistants (Figure 1). As environment and human health are closely related, the unique interdisciplinary expertise of the researchers in our department enables us to apply new approaches to study complex interactions between environmental and genetic factors in the development of cancer and other degenerative diseases, as well as how these interactions affect ecosystems.

Figure 1: Department for Genetic Toxicology and Cancer Biology.
From the left in the front row: Anja Pucer, Saša Kenig, Jana Petković, Katja Kološa, Tina Eleršek; middle row: Tamara Lah, Maria Beatriz Duran Alonzo, Irena Zajc; back row: Bojan Sedmak, Irena Hreljac, Boris Gole, Mihael Bricelj, Karmen Stanič and Metka Filipič.

Environmental contamination due to human activities is a major threat to ecosystems as a whole and to human health. Therefore it is of major importance to recognise these threats in order to introduce efficient preventive and protective measures. Of particular concern is exposure of living organisms to genotoxic contaminants, which induce damage to genetic material and mutations, and which in humans lead to heritable diseases and cancer. Since genetic function and structure in all organisms is basically the same, genotoxins in exposed ecosystems can cause severe changes in biodiversity.

Cancer development is an extremely complex multistage process. Initiation of cancer starts with DNA damage, which leads to mutations. Mutations can occur spontaneously at a very low rate and, much more frequently, as a result of DNA damage caused by chemicals or ionising radiation. Cells accumulate mutations, and some cells, which acquire mutations that silence tumour suppressor genes or activate oncogenes, eventually gain the ability to escape cell cycle checkpoints and divide without control. Further mutations and tumour-promoting chemicals, which stimulate cell division by different mechanisms, lead to abnormal proliferation of transformed cells and the development of cancer. Part of the basic and applied research of the Department of Genetic Toxicology and Cancer Biology is focused on studying the effects of genotoxic contaminants on rodent and human cells, as well as the effects of these pollutants and toxins on water ecosystems. The aim of these studies is to identify genotoxins and to explore their mechanisms of action with the goal being to find effective preventive measures against cancer initiation and adverse effects on ecosystems.
However, exposure to genotoxins is unavoidable, and therefore human cancer is also unavoidable. The other part of our research is focused on exploring the mechanisms of tumour progression and the increased invasiveness of tumour cells and other biochemical alterations, with the goal of identifying new targets and strategies for prevention of cancer development, and for therapy.

Genetic toxicology, ecotoxicology and ecotoxinology

In our everyday life, we are exposed to different carcinogens from different sources (Figure 2). For human risk assessment and risk management, it is very important to characterise DNA-damaging (genotoxic) chemicals and to clarify their exact mechanisms of action. Our research in the field of genetic toxicology is focused on exploring the mechanisms of genotoxicity of some ubiquitous environmental carcinogens such as heavy metals, certain organic pollutants (particularly food contaminants), and pesticides, as well as emerging contaminants such as nanoparticles and natural toxins.
For these studies, we are using different standard genotoxicity assays such as bacterial mutagenicity (Ames) and SOS/umu assay as well as more complex mammalian cell and tissue models. For measuring genotoxic effects, we use different methods for detection of mutations, chromosomal and primary DNA damage. One of the most sensitive methods for measuring

Prof Dr Tamara Lah, Director

Who are we?

Within our department, we are discovering new natural compounds and investigating and explaining mysterious laws of nature. We are able to determine the mechanisms of action of natural and artificial toxic and genotoxic substances by inventing new detection methods. We also offer services in toxicology by routinely using a battery of detection assays – from microbial-based toxicity and genotoxicity tests all the way up to fish embryo tests, human cell cultures and tissue models.
As is well known, cancer is in many cases avoidable, and cancer prevention is an increasingly important area of interest. Our research is focused in environmental aspects that can lead to cancer development – how strong is the link between the lack of care for the environment and the increasing frequency of such damaging diseases? On the other hand, many natural compounds consumed every day may reverse carcinogenesis, and we are seeking to investigate some of them.
Following carcinogenesis, it is important to understand how cancer progresses; we are researching how to predict tumour progression and regression – how to predict the results of applied therapy and how to improve it.
We are researching answers to all these questions, proposing new prognostic and prediction markers, and are up-to-date with new trends in global scientific research, as well as with the most recent guidelines and legislation in the field of toxicology and environmental policy.

If you have questions in these fields – believe us, we can provide answers!

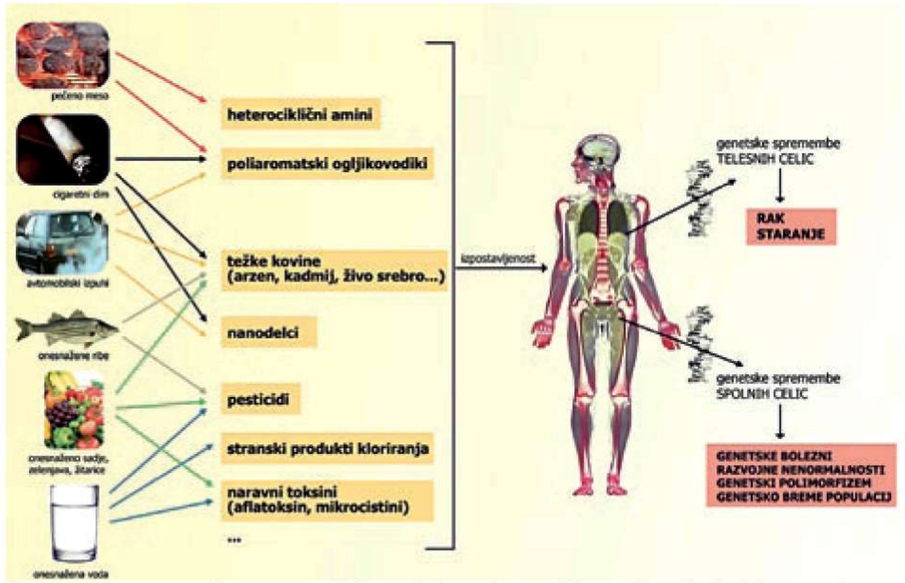


Figure 2: Major sources of human exposure to genotoxic carcinogens [diagram: Irena Hreljac]. In exposed humans, genotoxic carcinogens induce DNA damage, which, if not repaired, leads to mutations and consequently to increased probability of cancer development and genetic diseases.

DNA damage is single cell gel electrophoresis, also called Comet assay (Figure 3).
Genotoxic chemicals may react with DNA directly, but most need metabolic activation in order to damage DNA. Therefore, metabolically active experimental models that reliably reflect metabolism in humans are needed. Within the 5th European Framework project, HEPDNA, we collaborated on the development of an experimental model with metabolically active human hepatoma HepG2 cells for genotoxicity and antigenotoxicity studies. In collaboration with the University of Groningen, we recently introduced a model with precision-cut liver slices. We were the first to apply the Comet assay for studying DNA damage in human and rat precision-cut liver slices, and this new method has been recently published in the journal Toxicology in Vitro. Its major advantage is that it allows study of the mechanisms of genotoxicity in whole-tissue samples, which better reflect processes in intact organs than isolated primary and permanent cells.

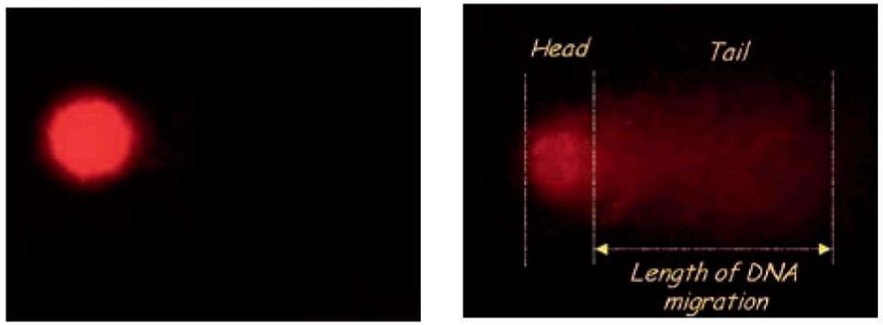


Figure 3: Comet images of the nuclei with undamaged (left) and damaged (right) DNA in liver cells released from precision-cut liver slices [photo: Janja Plazar]. Comet assay, also known as single cell gel electrophoresis (SCG), is a microgel electrophoresis technique which detects DNA damage and repair in individual cells. The damage is represented by an increase of DNA strand breaks that have, due to their negative charge, migrated out of the cell nucleus towards an anode, in the form of a characteristic streak similar to the tail of a comet. The length and DNA content of the tail is directly proportional to the amount of DNA damage.

As a response to the requirement of replacing animal tests with in vitro methods, we recently introduced in our laboratory a fish embryo test (FET test) using zebrafish (Danio rerio) (Figure 4). The method is suitable for determination of the acute lethal, sublethal and teratogenic effects of environmental pollutants and chemicals. In addition, zebrafish is genetically well characterised, which enables mechanistic studies at molecular level. To clarify the mechanisms of actions of different chemicals, we use various state-of-the-art molecular and cell-based methods such as gene expression analysis using quantitative RT-PCR and PCR-arrays, fluorescent microscopy with immunostaining, flow cytometry for analysis of different parameters i.e. cell cycle analysis, apoptosis, etc.

Heavy metals are ubiquitous environmental contaminants: within Slovenia areas around Mežica and Celje are heavily polluted with cadmium. Cadmium is classified as a human carcinogen, however the mechanisms of its carcinogenicity are not fully understood. Cadmium has been considered as non-genotoxic carcinogen, but our studies showed that, at the low concentrations that are relevant for environmental exposure, it induces DNA damage and mutations, and that it inhibits repair of DNA damage. To protect the health of exposed humans it is necessary to recognise early effects of exposure to cadmium, and our studies indicate that the DNA repair efficiency of lymphocytes might be a reliable biomarker of the effects of cadmium exposure.

An important group of environmental pollutants is organophosphorous pesticides (OPs), which are the most widely used insecticides. OPs are nerve toxins; their primary mechanism of toxicity is inhibition of acetylcholine esterase in the nerve synapses.

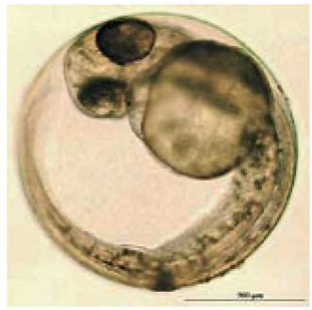


Figure 4: The laboratory aquaria with adult zebrafish (Danio rerio, Hamilton-Buchanan) [photo: Aleksander Gnjidić] (left) and zebrafish embryo, 48 h after fertilization, under light microscope, 100 × magnification [photo: Tina Eleršek] (right). Use of vertebrates at early developmental stages is recognised as an alternative ecotoxicological method. Replacement of currently used whole-animal toxicity tests has the potential to save a large number of adult fish from suffering acute toxicity.

Chronic exposure to low non-acutely toxic doses of these pesticides has been linked to increased risk for certain forms of cancer. However, not much is known about their mechanisms of carcinogenesis. Using the HepG2 cells experimental model, we studied the mechanisms of carcinogenicity of three model OPs: parathion, paraoxon and dimefox. Investigation showed that parathion and paraoxon are genotoxic and may act as tumour initiators, while dimefox induces increased cell proliferation and can be considered a tumour promoter. The most important finding is that parathion, which in humans shows lower acute toxicity than paraoxon, and is therefore used in commercial pesticide preparations, has higher genotoxic activity, indicating that at chronic exposure it represents a higher risk for human health. We also found that all three OPs exert very strong synergistic genotoxic effects in combination with carcinogenic polyaromatic hydrocarbon benz(a)pyrene. As humans are typically exposed to multiple contaminants, this synergistic activity can be considered a mechanism that contributes to the carcinogenic potential of Ops, and should therefore be taken into account for risk assessment.

One of the fastest developing technologies currently is nanotechnology. Professional and public exposure to nanomaterials is expected to increase dramatically in the coming years. Thus, it is necessary to know the health hazards related to this exposure.
Nanoparticles (defined as particles with at least one dimension smaller than 100nm) have nanostructure-dependent properties (e.g. chemical, mechanical, electrical, optical, magnetic, biological), which make them suitable for numerous commercial or medical applications. However, these same properties may potentially lead to nanostructure-dependent biological activity with adverse effects on humans and the environment, and which are currently relatively unknown. This is why our group recently decided to start investigating mechanisms of toxicity and genotoxicity of nanoparticles. Our current studies aim to establish appropriate in vitro experimental model for nanoparticle toxicity studies; current results indicate that the model with human hepatoma HepG2 cells is a sensitive indicator of cytotoxic and genotoxic effects of model nanoparticles.

An important part of our research is centred on finding and exploring the mechanisms of activity of potential cancer-preventive agents of natural origin. We studied the antigenotoxicity of mushroom extracts, certain medicinal plant constituents and hops extracts. Our most important finding is that xanthohumol, the principal prenylated flavonoid present in the hop plant, Humulus lupulus L., inhibited genotoxic effects of indirect acting carcinogens and oxidants at very low, nanomolar concentrations (Figure 5). These effects were observed in HepG2 cells and also in precision-cut liver slices. In collaboration with the Medical University Vienna, we also found that xantohumol prevented formation of preneoplastic lesions in rat liver induced by heterocyclic amine (a carcinogen present in cooked meet and fish). These results provide additional evidence for the strong cancer-preventive potential of xanthohumol, which warrants further investigations and development of xanthohumol-based food or pharmaceutical supplements for chemoprevention of cancer.
Within ecotoxicology, our major area of research is cyanobacteria (blue green algae). Cyanobacteria capable of bloom formation produce different toxins including cyclic peptides, some of which i.e. microcystins, are highly toxic for humans and animals (Figure 6). Microcystins (MCs) are cyclic heptapeptides that are considered to be liver-specific toxins. They are suspected carcinogens; in animals they have been shown to be potent tumour promoters acting via inhibition of alkaline phosphatases. We were the first to show that microcystins are also genotoxic, and that the underlying mechanism of their genotoxicity is induction or reactive oxygen species formation. In collaboration with colleagues from the Medical Faculty, Institute for Pathophysiology, we showed that at chronic exposure to nonlethal doses, microcystins induce DNA damage, not only in liver tissue but also in other tissue, including brain tissue. These results indicate that exposure to microcystins represents a serious health threat, particularly if they are present in drinking water to which a large human population can be exposed. Our results also indicate that application of antioxidants can efficiently counteract their genotoxic effects.
With studies of the effects of cyanobacterial toxins on water ecosystems,

Figure 5: The hop plant (Humulus lupulus L.); the source of the prenylated flavonoid, xanthohumol, with extremely promising cancer-preventive properties.

we have recently discovered that non-toxic peptides, which have the ability of serine protease inhibition, can be cytolitic to different phytoplankton species in a cyanobacterial bloom. With this activity, they can have an essential influence on biodiversity in water bodies, and have an impact on cyanobacterial bloom decay.

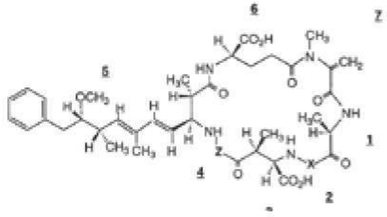


Figure 6: Cyanobacterial blooms are becoming a serious problem worldwide due to anthropogenic water contamination and global warming. Cyanobacterial toxins – microcystins – are hepatotoxic and carcinogenic, and represent a serious health threat to exposed human populations.

Tumour Biology

Research in the field of Tumour Biology is currently in a great part focused on gliomas, the most abundant primary brain tumours in adults, of which glioblastoma multiformae (GBM) is the deadliest. The name "multiformae" (i.e. "many forms") derives from the vast morphological heterogeneity of these tumours. GBM express extensive neo-angiogenesis (i.e. formation of new blood vessels) and diffuse invasion of tumour cells into healthy brain tissue, making complete surgical removal impossible. In addition, due to a high cell proliferation rate and high cell death resistance, other types of treatment, such as radiotherapy and chemotherapy, are also unsuccessful. Most patients die within a year of diagnosis. Improving current therapies and developing new ones is therefore highly important. To enable that, the basic characteristics of GBM need to be thoroughly investigated.

Cysteine cathepsins are highly important enzymes in glioma progression – their specific and controlled inhibition could therefore be efficiently used in cancer therapy. In the invasion process, cysteine cathepsins can act at the beginning of a so-called "proteolytic cascade", enabling GBM cells to invade the surrounding brain tissue by degrading the extracellular matrix. Using the spheroid invasion model (Figure 7), we have shown the activity of at least two cysteine cathepsins, B and L, to be highly elevated in the cells invading the surrounding matrix. We found that specific inhibition of cathepsin B decreased the invasion of GBM cells, confirming its role in the invasion process. This result is consistent with other studies showing a correlation between high cathepsin B expression and tumour invasiveness.

On the other hand, inhibition of cathepsin L by chemical inhibitors, antisense RNA or siRNA (Figure 8) showed no effect on invasion. Increased cathepsin L thus confers some other advantage to the invading GBM cells. Resistance of tumour cells to cell death is one of the main reasons for unsuccessful treatment of GBM. We have found increased activity of cathepsin L to increase cell death resistance in GBM cells, while its decrease has an opposite effect. Thus, cathepsin L acts in an anti-apoptotic manner – preventing GBM cells from going to apoptosis-programmed cell death. Its inhibition would therefore sensitise cells for cell death induction and would increase the efficiency of chemotherapy. Although the mechanisms of cathepsin L action are not yet entirely clear, current results suggest cathepsin L inhibitors as possible candidates for adjuvant therapy. These studies are part of the 6th Framework Programme integrated project, CANCERDEGRADOME.

A promising new GBM therapeutic is arsenic trioxide, As2O3. In 2000, the first chemotherapeutic drug containing As2O3 was registered by the Food and Drug Administration for treatment of acute promielocytic leukaemia. Currently it is also in clinical studies for treatment of GBM. To predict how an individual patient might respond to As2O3 treatment, the mechanisms of its action must be thoroughly investigated. It was shown that arsenic can induce apoptosis and autophagy, another type of cell death. We are studying these two types of cell death, and especially the possibility of sensitising cells to arsenic by modulating the expression of cysteine cathepsins, which have been shown to have an important role in cell death.

Apart from tumour cells, other cell types, such as immune and endothelial cells, commonly named stromal cells, are present in all tumours. Promising new therapies are aimed at the stroma because of its important contribution to cancer development and progression. Stromal cells are also genetically more stable and therefore less likely to become resistant to therapy. In our group, we are investigating the communication of GBM cells with endothelial cells and macrophages, two of the most important stromal cells types present in GBM. By growing cells in co-cultures we are able to follow changes in processes such as invasion, proliferation, and resistance to apoptosis of both tumour and stromal cells. Again, we are especially interested in the role of cysteine cathepsins.

Applied research

Management of water resources in Slovenia and worldwide is becoming more and more demanding. Changes in climate have adverse effects on the quality and quantity of water resources. We are conducting a number of applied projects oriented towards the biological properties of surface waters (using indicators such as zooplankton, phytoplankton, macrophyte populations, etc.), to support recognition of the general quality conditions of water bodies in Slovenia,

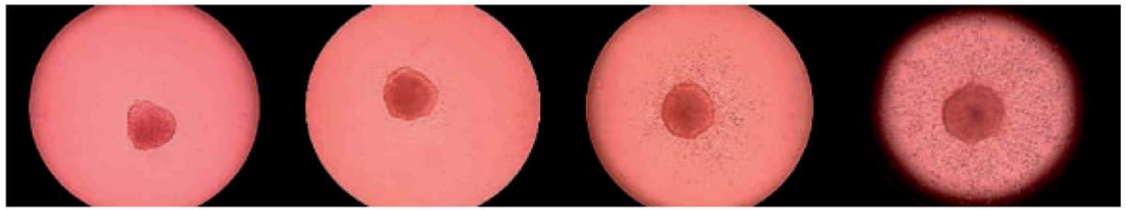


Figure 7: Glioblastoma multiforme cell line U87 spheroid invasion into collagen gel – day 0, 1, 3 and 7 (left to right). To study GBM invasion, we facilitate a "classical" one-dimensional Transwell invasion assay and recently developed 3D-spheroid invasion assay. While the first is easier and quicker to perform, and is therefore more suitable for routine work, the more complex spheroid invasion model reflects the real tumours more closely and also enables long-term studies of the invasion process.

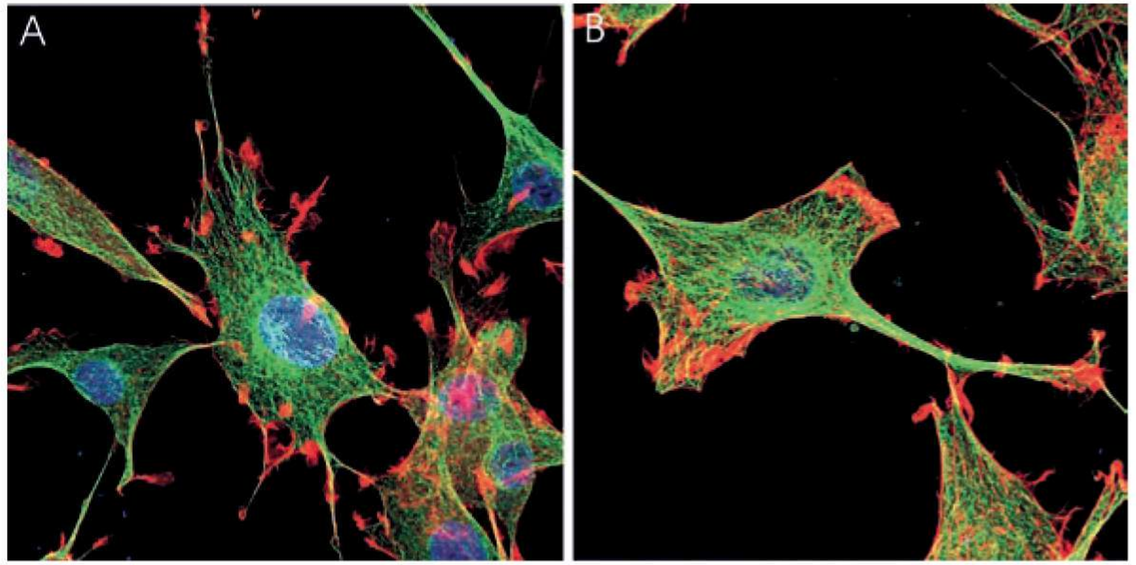


Figure 9: The effect of cyclic peptide planktopeptin BL 1125 from cyanobacteria Planktotrix rubescens on the cytoskeleton of glioblastoma cells U87. Confocal images show the organization of actin filaments (in red) and microtubules (in green) in U87 cells exposed to planktopeptin BL 1125. (a) Control U87 cells with normal distribution of actin filaments and microtubules. (b) Reorganization of cytoskeleton – collapse of actin filaments after 24 h exposure to 10 µM planktopeptin BL1125. (Photos: Prof. Robert Frangež)

identification of sources of water pollution and classification of surface waters into quality classes. We are conducting numerous contracted projects. For the Environmental Agency of the Republic of Slovenia we are undertaking "Monitoring the quality of lake waters" and "Monitoring the quality of surface waters". We have developed non-invasive methods of tracing, with which we can trace directions of the pollution of water resources and mixing of surface and ground waters.

The presence of genotoxic contaminants in surface, ground and drinking water is of special concern. In our laboratories, we are conducting several genotoxicity tests according to the standard methods. A fish embryo test has been introduced for the purposes of monitoring of wastewater toxicity prior to release into the environment. We are partners in the Centre of Excellence: Environmental Technologies, where our main role is developing new biological methods for detection of toxins and monitoring the effectiveness of wastewater treatment plants.

Taken together, our research contributes to basic knowledge of the processes and mechanisms involved in human carcinogenesis, which are important for the identification of new targets for cancer prevention and treatment, as well as for reliable risk assessments on exposure to potential carcinogens. Our research is also in line with the objectives of the recently adopted European chemical safety legislation, REACH (Registration, Evaluation and Authorisation of Chemicals; Official Journal No L 396, 30/12/2006), which calls for the testing of all chemicals produced in amounts greater than 10 tonnes, and requires reductions in animal use in toxicity testing. We provide consultation, as well as toxicity and genotoxicity testing, for industry and other stakeholders who are required to provide toxicological data for the chemicals they are producing or using. With the development of new in vitro toxicity testing approaches, we are also contributing to reduction of the use of animals in toxicity testing.

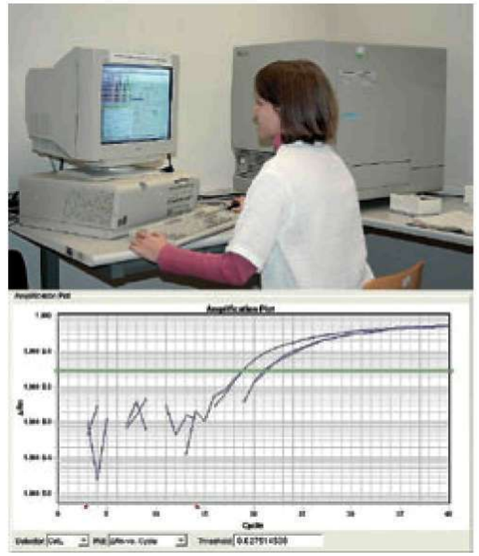


Figure 9: Efficient inhibition (silencing) of cathepsin L is confirmed by quantitative real-time PCR – the delayed signal (the right curve) means lower expression of the gene.
To study the role of cathepsin L, its expression was inhibited using siRNA. These are short RNA fragments complementary to the target mRNA (cathepsin L mRNA in our case), which specifically bind to target mRNA. The double-stranded RNA so formed is then degraded. Gene expressions (of cathepsin L and other genes) are analyzed by quantitative real-time PCR.

Laboratory of Biotechnology at the National Institute of Chemistry

From Molecular Immunity to Synthetic Biology:

Applying Basic Science to Solve Health Problems

Roman Jerala

Prof. Roman Jerala PhD
Head,
Department of biotechnology

The Department of Biotechnology underwent a significant transformation six years ago, when several researchers from the Laboratory for Molecular Modelling and NMR Spectroscopy joined the Laboratory of Industrial Mycology. The laboratory was later renamed the Department of Biotechnology, as the focus of its research shifted along with the acquisition of new instruments for advanced biochemical techniques and an increase in the number of PhD students. Researchers devote considerable effort to education, as several members have teaching commitments at the Faculty of Chemistry and Chemical Technology at the University of Ljubljana and all of the members participate in student training, particularly at the PhD level, but also at the undergraduate level (see below). The department is continuously engaged in EU projects starting with the 5th Framework Programme in the area of antimicrobial and immunomodulatory peptides and prion proteins, and previously also in engineering metabolic pathways. The departmental programme, "Molecular biotechnology: from dynamics of biological systems to applications", was selected by the Slovenian Research Agency among the top Slovenian research programmes for the year 2005.

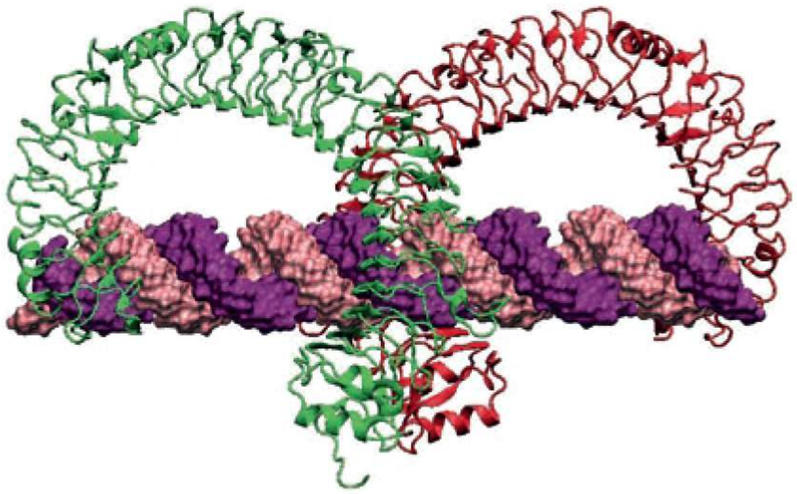


Figure 4: Recognition of viral double-stranded RNA by Toll-like receptor 3 dimer, proposed and experimentally confirmed in the Department of Biotechnology at NIC. The existence of two binding sites on the ectodomain of TLR3 provides differentiation between long RNA duplexes, characteristic of viruses, and endogenous short RNA molecules.

Research topics

Research at the Department of Biotechnology can be broadly defined as biochemical processes, such as biomolecular recognition and cellular signal transduction, which have potential applications for health (biotechnological, medicinal, and pharmaceutical). The main research topics are the molecular mechanisms of innate immunity, mechanisms and design of antimicrobial agents and conformational diseases involving amyloids. Members of the department successfully combine methods of atomic resolution, such as high-resolution NMR and bioinformatics, with techniques of biochemistry, molecular and cell biology, microbiology and biophysics. We are particularly interested in the mechanisms of molecular recognition and signal transduction at the molecular level, especially involving molecular patterns characteristic of pathogenic microorganisms (PAMPs) recognised by pattern recognition receptors (PRRs). To this end, we use instrumental methods with high resolution and sensitivity, such as nuclear magnetic resonance (NMR) and fluorescent spectroscopy using fluorimeters, luminometers, a circular dichroism spectrometer, a fluorescent cell sorter and a laser confocal microscope. Research at the department also includes work on the metabolism of microorganisms, where again we find parallels in the human organism in pathological processes such as cancer.

Molecular mechanism of response to infections

The largest group of researchers is involved in research on immunological recognition of bacterial infections and some other inflammatory processes. Among the cellular receptors that sense infection, we are currently studying TLR3 and TLR4 with its co-receptor MD-2. The TLR4/MD-2 complex senses the presence of extremely small amounts of bacterial endotoxin, which causes a strong response of the organism invaded by the bacteria and can lead to sepsis. Sepsis is the major cause of death in intensive care units throughout the world, with high rates of mortality, particularly in elderly and immunocompromised patients. There is a strong need for effective therapy or prevention of sepsis. It is only in recent years, with the discovery of Toll-like receptors, that the mechanisms of initiation of sepsis are becoming understood. We approach this problem in two parallel ways: the first approach is the study of cellular receptors that recognise bacterial endotoxin, which could lead to the possible inhibition of this process, and the second approach is to design compounds, particularly peptides, that bind to endotoxin and prevent activation of receptors, and would require rational design, based on high-resolution structures determined by NMR.

Several years ago, we pioneered identification of the segments of MD-2 that

Figure 1: Members of the Department of Biotechnology at the National Institute of Chemistry.

Mechanisms of the natural immune system: molecular modelling and biochemistry hand-in-hand unravel how the cellular receptor discriminates between viral and the body's own dsRNA

Our immune system is able to recognise infection by microorganisms by detecting components of pathogens that are different from our own molecules, which is the basis of the innate immune system. Toll-like receptors are a family of cellular proteins that recognise specific molecular patterns of pathogens. Double-stranded RNA occurs in the process of viral replication inside infected cells. On the other hand, our cells contain short segments of double-stranded RNA, which should not, and does not, activate the immune system. How does the body distinguish between long (viral, harmful) and short (its own, normal) RNA? It has been known that TLR3 receptor binds dsRNA, and previous work has determined the crystal structure of the binding domain and binding site for RNA. We reasoned, however, that this mechanism was not satisfactory since it could not distinguish between short and long RNA duplexes. We used molecular modelling and predicted the existence of a second binding site on the extracellular domain of TLR3, which requires dsRNA longer than 40 base pairs for binding and activation, because it must span the distance between binding sites on two TLR3 molecules. Experiments using cell lines expressing mutated TLR3 confirmed this hypothesis, which is very important for the potential design of drugs directed towards better vaccines, antiviral defence, anti-inflammatory or anticancer uses.

are responsible for the recognition of endotoxin. More recently, we have prepared and experimentally tested the molecular model of MD-2, which has been in most aspects corroborated with recent determination of its crystal structure. We have recently characterised natural polymorphisms of MD-2, which interestingly occur only in populations of European descent. One of the polymorphisms significantly impairs cellular response to endotoxin. This discovery is most relevant for the responsiveness of cells that do not produce MD-2, such as epithelial cells in the respiratory tract, which are constantly exposed to high concentrations of endotoxin. We have also identified several inhibitors of MD-2, synthetic and of natural origin, as promising therapeutic targets to prevent inflammation caused by endotoxin.

Antimicrobial and endotoxin-neutralising peptides

The second area of research on preventing the harmful effects of bacterial endotoxin is based on our expertise in high-resolution NMR spectroscopy, and the use of the National NMR centre, with 800, 600 and 300 MHz instruments, located at our institute. We have determined several structures of peptides in complex with endotoxin and in a membrane-mimetic environment that have allowed us to design improved generations of antimicrobial and endotoxin-neutralising peptides that selectively target bacterial membranes. With our collaborators in the ANEPID EU research project, we were able to improve the efficiency of lipopeptides in the animal model by several orders of magnitude, with the best compounds being more effective than the "gold standard" polymyxin B, but importantly lacking its toxicity. As part of our research on antibacterial agents, in recent years we have prepared a set of lipopolyamines which combine antimicrobial and endotoxin-neutralising activity and, in a report with particular resonance outside of specialised circles, we have characterised and determined the target site of the catechin from green tea – we have discovered that it inhibits bacterial gyrase.

Molecular mechanism of prion diseases

Conformational diseases are caused by changes in particular protein conformation, which transforms into a structure that forms aggregates, such as amyloids, that are connected with pathology. Best known among those are prion diseases, which are unique in that replication and transmission to other cells and organisms does not require nucleic acids. We are interested in the molecular mechanism of transformation of prion protein (PrP) with potential application for prevention of pathological transformation of PrP, and for faster and more sensitive diagnosis of infectivity, and are participating within the TSEUR EU research project. Through binding of a compound of natural origin, curcumin, we discovered the possibility of inhibiting the conversion of prion protein by means of binding to the structural intermediate between the native and fibrillised form of PrP. Based on analysis of the spatial structure of PrP and its biochemical properties, we prepared mutants of PrP, some of which were resistant to conversion, while others transform faster, which can be important for health, and also for preparation of a quicker and more sensitive test for detection of infectivity of biological material.

Synthetic biology as the link between research and education

In 2006 and 2007, our researchers mentored student research teams for the preparation of a research project in the field of synthetic biology at the iGEM (international Genetically Engineered Machines) competition. In 2006, we designed and successfully implemented a genetic circuit, which restricts the cellular response to stimulation with bacterial components that can lead to sepsis. This was achieved by inserting a negative feedback loop, activated by inflammation and leading to the inhibition of excessive stimulation. The objective of the project in 2007 was to prepare the defence of human cells against HIV-I virus that would be insensitive to viral mutations. This objective was achieved in such a way that the viral detection was based on the viral function independently of particular amino acid sequences which can mutate, leading to drug resistance or evasion of the immune system (see frame for details). At the 2006 competition, 33 teams participated; this increased to 56 teams in 2007, coming from all over the world to compete at the jamboree at MIT. Among participants were the most prominent universities such as Harvard, Stanford, Berkeley, Princeton, MIT (from the USA); Cambridge, ETH, Paris, Freiburg (from Europe), and Asian teams from Bangalore, Tokyo, Daejong and four top Chinese universities. In 2006, our team achieved an outstanding success by winning the first place (Grand Prize) with a project on a synthetic biology approach towards treatment of sepsis, and in 2007 a new team of students repeated the success by qualifying among the six finalists and winning first place among the projects in the field of Health and Medicine. The success attracted significant media attention in Slovenia and abroad, and contributed to awareness about the importance and capabilities of Slovenian bioscience and university education. The mentors received the Prometheus of Science Award for scientific communication of the Slovenian Scientific Foundation and the Socrates Award for achievements in high-school education.

Figure 3: Finalists of the iGEM competition 2006 on the stage at the Kresge auditorium at MIT in November 2006. Imperial College team in blue shirts (second place), Slovenian team in green shirts (first place) and Princeton University on the right (third place). The winning project of the Department of Biotechnology at NIC prepared a genetic device to decrease excessive response to bacterial infection aimed at preventing sepsis.

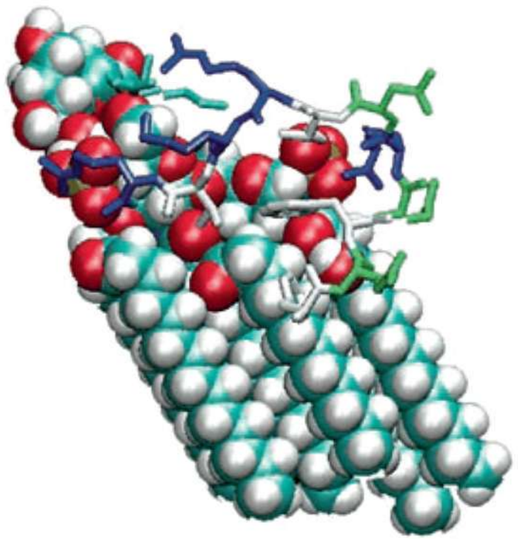


Figure 2: Structure of the antimicrobial peptide LF11 in complex with endotoxin determined by high-resolution NMR spectroscopy. Peptide structure is important for the rational design of peptides with improved biological activity.

Faculty of Civil Engineering University of Maribor

Ludvik Trauner

The study of civil engineering began at the Maribor Higher Technical School in 1960. At first, one hundred and twenty-eight freshmen started studying in cramped rooms that did not belong to the school, without laboratories and with very modest equipment and logistic support. There was an insufficient number of teachers, and therefore skilled practitioners from construction companies and offices dominated. We could not even think about real research work.

Eight years later the Department of Civil Engineering got its first laboratory. Since then, the development of civil engineering studies has made great progress. In 1973 the Higher Technical School transformed into the High Technical School and in 1975 the first students were enrolled in second degree studies. In that year we became equal partners with the newly established University of Maribor; seven years later postgraduate study was introduced. In 1985 the school was renamed the Technical Faculty of the University of Maribor.

Dean,
Full Professor
Ludvik TRAUNER,
PhD, Bachelor of
Civil Engineering

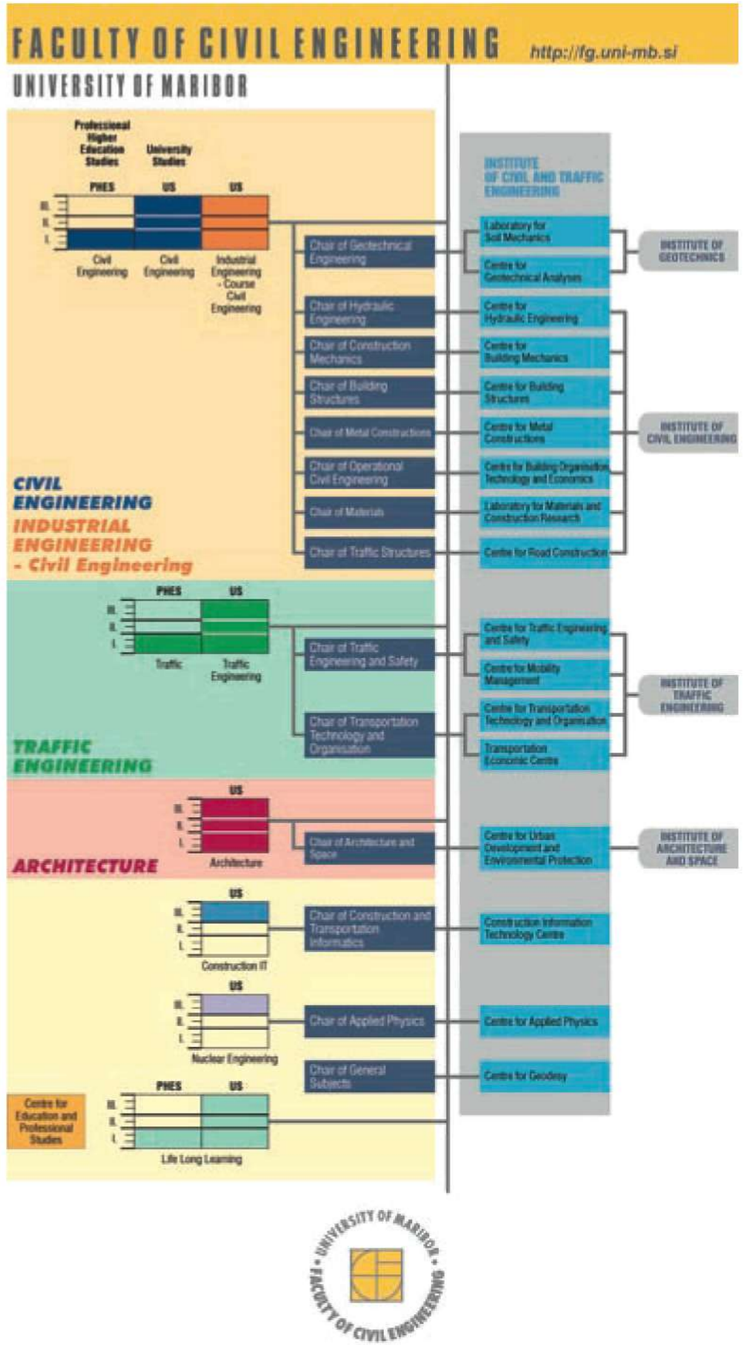
A very important evolutionary moment occurred in 1993, when besides the traditional civil engineering programme two new programmes were introduced – Traffic Engineering and Business Engineering, which was a course in civil engineering given in cooperation with the Faculty of Economics and Business in Maribor. In 1995 the four departments of the Technical Faculty agreed to reorganise into independent faculties. One of them was Faculty of Civil Engineering. In the last ten years the latter has been quickly developing, and the number of students and graduates has rapidly increased – there have been more than 3000 considering all the stages and study levels from the very beginning in 1960 till today. Also, scientific research work and inclusion of the Faculty in international courses have developed promptly.

In 2007 another very important leap was made – the study programmes were reformed according to the Bologna Declaration and new study programmes were introduced. An important step forward was taken with the introduction of an architecture programme, which we hope will develop into an integrated study programme in our Faculty.

Nevertheless, we are aware that satisfaction with our achievements means the end of our development. So, we are looking into the future. We think that our development results as well as the connection of the natural and engineering sciences in Maribor will be encouraged by the new organisation (as shown in the figure).

Scientific research at the Faculty of Civil Engineering is implemented under the research programme and basic, applied and targeted research projects financially supported by the Slovenian Research Agency, Ministry of Transport, and Ministry of the Environment and Spatial Planning. It should be pointed out that research activities at the FCE are also supported by other ministries; however, in such cases, they concern mostly entirely specific tasks related primarily to the use of knowledge, including the creation of new knowledge only to a smaller degree and therefore they concern applied and developmental tasks. Experts regularly publish their research results in international scientific publications and present them as papers at international (and domestic) congresses and symposia.

International cooperation is implemented through numerous forms of bilateral cooperation with foreign universities and research institutions as well as through (primarily) European projects, either under the EU Framework Programmes or international projects such as INTERREG, COST, ESPON, KNET, etc.



Dean Ludvik TRAUNER,

The Statute of the University of Maribor determines the Chairs, i.e. the organisational units of the university, as the holders (among other tasks) of basic research activities under a specific scientific discipline, with an aim to transfer, in the appropriate manner, scientific research achievements and new findings into the educational process at all study levels. In this respect, 14 Chairs have been established in the Faculty of Civil Engineering, the scientific research work of which is presented in further descriptions and additional web links. It should be pointed out that most of the members from the various Chairs are very active in the profession; however, this part of the activities and achievements of the university teachers and assistants is presented separately in another, more appropriate place.

In this way, university study creates conditions for creative thinking leading directly to the growth of the cultural and material welfare of people, along with continuous and simultaneous accumulation of knowledge and with an awareness of the need to decrease the harmful recurrent impact of increasing welfare on the living and non-living environment.

Lecturer Milan KUHTA, BSc

PUCH'S BRIDGE IN PTUJ

V. Markelj, M. Kuhta :

Cable-stayed bridges are the most demanding engineering structures. If a cable-stayed bridge is built using free-cantilever construction at a sharp radius across a wide lake, it is surely worthy of worldwide attention. Such a structure is Puhov Most (Puh Bridge) in Ptuj, which crosses an artificial lake on the Drava River. The new bridge is a part of the southern highway into the town of Ptuj, which was built as part of the G1-2 main road in the Hajdina – Ptuj section. The road has solved many traffic problems in Ptuj since there was just a single road bridge over the Drava River prior to the bridge's construction.

Lecturer Viktor MARKELJ, BSc

Bridge design

Finding the optimal bridge design was not a simple task. On the one hand, large spans were needed (lake bridging, waterproof canal bank wall and other obstacles), while on the other hand, very thin construction had to be used (low street level line, navigable profile and preserving the view of the oldest Slovenian town).

The longitudinal disposition, with spans of 65 + 100 + 100 + 100 + 65 = 430 m, was suitable for the given street geometry and morphology of obstacles; therefore, the innovative "extrados bridge" construction system was selected, which is a cross between a cable-stayed bridge and a girder bridge. The depth of the box girder deck is only 2.7 m, whereas a normal free cantilever, without cable stays, would necessitate a deck depth of 5.5 m. The girders of "extrados" bridges is still the main girder element, but with a depth of 2.70 m it is not rigid enough for a span of 100 m (L/H=37) and thus the cable stays, prestressed post-tensioned?????? over short pylons, add to the structure's stiffness. Also, the cables have an important function in the construction phase because 50-m-long girders with such a small structural depth cannot be built.

The structural parts of the upper construction are also short pylons of a height of 9.0 m, two for each support. The pylons are inclined at 7.5: 1 so that the cables do not reach road clearance. The concrete rating used for the deck and pylons is high-quality C45/55 MPa.

The substructure consists of 2 abutments and 4 piers, three of which are in the lake with one on land; all are supported by 150-cm-diameter piles which are 25 to 30 m long.

Erection

Erection of the bridge, undertaken between October 2005 and May 2007, was a very demanding task. The first phase included displacement of high voltage transmission lines and sewage lines, as well as construction of a foundation in the wide accumulation lake to a depth of 5 metres.

The foundation in the lake was carried out with the help of artificial islands built with the help of sheet piles. This was followed by driving 150-cm-diameter piles 150 cm in diameter with a length of 30 m in order to reach the marl base. Normal piling was not possible because of the problems with extracting the casings. Therefore, the contractor was forced to use the technology of bentonite flushing. Excavation was accomplished with boring equipment on a special dredger through steel casings to a depth of 8m; the stability of the well was assured with the help of a bentonite suspension. All transport of equipment and material was achieved with heavy barges.

The bridge deck was built as a free-cantilever structure with the addition of inclined extrados cables. A movable scaffolding (handcart) with a segment length of 5m (manufactured by Wito and Doka) was used for erection. Since the superstructure is of constant height, the scaffold did not have to be adjusted as with the usual condition of variable height. This aspect saved time, with the setting and prestressingpost-tensioning???? of the cable stays performed within the single construction stage of one week, as is usual.

One of the particularities of the construction is also the inclined cable stays, which consist of three basic components: a free part, two anchorages in the beam and a deviator in the short pylon. The cable itself, i.e. the free part, consists of 31 tendons made from high-strength steel with high-quality anticorrosive protection. Each tendon is first coated with zinc, then protected with grease and a plastic wrapping. Thirty-one such tendons, each 1.5 cm in diameter, are put into a tube of solid resistant plastic 18 cm in diameter, and the interstices are filled with cement. This cable can sustain a maximum stress of up to 820 tonnes, while the actual stress in each is 4000 kN (400 tones). A unique solution is the pylon cable saddle, which accommodates 40 cable stays.

The biggest problems in the project were the demanding sharp-curvature geometry of the structure, construction of anchorages and cable details. Another extraordinary story is also the monitoring of deformations in all phases of construction. The construction of such a bridge would be impossible without the most modern software and the most accurate geodetic equipment.

This demanding project represented an extraordinary technological challenge for the client, designers and contractors and is a reference work of world scope. With the new bridge, Ptuj has gained a unique engineering example, one which not only solved traffic problems but which has also become a new feature of the skyline and modern symbol of the town in the southern outskirts near Ptuj Castle and the medieval town centre.

Puch's bridge in Ptuj.

SOUTH-EASTERN DOMAIN OF SLOVENE ARCHITECTURE

Uroš LOBNIK

Lecturer Uroš LOBNIK, BSc.

With the beginning of the study programme in architecture at the Faculty of Civil Engineering, University of Maribor, a new era in the development of Slovenian architecture began. The architecture programme at the Faculty of Civil Engineering in Maribor is being established at a time of intense change in the profession of architecture, when numerous new architecture schools are being opened and brought into force in the spotlight of the regional European architectural scene. The spreading of architecture schools and high-quality study programmes brings much more good than bad as a rule.

At the Faculty of Civil Engineering, within which the Chair for Architecture and Space was established in 2000, preparations for a new study programme in architecture began in 2003. For decades there were deliberations about the connection of the fields of construction and architecture, as well as about the domain of supplementing the technical knowledge of Slovenian architecture and the need for developing another recognised regional school of architecture in Slovenia. For this purpose, the goal was the creation of an architecture programme which would be configured according to the Bologna Declaration and capable of reacting to the needs of society and its space with "regional specifics". In the new study programme, students will gain and use knowledge from the field of civil engineering, spatial planning and urbanism or opt for gaining new knowledge with the help of specialisation in specific technical fields after three years.

Study programme in architecture

Higher education of engineers in architecture in European countries is conceived according to the Bologna Declaration in the form of consecutive undergraduate and postgraduate programmes of study. Undergraduate and postgraduate studies constitute a unified programme of qualification, in the sense of European and international standards of acquiring licences, and assure a high level of mobility of students of architecture, academic and administrative staff. This principle means a change in the existing system of higher educational study in Slovenia, comparable to restructured programmes in the related cultural space of Europe (Austria, Italy and Croatia).The architecture programme at the Faculty of Civil Engineering of the University

of Maribor has been set up according to European recommendations in two clearly separated segments, undergraduate and postgraduate (Bachelor and Master), to educate experts in the field of architectural design and construction and enable gaining a licence as an authorised architectural planner and responsible space designer.

Starting points in planning the architecture programme

The primary goals of the architecture programme in Maribor is to educate architectural practitioners who will be capable of integrating architectural, urban, constructional and economic knowledge, who will be able to understand and lead the entire process or separate phases of designing construction, sanitation and space (environment). In this domain the process of teaching architecture at the Faculty of Civil Engineering is the starting point for acquiring basic knowledge in the field of architecture, planning, design and construction covering fundamentals of design, planning, construction with specific materials, architectural detail, function, construction methodologies, renovation, protection of the environment, economics of construction, urban economics and management. Specific areas of knowledge cover the entire field of architecture: from urbanism, renovation, materials, technology, construction and economics to ecology. The programme is based on projects, and besides compulsory subjects the educational process offers a wide range of optional subjects in many relevant fields.

Figures 1, 2: Participants in the architecture programme proposed a linear park along the Drava River.

Objectives of the undergraduate and postgraduate programme in Architecture

The goals of the three-year undergraduate programme is to qualify experts who to be able to perform the processes and duties of the profession of architecture in creative planning and design. The basic objective of the undergraduate programme is to enable continuation at the postgraduate level in the field of architecture and related fields at home as well as abroad.

The two-year postgraduate programme should educate experts with integrated knowledge of the specific fields of architecture and urbanism. The distinctive differentiation of subject matter is planned according to modules to enable understanding and integration of professional, scientific and artistic aspects of architecture.

Expectations

The undergraduate level of study in architecture at the Faculty of Civil Engineering started in the academic year 2007–2008. A total of 63 students are enrolled in the first year. The study programme is carried out by experts employed at the Faculty of Civil Engineering as well as experts from Slovenia and other countries. The involvement of a number of reputable domestic and foreign university professors has already been arranged. The experience of these experts in the field encompasses planning, research and scientific work: Prof. Dr. Boris Podrecca (Austria), Hrvoje Njirić (Croatia), Dr. Grigor Doytchinov (Austria) and Dr. Tomas Valena (Germany). In addition, cooperation with many architects and urban planners – mentors who have proved themselves with their theoretical and practical work at home and abroad – is anticipated.

Bresternica Workshop

In October 2007, the municipality of Maribor invited two schools of architecture from Slovenia – the Faculty of Architecture in Ljubljana and the Faculty of Civil Engineering with a study programme in architecture in Maribor – to solve development problems of the local community of Bresternica. The Chair for Architecture and Space cooperated in the Bresternica workshop with students and assistants in the architecture programme.

Bresternica represents an important urban developmental area of the municipality with the potential of becoming a high-quality residential community. Over four decades, suburban development reached the point where the existing planning documents of the municipality were no longer valid. Because of the complexity of the task, the idea for an urban workshop was proposed and the two schools of architecture contributed a variety of results, from the urban concept to detailed architectural plans for public spaces and residential areas.

THE PROCESS OF INTRODUCING ROUNDABOUTS INTO THE REPUBLIC OF SLOVENI

Tomaž Tollazzi

During the past fifteen years, roundabouts have become more and more interesting for both designers and investors in the Republic of Slovenia. Our deeper interest in roundabouts started with independence; until that time, there had been no significant experience with roundabouts and their advantages in road traffic in Slovenia.

Today there are about 108 roundabouts, with more under construction. Considering the chronic lack of professional literature on roundabouts, the excess of professional literature, manuals and guidelines in other countries, the lack of our own guidelines for roundabouts and the number and consequences of traffic accidents, we can affirm with complete responsibility that both designers and contractors have done their work professionally, and with a high level of quality.

The process of introducing roundabouts in the Republic of Slovenia has had a number of participants who, although a little later, also joined in. Without their cooperation, the process would have been much less successful. These are the police, media, driving schools, etc. Unlike driving schools, the media are the major means of providing information to the largest number of users – to drivers, pedestrians and cyclists.

After initial enthusiasm in introducing the first roundabouts in cities such as Ljubljana, Maribor, Koper, Velenje and Nova Gorica, the first questions arose concerning the justification of their installation and the traffic safety which they provided. Considering that roundabouts in Slovenia were a novelty at the time (with the exception of some rare earlier examples), such caution was completely understandable in view of the fact that there was no assurance that roundabouts in Slovenia would prove themselves appropriate in the same way that they did abroad. With regard to the fact that fifteen years ago roundabouts were practically an innovation, there were some hindrances and expectations of effects opposite to those they were actually designed for.

The lack of our own guidelines forced designers to choose among foreign guidelines. Thus, the choice of a certain guideline depended on the designer's subjective estimation and on the literature which was available at the time. This caused partial disunity in designing the first few roundabouts.

In other words, every roundabout was designed according to different criteria. This is objectively understandable, as until recently there was no official or individual person who, with experience and theoretical knowledge of roundabouts, would be able to decide with certainty which of the foreign guidelines should be taken as standard in Slovenia.

The direct application of foreign guidelines in Slovenia would be unacceptable and nonsensical, would not correspond to actual traffic conditions and would likely cause undesirable (if not entirely negative) effects.

In spite of the foregoing, roundabouts turned out well, even immediately after introducing them in Slovenia. Significant at that point were the designers and institutions (especially the Faculty of Civil Engineering at the University of Maribor) that took part in working out assessments of the suitability of their realisation and of the projects in general.

Associated Professor Tomaž TOLLAZZI, PhD, BSc

General experience with roundabouts in Slovenia does not differ from that of other countries which have been constructing them for decades. The installation of roundabouts in Slovenia is suitable and recommended mainly at intersections:

- of X, Y and K types (sharp intersection angles);
- of H types (two three-arm junctions close by);
- of a larger number of arms (five or more);
- which are especially exposed to traffic accidents with heavy consequences;
- with excessive traffic speeds on approaches;
- in areas where driving conditions change instantly (i.e. at the ends of high-speed road sections (motorways), at entries into urban areas, at motorway exits...);
- in the case of excessive traffic speed on major roads;
- where posting of traffic lights is, for some reason not justifiable and as a measure for calming traffic.

Thus, in some cases in Slovenia the installation of a roundabout is the only acceptable solution (for instance at an intersection with a large number of arms – five or more). In other cases (at junctions with excessive speeds of entering traffic, in case of sharp intersection angles, for calming traffic ...), it is only one among a number of possible solutions. Therefore, there is no universal "prescription" which would determine the installation of roundabouts in Slovenia. Each case is treated separately, according to its own features and circumstances.

Use of Fibre-reinforced Shotcrete for Primary Lining in the Dekani Tunnel

Vojkan Jovičić, Jakob Šušteršič

Abstract:

A 10 m-diameter motorway tunnel at Dekani was constructed using the principles of the NATM method. The tunnel was located in the flysch geological sequence, which is classified as weak rock. The aim of the research presented in this paper was to examine whether fibre-reinforced shotcrete (FRS) can be successfully used as the only material for the primary tunnel lining in these geological conditions. In-depth interpretation of the interaction between the FRS lining and the surrounding rock, which was based on monitoring in a 60 m-long test field, is presented in the paper. The success of the test field led to the use of FRS for the primary lining in a 410 m-long section of the tunnel.

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1. Introduction

Steel fibre-reinforced shotcrete (SFRS) has a relatively long history of application in tunnelling. Steel fibres were introduced as a component of shotcrete in the 1970s to impart ductility in an otherwise brittle material. Ductility is of particular importance for the distribution of load between the tunnel lining and the surrounding ground. During interaction between the two, the lining is prompted to carry a significant load only once the ground is deforming. The large deformations that occur in the ground can easily overload brittle material such as plain shotcrete and lead to failure.

It is demonstrated in this paper that the combination of fibres and shotcrete makes a composite material of sufficient ductility to accommodate large ground deformations several hours after the application.

These deformations are accommodated from their very onset, when they develop most rapidly, without damage to the composition of the FRS, so that the lining does not lose any of its initial capacity. The subsequent gain in strength of the lining with time is enhanced by the lessening of ground deformation. From this point of view, FRS is an ideal material for tunnel lining.

2. The test field

The geological structure in the area of the Dekani tunnel is dominated by flysch, which is a turbidite material deposited off the continental shelves during the Cretaceous period. At the time of formation, collapses in the underwater depository slopes were common – the macrostructure of flysch is dominated by their failed shapes. The Dekani flysch is characterised by intermittent layers of marl and sandstone, the latter varying in thickness from a few centimetres to one to two metres. An important feature of the Dekani flysch is that the original sequence was tectonically alternated and is now heavily folded, featuring a chaotic distribution of layers and joints, as shown in Figure 1.

The interaction of the rock mass and the tunnel lining was closely observed during construction of the tunnel using real scale measurements. These were carried out to measure the convergence of the cavity and the degree of mobilisation of the tunnel support elements. For this purpose, measuring profiles were installed systematically at characteristic sections along the tunnel.

As part of the active design approach, back analyses were performed to determine the relevant mechanical characteristics of the rock mass and to refine the support measures.

The 60 m testing field, in which the FRS lining was used alone, was particularly well covered by instruments. Sets of geodetic targets around the perimeter of the excavation of the tunnel were used to measure radial and longitudinal convergence. Sets of extensometers installed at depths of 3, 6, and 9 m were used to measure movements within the body of the surrounding rock mass and sets of radial measuring anchors were used to measure the mobilised anchor forces.

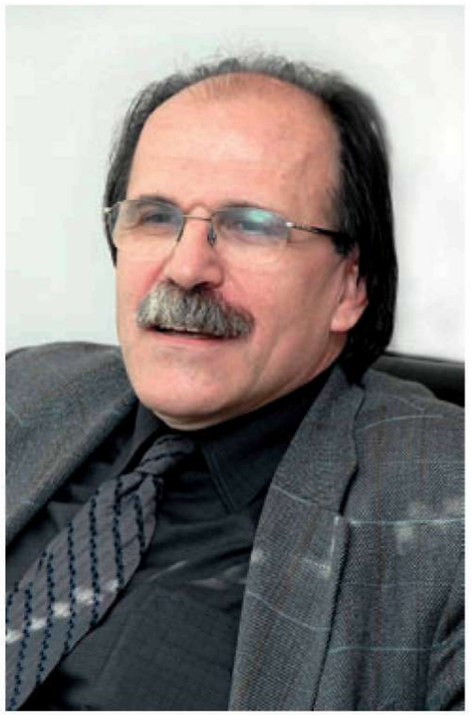
The purpose of the test field was to examine whether a 20 cm-thick FRS lining of class C20/25 can be equally efficient as a standard lining, when used in similar geological conditions. The standard NATM lining in this case comprised steel meshes ϕ6 mm/15 cm, TH21 steel arches at 1.5 m spaces, and 20 cm-thick shotcrete of class C20/25.

3. Description of the performance of the new FRS

A combination of steel and polypropylene fibre was used to prepare the mix for the FRS. Based on previous experience, the following ingredients were used for the preparation of the FRS:

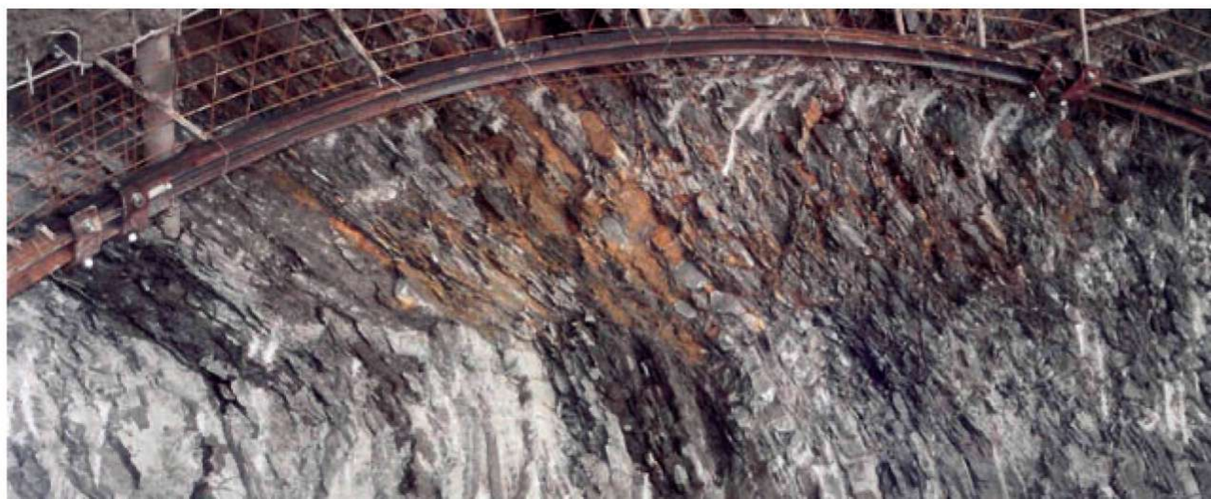
- cement (CEM II);
- high-range super-plasticiser;
- accelerator;
- steel fibres with length of 16 mm and with diameter of 0.40 mm – 0.4% of total volume;
- polypropylene fibres with length of 10 mm – 0.05% of total volume;
- crushed limestone aggregate – fractions: 0–1, 0–4 and 4–8 mm.

The FRS was mixed wet. All the processes of preparation, transportation and spreading were performed as for plain shotcrete according to the technical specification. Fresh FRS was mixed in the ready-mixed concrete plant, with steel and polypropylene fibres added, and was then delivered to the



Jakob Šušteršič, IRMA – the Institute for Materials and Application, Slovenčeva 95, 1000 Ljubljana, Slovenia.

Figure 1: Typical texture of the Dekani flysch sequence exposed during excavation of the tunnel (marl sequence is coloured grey and sandstone sequence is coloured brown)



Bojan Jelan

site by a truck mixer. The accelerator was added into a truck mixer during controlled mixing. By careful choice of the length and the amount of fibres added, there were no difficulties with the placeability of the FRS during the spreading.

The following properties of the FRS were tested: compressive strength, modulus of elasticity, ultimate flexural strength, and properties obtained with a wedge splitting test. The latter test, developed by Tschegg and Linsbauer (1986), is schematically shown in Figure 2 from Linsbauer and Šajna (1996). The wedge splitting test was designed to minimise some of the problems of the third-point bending test on a notched prism in evaluating the ductility of concrete.
Wedge splitting tests were used to measure the ultimate strength, the strength at the first crack and the

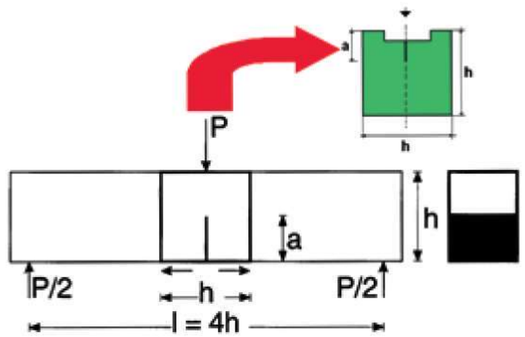


Figure 2: Wedge splitting test (WST) method (after Linsbauer and Šajna (1996)).

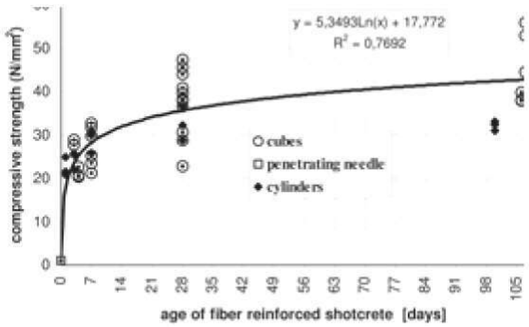
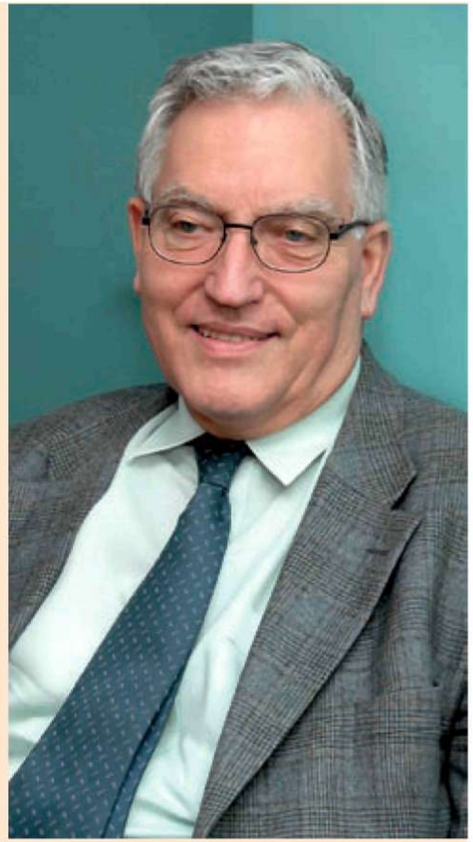


Figure 3: The rise of compressive strengths of FRS with time.

IRMA – the Institute for Research in Materials and Application

IRMA, the Institute for Research in Materials and Application, was established in November 1992 as a private institute for research and development, testing, consulting and engineering in building materials. The institute specialises in concrete, concrete technology and concrete products, as well as in repair and restoration of concrete constructions.
In regards to consulting and engineering, the institute provides technical support and solutions to complex problems in concrete technology, alongside technical supervision and quality control of materials for investors in concrete construction. Of special interest in this field is the use of the most advanced materials and solutions in the repair and restoration of concrete structures. In this capacity, the scientists of the institute determine the condition of the structure. After determining the causes of damage, they design repair procedure and provide technical supervision for the most delicate stages.
IRMA is a notified body for testing and certification. The IRMA testing laboratory carries out tests of concrete, aggregates, mortars, concrete products, masonry units, products and systems for the protection and repair of concrete structures, and is accredited according to standard SIST EN ISO/IEC 17025: 2005 from Slovenian Accreditation – Accreditation Certificate No. LP-008 from 7 March, 2005.
IRMA is a certification body for factory production control of concrete, aggregates, masonry units, masonry mortars and chimneys – components: concrete flue liners, concrete flue blocks and concrete outer wall elements, as well as of precast concrete products – linear structural elements. The identity number of IRMA as a certification body for concrete factory production control is REG2-0008-01, and as a notified body for factory production control of construction products according to the harmonised standards, 1374.
The certification body is accredited for certification of factory production control related to concrete, aggregates and some masonry units according to standard SIST EN 45011:1999 from Slovenian Accreditation – Accreditation Certificate No. CP-004 from 27 December 2005.



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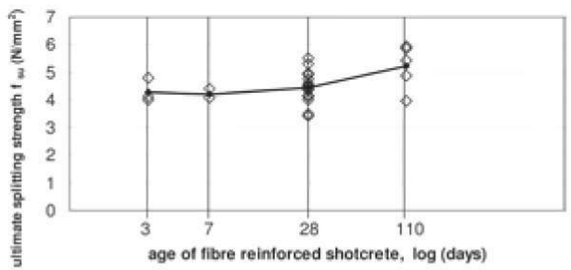


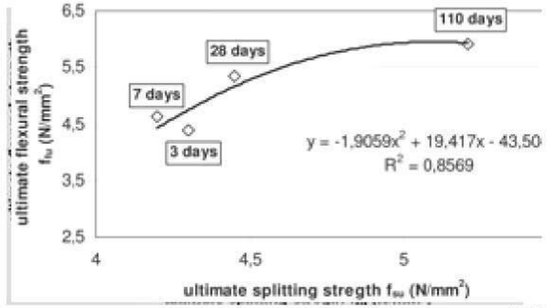
Figure 4: Influence of age of FRS on ultimate splitting strength.

equivalent strengths up to selected crack widths of 0.1, 0.2, 0.3 and 0.4 mm.

The critical parameter for the efficiency of a sprayed concrete lining is early compression strength. On average, a compressive strength of 1.0 N/mm² was obtained at 1 h and 40 min after the placing of the FRS. Further progress of measured compressive strength with regard to the age of the FRS is shown in Figure 3. As can be seen, the average compressive strength of about one-day-old FRS exceeds 20 N/mm². This was already approximately 50% of the average compressive strength achieved for 110-day-old FRS.

Figure 5: Correlation between average results of ultimate splitting strength f_{su} and ultimate flexural strength f_{fu}.

The influence of age of the FRS on ultimate splitting strength is shown in Figure 4. It can be seen that the ultimate splitting strength fsu increases with the ageing of FRS, at a similar rate as compressive strength.



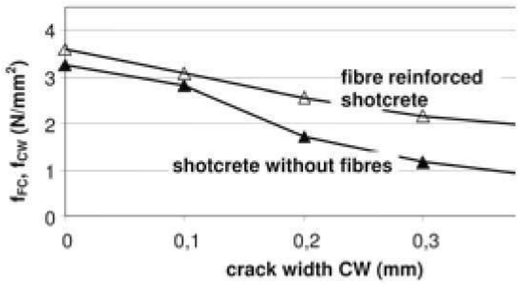


Figure 6: Influence of fibres on the increase of the crack opening resistance of shotcrete at the age of 28 days.

Linsbauer and Šajna (1996) argue that the wedge splitting test method can be considered as a variant of the third-point bending test method on a notched prism (Figure 2). Following this assumption, a correlation between ultimate splitting strength f_{su} and ultimate flexural strength f_{fu} was plotted, as shown in Figure 5. It can be seen that these two strengths correlate strongly, despite different notch depths (the cubes had a notch depth of 5 cm and the prisms had a notch depth of 3.3 cm).

An attempt was also made to compare directly the performance of the plain shotcrete and the FRS. The higher strength of the FRS is the result of higher ductility and higher crack-opening resistance. This can be evaluated by measuring equivalent strengths up to the selected crack widths (Šušteršič et al., 2001). Equivalent strengths, which represent toughness indices up to the selected crack widths of 0.1, 0.2, 0.3 and 0.4 mm, are calculated by taking into account the values of the absorption energy capacity derived from the load-deformation curves.

The increase of crack-opening resistance of the shotcrete by addition of fibres relative to shotcrete without fibres is shown in Figure 6. The average equivalent strengths f_{CW} and the strength at the first crack f_{FC} (crack width = 0.0 mm is a notation for the range of micro-cracks) of the samples of the FRS and the plain shotcrete are plotted for the same crack width at the age of 28 days. It can be seen that the presence of fibres increases the crack-opening resistance of shotcrete within the range of 10% at 0.0mm cracks, up to 100% for cracks of 0.4mm.

4. Results of observation in the test field and subsequent back analyses

The results of the observation of the interaction between rock-mass and tunnel lining are compared for a test field and for a regular measuring profile. Two profiles were compared: 20cm-thick FRS lining and the equivalent conventional NATM lining (steel meshes ϕ6 mm/15 cm, steel arches T21 at 1.5 m spaces, and 20 cm-thick shotcrete). Both linings were supported by a set of identical SN radial anchors ϕ=28 mm, l=6.0 m at approximately 2.0m distance along the perimeter and 1.5 m longitudinally. The profiles were chosen within similar geological conditions and the same level of overburden. The measurements of convergence displacement of the two linings showed no significant difference.

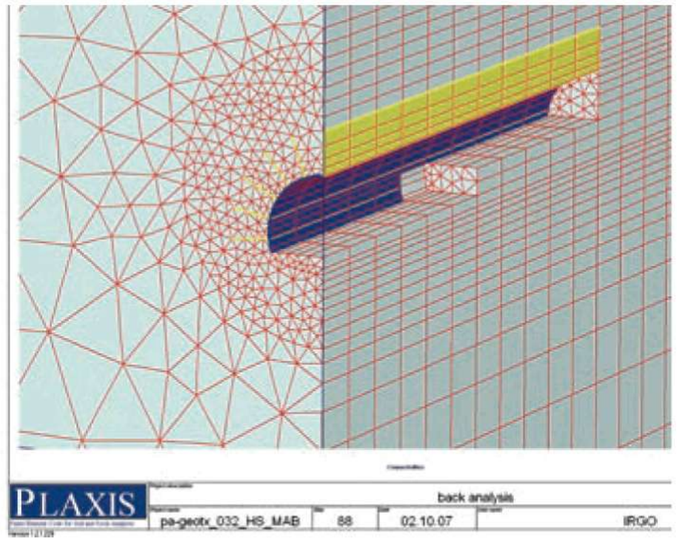


Figure 7: Finite element model of the construction of the Dekani tunnel

Back analyses of the interaction of the rock-mass and the FRS lining in the test field were carried out using the 3D finite element program PLAXIS. The model, shown in Figure 7, featured a finite element mesh of about 14,000 elements. All stages of the excavation, and support of the top, bench and the invert were separately modelled, as indicated in the figure. A hardening soil model (Schanz et al., 1999) was used to model the behaviour of the rock mass using the parameters presented in Table 1.

The purpose of the back analyses was twofold: a) to examine the efficiency of the interaction between the tunnel lining and the rock mass and b) to evaluate the parameters for the rock mass model relevant for tunnel construction as performed in the test field. The back analyses were performed by simulating in detail the steps of tunnel construction while attempting to match the observed behaviour in the test field by changing the material parameters of the modelled material. The material parameters were iterated until good agreement between the observed and the calculated behaviour was achieved. The back-calculated parameters were then used to refine the design in the remaining section of the tunnel.

The final comparison of the calculated and measured convergence movements is shown in Figure 8. The difference in convergence of the FRS tunnel lining and the conventional NATM lining is also shown in the figure.

Bending moments in the lining were not measured

	Unit weight γ [kN/m³]	Cohesion c [kN/m²]	Friction angle φ [°]	Young's modulus E_{50} [GPa]	Young's modulus E_{ur} [GPa]	Poisson's ratio ν
initial	26	239	38	0.50	2,.0	0.20
final	26	295	41	0.75	3.00	0.20

Table 1: Initial and final material parameters of the flysch for the back analyses

in the field. Given the fair agreement between the other indicative parameters, it is plausible to expect that the bending moments obtained in the back analysis would be close to the actual field values. The back analyses indicate that for the given FRS lining, the actual field bending moments would be at the upper mark of 20 kNM/m.

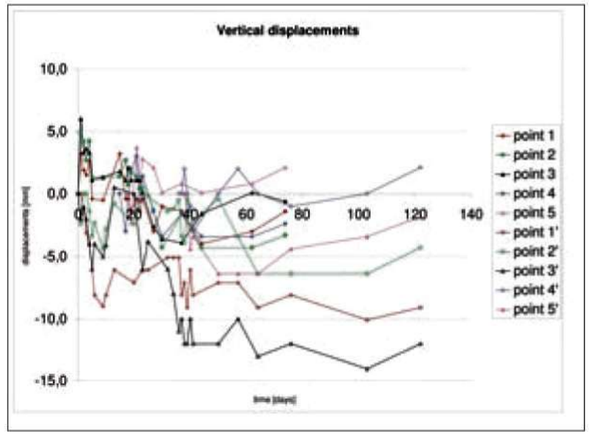
5. Discussion and conclusion

The purpose of the use of the steel arches, an integral part of the conventional NATM lining, is mainly to provide short-term support to the tunnel excavation, before the sprayed concrete sets in and integrates with the steel reinforcement meshes. But after several hours, their role becomes mainly obsolete, despite the considerable efforts to put them in place.

The installation of the reinforcement meshes is demanding and requires exposure of working force to the open faces of the excavation. Initially, the meshes have low efficiency, as the integration of the meshes and the sprayed concrete is done after the main convergence deformations in the tunnel have already taken place. This is the usual explanation for the often-seen brittle failure of the sprayed concrete lining that occurs in the first few days after the excavation.The fibres in FRS have an almost immediate effect and, due to improved ductility and a high post-crack strength, the FRS remains load-bearing during the main convergence deformations in the tunnel.

This paper has shown that FRS can be a highly appropriate material for tunnel linings constructed in weak rock, such as flysch. Using real-scale measurements in the testing field and numerical back analyses, it was shown that FRS can achieve a comparable strength capacity to the mesh-reinforced sprayed concrete of a conventional NATM lining.

The use of the FRS in the testing field proved successful and a further 410 m of tunnel was constructed using this method. Savings were made in the use of working force and materials. The contractor achieved advancements in given ground conditions of about 7 m per day, as opposed to 5 m per day as planned. This resulted in the conclusion of the works some four months ahead of schedule. This was achieved without any compromise in the required quality of the works or health and safety procedures.



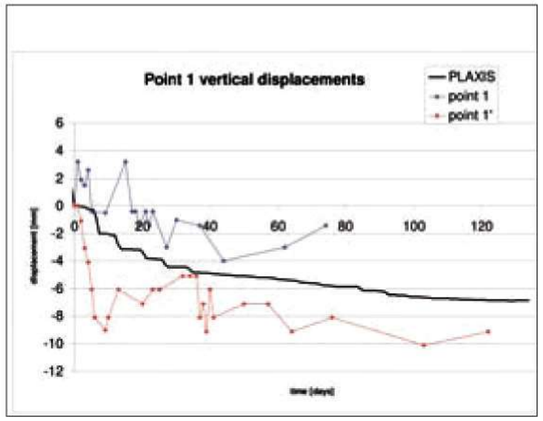


Figure 8: Comparison of the calculated and measured vertical convergence movements (points 1–5 are movements measured for the FRS lining, whereas points 1'–5' are movements measured for the conventional NATM lining)

Acknowledgements

The work in the research field in the Dekani tunnel was partly funded by the Slovenian Research Agency and partly by the contractor SCT d.d.
Permission for the testing field in the Dekani tunnel was given by the investor, DARS d.d., the Motorway Company of the Republic of Slovenia.

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A Laboratory for Algorithms and Data Structures

Borut Robič

Prof. Dr Borut Robič, head of the laboratory.

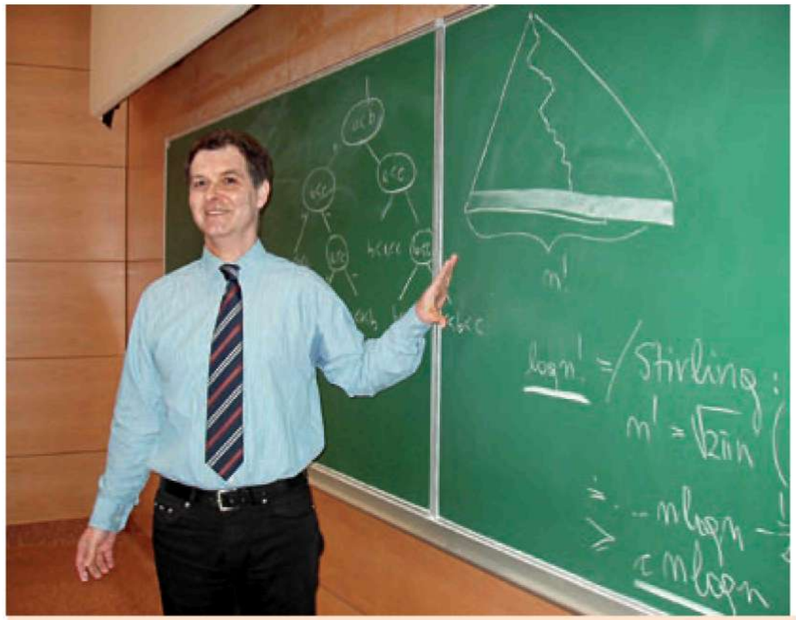
Among those problems which are solvable, there are still some so difficult that for all practical purposes they cannot be solved in their full generality on a computer. Such problems are called "intractable", because they have been proved to require at least exponential time for their solution. For some others, usually called "NP-complete" problems, the implication is that exponential time is required to solve them; however, if any of these could be solved in less than exponential time, then a great number of problems could also be solved substantially more quickly. The significance of the class of NP-complete problems is that it includes thousands of important natural problems from computer science, mathematics, economics, and other fields. These problems have been examined seriously, yet none of them is known to have a quick (i.e. polynomial) solution.

The fact that theory doesn't bring only good news has pushed researchers in a number of directions, intended to try to alleviate intractability. For example, in practice, we may not need the optimal solution to a problem; a solution that is nearly optimal may be good enough and may be much easier to find. Algorithms of this kind are called approximate. Other problems seem to be more easily solvable by probabilistic algorithms, which use the outcome of a random process, such as flipping a coin. The price paid for this is the possibility of error, but for some problems this possibility can be minimised and safely ignored. Yet another approach is to use computer networks, where there may be many computers, or many processors within a single computer, to work on a problem and compute the solution jointly. Combining all these approaches, we can take inspiration from ants (or some other biological or physical system) in order to design algorithms for solving computationally demanding problems.

In the following, we describe some of our application-directed research.

Location problems and uncertainty

Models in which a number of facilities have to be located in the presence of customers, so as to meet some objective, have been studied for many years. For example, facilities can be warehouses, supermarkets, parking garages or hotels, as well as facilities that are not so expensive to set up, such as computers or communication transmitters. Although these examples are different from each other, they share common features, which are formalised in the so-called location problem. Informally, this is defined as follows: given a space, a distance function that is defined between any two points in that space, a number of existing "customers" that are located in the space under consideration and who have certain "demand" for a product, the task is to locate one or more "facilities" in that space that will satisfy some or all of the customers' demand. There are many variations of this problem. Usually, the facility to be located is small in relation to the space under consideration, but the space can be continuous, discrete, or a network, and there are also several ways of choosing the distance (e.g. Euclidean, Manhattan, etc.). Unfortunately, it can be shown that many of these variations are NP-complete, thus requiring either specialised and highly efficient exact solution techniques or good heuristics. In our laboratory, we develop algorithms and methods for solving location problems and other optimisation problems where there is uncertainty of input data.



Prof. Dr Borut Robič, head of the laboratory: in the Laboratory for Algorithms and Data Structures, the following areas of application-directed research are currently being pursued: combinatorial optimisation (e.g. facility location problems, replication problems in distributed computing, routing problems in networks, mapping and scheduling problems in parallel and distributed systems) and compiler design (e.g. combining top-down and bottom-up parsing). Members of the laboratory also pursue fundamental research in algorithmics, such as modern techniques for coping with intractability (e.g. approximate and randomised computing) as well as other aspects of algorithm design and computational complexity (e.g. algorithms for fast matrix multiplication, bio-inspired and parallel algorithms).

Assist. Dr Jurij Mihelič: uncertainty of input data is often present in practical optimisation problems. For this reason, we are interested in algorithms and methods for solving these problems in a flexible way. This means that the solution has to be constructed in such a way that it can easily be adapted to reflect subsequent change in input data, while at the same time retaining its desirable properties.

Distributed processing

Computers are becoming a commodity, emerging in all aspects of modern life. However, these computers are mostly under-utilised in terms of their computing power, as well as their storage capabilities. On the other hand, science is changing rapidly. Large-scale scientific endeavours are carried out via collaborations on a global scale in which information and computing technology plays a vital role; these are popularly termed "e-Science". The need for enormous amounts of computing power and data has motivated the development of new technology which would con-

nect all the idle computing power, data capabilities and other computer services into one virtual computer. Thus, grid computing has emerged as one of the key computing paradigms enabling the creation and management of Internet-based utility computing infrastructure for the realisation of e-Science. There are many problems which arise when constructing such systems. Some of these problems are the focus of the research in our laboratory.

Assist. Dr Uroš Čibej: one of the most critical problems in data intensive grids is the optimisation of the access to data. In modern distributed systems, large amounts of data are being generated. Instead of keeping the data in one place, several copies can be made on different nodes of the system. In this way, the users can access the closest copy, thus making the transfer of data much faster. However, finding optimal locations for them is an NP-complete problem.

We develop formal models that describe these problems in strictly mathematical language and make them more amenable to analysis. We design new algorithms for solving data-replication problems and use various simulation tools to empirically evaluate them. In collaboration with the University of Melbourne, we developed a component for the GridSim simulator, which makes such evaluations easier.

Another very important problem is the search for specific data. Mechanisms need to be developed which enable users to find the data they require from the incredible number of different files and databases available in a typical grid. An algorithm has been developed in our laboratory that uses a biologically inspired technique called ant-colony optimisation. A user sends a query in a form of a set of agents (ants) which "run" around the nodes of the grid collecting the required information. The algorithm shows good results and we believe it will improve the quality and usability of today's grids.

Compiling

Computer programs are written in programming languages which are designed to ease the programmer's work of describing the computation to be performed. However, before this program can be processed, it must first be translated from a programming language into the computer machine language. Translating a program from one language into the other is called compiling, and a tool which automatically compiles a program is a compiler. Unfortunately, compilers are complex programs. Each is written for a specific programming language and for a specific processor. A compiler needs to handle every detail of the programming language and requires every detail of the processor's architecture to be integrated. Additionally, it is expected that the compiler-generated translation is improved (optimised). A modern compiler consists of two main parts. The compiler's front-end is used for analysis of the program which is being compiled, and for translating it into the compiler's internal representation. This part of the compiler is also responsible for detecting various syntactic and semantic errors in the program, although not all can be found by the compiler. The second part, or a compiler's back-end, is used for generating the translation of the program being compiled. With the development of ever more sophisticated programming languages, more powerful methods for program analysis are needed in compilers. Thus, a number of new parsing algorithms have been developed in the Laboratory.

Many techniques and algorithms that were developed in the compiler field are used in much wider context nowadays. For instance, each time a web browser displays a web page, it must analyse its description and this is done by syntax-analysis methods similar to those used in compilers. Furthermore, a number of algorithms developed for program analysis have been used for gene analysis in bioinformatics.

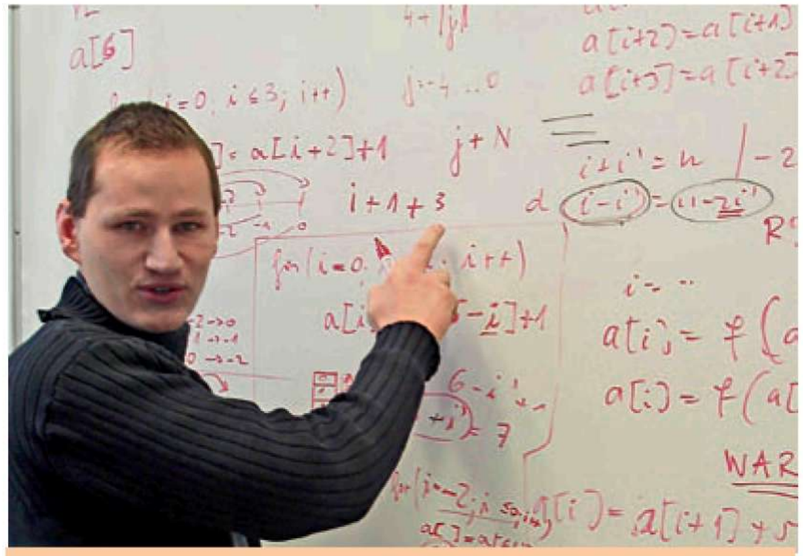
Routing in regular networks

Routing is the process of selecting paths in a network along which to send data or physical traffic. It can be performed for many kinds of networks, including the telephone network, the Internet and transport networks. In our laboratory, we are interested in routing within computer networks. Such a routing directs forwarding of logically addressed data packets from their source computer toward their ultimate destination computer through intermediary nodes. Routing is usually performed by dedicated hardware devices, but it can also be controlled

Doc. Dr Boštjan Slivnik: our new algorithms simplify the construction of the syntactic analyser, the part which represents the backbone of every compiler's front-end, in two ways. Firstly, far fewer restrictions are imposed on the code that the analyser is augmented with, and thus the compiler writer need not apply any "dirty tricks". Secondly, by applying these algorithms, the syntax of the programming language for which the compiler is made can be described more conveniently. At the same time, they provide much better mechanisms for error reporting – something that a programmer, the user of a compiler, badly needs.

by software stored in each node of the network. Routing techniques differ in how resources are allocated, especially when collisions occur. If two packets collide, one of them "wins" (i.e. gets the desired resource) while the other "loses". This raises the question of what to do with the losing packet? There are several possibilities, one of which is to send the packet in an alternative direction.

One of the research areas of the laboratory is the design of algorithms which construct alternative directions, and hence alternative routing paths, either statically (before the routing starts) or dynamically (when the collisions appear). Dynamic routing algorithms are capable of on-the-fly decisions on where to send a losing colliding packet to stay on one of the shortest paths to its destination. Dynamic routing algorithms are more flexible in avoiding collisions and routing problems that arise from congestion or node/link faults.

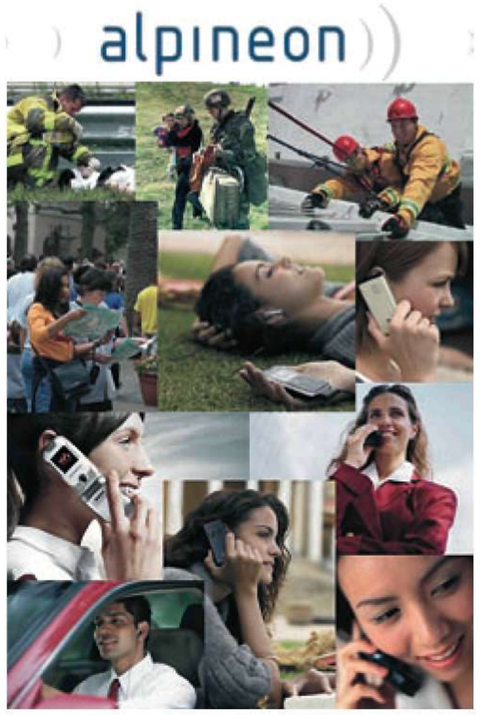


Doc. Dr Tomaž Dobravec: our simulations have shown that in regular networks, such as circulant graphs, tori, and hypercubes, dynamic routing algorithms outperform their static counterparts in about 11% of all cases. This is because dynamic routing offers a larger set of routing possibilities during each routing step.

Human language technology enables breaking communication barriers within the EU

HLT in Slovenia: Overcoming Language Barriers

Jerneja Žganec Gros



HLT: the European Dimension

Human Language Technology (HLT) plays a truly unique role in the European Union from the cultural, social and economic perspectives. For all citizens to become e-included in the information society, the products and services of that society must be accessible in their own languages. Language transparency, in which products and services are offered cross-lingually and in a localised manner, is one of the major prerequisites for the successful establishment of a common European market.

Research and development in HLT is nowadays rapidly transferred into commercial systems, and it is becoming increasingly pervasive in everyday life. Apart from the well-known areas of **machine translation** (MT), **automatic speech recognition** (ASR) and **text-to-speech synthesis** (TTS) – all of which are now packaged into inexpensive applications of varying quality for the commercial and home markets, at least for languages with a broad speaker base – other previously unexpected areas of use are emerging, such as speech-to-speech translation systems.

Dr Jerneja Žganec Gros, COO

Is HLT equally well supported for all EU languages?

The extent to which the languages spoken in Europe have been researched systematically varies widely from language to language, with a minority being well investigated – such as English, French and German – while some are hardly being addressed at all. Most often, the new Member States have not been in a position to develop strong technologies for their own spoken and written languages.

HLT in Slovenia

Slovenia is a new EU Member State in which about 2 million speakers communicate in Slovene. Although the market for language technologies is rather small, this can also be viewed as a competitive advantage, because most of the resources and expertise of the language are based within Slovenia and large market players are not yet ready to invest in developing HLT products for Slovene.

According to the e-Europe action plans, and most recently the i2010 Communication, the Slovenian government has decided to foster the development of future-oriented public services and to create a dynamic environment for e-commerce. In the past 5 years, the Slovenian Ministry of Information Society, later followed by the Slovenian Ministry of Defence, launched a series of calls for targeted research projects aimed at developing HLT resources and pilot speech-enabled systems for Slovene.

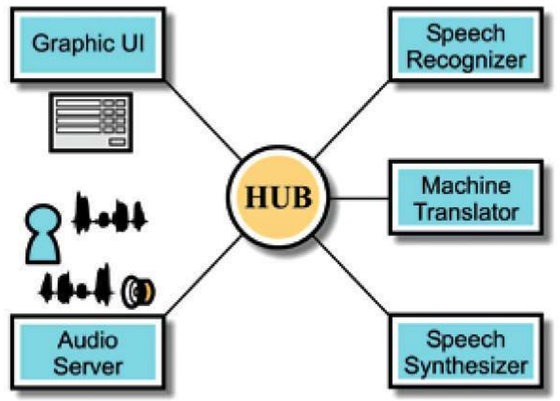
Alpineon, a Slovenian research SME and member of the Slovenian ICT Centre of Excellence, is coordinating two of these projects; the other partners involve three faculties of the University of Ljubljana, the Jožef Stefan Institute and the Fran Ramovš Institute.

The first targeted project was commissioned by the former Slovenian Ministry of Information Society in response to the needs of the public sector for speech technologies to be applied in systems for information access for all citizens, and especially for impaired persons, via voice in Web and voice portals. It is based on the European action plan "Accessibility of Public Web Sites and Their Content". The project builds on the experience gained in creating the HOMER system – an award-winning voice-driven Slovenian Web reader especially designed for visually impaired users – in close cooperation with the Slovenian Association of Blind and Partially Sighted Persons.

Many of the basic language resources for Slovene were created within the project. More tangible results are pilot speech technology engines with standard interfaces, which can be used as plug-in modules in standard voice portal and voice browser applications that allow access to public service information via voice. They can further be applied in assistive technology products, and for improving access to online facilities for visually impaired people, such as to e-libraries and other e-learning platforms. The public sector, in turn, must seek to ensure the accessibility of all public web pages by complying with W3C standards, with an emphasis on the Web Accessibility Initiative recommendations for e-content accessibility to the impaired.

The second targeted research project, VoiceTRAN, focuses on speech-to-speech translation. The aim of the project is to build a robust multimodal speech communicator able to translate simple domain-specific sentences between Slovene and English; more complex phrases can be entered via keyboard using a graphical user interface. The VoiceTRAN communicator is composed of a number of HLT servers – audio server, graphical user interface, speech recogniser, machine translator and speech synthesiser. The initial version of the VoiceTRAN communicator was presented at the eChallenges e-2005 event. It received the runner-up exhibitor award for the presentation in the Slovenian ICT Pavillion.

The VoiceTRAN project received the eChallenges exhibitor award.
Dr Jerneja Žganec Gros and European Commissioner Janez Potočnik



Alpineon is a high-tech SME providing turnkey software and hardware solutions in the ICT, automotive and industrial automation control fields. The team has extensive experience in hardware and software development, including CTI applications, VoIP devices and services, and speech technologies.

Alpineon specialises in developing state-of-the-art speech technology products for Slovene and other Slavonic languages. Its members have built the first commercial speech technology-enabled services in Slovenia, including a carrier-grade SMS-to-voice application along with an e-mail reader service. Its reference list ranges from voice portal applications to individual speech engines, such as text-to-speech synthesis, speech recognition, speech-to-speech translation, to be used in carrier-grade applications as well as in embedded devices.

Alpineon is a member of the Slovenian ICT Technological Network and several technological platforms. The company is currently involved in numerous industrial, national and international R&D projects, where it cooperates with leading academic institutions, institutes and major industrial players in Slovenia and abroad. Alpineon is coordinating the e-inclusion Eureka project E!3864 iTEMA and the largest HLT targeted research project in Slovenia, VoiceTRAN, funded by the Slovenian Ministry of Defence, which aims at building a speech-to-speech communicator to be used by the armed forces in peacekeeping operations.

The University of Primorska Endeavours to Cherish and Further Develop the Specific Features of the Environment

Rado Bohinc

The University of Primorska, drawing on the unique conception of its operation, has strived to be a modern, young and ambitious university that integrates research and educational efforts. Well aware of its position as the third state university, the University of Primorska endeavours to cherish and further develop the specific features of the environment – a meeting point of several cultures and languages – in which it has been founded. It is this environment that offers the main basis for research and provides orientations for the university and its members in the development of disciplines and innovative study programmes. In this way, the mission of the University of Primorska is based on the culture and tradition of areas of contact. It is from here that the university, taking into consideration continuous changes and several reforms in research and higher education, spreads its mission and vision to the wider international area.

Prof. Dr Rado Bohinc, Rector of the University of Primorska

We firmly believe that the university's research work enables the evolution of high-quality higher education teachers and researchers, as well as wider recognition internationally. Additionally, the integration of research and education is fundamental in creating a society that can transfer research achievements into practice. The politics of research assure the importance of science as a developmental power for achieving the state's concurrence and competition on every level. Companies and enterprises are the direct connection between users and researchers. At the same time, they are the regulator of the application of discoveries made in laboratories.

This direct collaboration of the University of Primorska with the environment is also made possible by its advisory body, the Board of Trustees, composed of representatives of local communities, companies and enterprises. They co-operate with researchers in the processes of forming new research projects and finding new research areas, in order to assure added value for all. With the establishment of the University Incubator, a new structure was introduced to serve as an interface allowing direct transmission of knowledge from the university into the economy. The incubator supports ambitious entrepreneurs in developing their ideas and creating new enterprises. Internally, the university has enabled its researchers to protect research products and ideas, as well as stimulated them to create spin-off and start-up companies, where – in collaboration with the university – they are able to further develop and commercialise their research competences and potentials.

As the youngest Slovenian university, the University of Primorska has been able to surpass expectations and has been successful in acquiring many national and international research projects. It constantly offers research capabilities to interested parties and develops its research references, for which the University has already become known internationally. At the same time, these are the guarantees to improve and to achieve new successes. Further development of existing programme groups and the success of new programme groups, as well as successful candidatures and market potential, are the stimulations that inspire our university and give us new energy in our everyday work.

UNIVERZA NA PRIMORSKEM
UNIVERSITÀ DEL LITORALE
UNIVERSITY OF PRIMORSKA

UP FHŠ – Faculty of Humanities Koper
Research activities

The University of Primorska Faculty of Humanities Koper co-operates on research and development programmes with the university's Science and Research Centre Koper. Many collaborators are regularly employed at the faculty and the research centre. The faculty carries out various development projects independently or in collaboration with partner organisations. The projects directly contribute to the contents of study programmes and strengthen connections with industry, as well as consolidating the position of the faculty in the local, national, European and international contexts.

PROJECTS
National projects:

- Postdoc Basic Research Projects;
- Postdoc Applied Research;
- rojects;
- Applied Research Projects;
- Target-Oriented Research Projects;
- Basic Research Projects;
- Lifelong Learning Programmes.

International projects:

- international conferences;
- international summer schools: Summer Courses of Slovenian in the Slovene Littoral, "Hello, this is the Slovene Mediterranean!", and the Mediterranean Summer School of Theoretical and Applied Humanities, "META Humanities";
- SOCRATES ERASMUS, COMENIUS, LINGUA;
- LEONARDO DA VINCI;
- INTERREG;
- PHARE;
- FRAMEWORK PROGRAMME.

UP SRC – UNIVERSITY OF PRIMORSKA: SCIENCE AND RESEARCH CENTRE OF KOPER

The UP SRC operates on a distinctive interdisciplinary basis (combining human and social studies and natural sciences) and lays particular emphasis on the research of topics related to the Mediterranean and the Upper Adriatic area.

Its basic activities are:

- basic and applied research;
- preparation of expert studies and counselling;
- education;
- organisation of scientific and professional meetings;
- publishing;
- documentation and librarianship.

The centre's researchers also participate in educational processes conducted at all three Slovene universities, thus allowing for the transmission of their findings and research results to the educational sphere.
In addition to the three basic research programmes, the centre also carries out several other basic and applied projects, and places special emphasis on conducting international projects in collaboration with foreign partners, which assures it a recognised position on the international scientific map.
The UP SRC successfully conducts national, international and other projects.

SCIENTIFIC AND RESEARCH INSTITUTES

Scientific and research institutes, conduct research programmes, basic development and applied research commissioned by public institutions and companies, professional analysis and counselling, training of young researchers, and educational activities in their subject fields:

Rector Rado Bohinc

1. Institute for Mediterranean Humanities and Social Studies (headed by Dr Mateja Sedmak)
2. Institute for Biodiversity Studies (headed by Dr Boris Kryštufek)
3. Institute for Mediterranean Agriculture and Olive Growing (headed by Dr Tom Levanič)
4. Institute for Mediterranean Heritage (headed by Dr Mitja Guštin)
5. Institute for Linguistic Studies (headed by Dr Goran Filipi)
6. Institute for Historical Studies (headed by Dr Egon Pelikan)
7. Institute for Kinesiology Research (headed by Dr Rado Pišot)

PROJECTS
National projects:

- Postdoc Basic Research Projects;
- Postdoc Applied Research Projects;
- Applied Research Projects;
- Basic Research Projects;
- Target;
- Oriented Research Projects.

International projects:

- INTERREG;
- PHARE;
- LIFE;
- DAPHNE;
- FRAMEWORK PROGRAMME;
- CULTURE 2000.

Research in humanities is dealing with intercultural issues

UNIVERZA NA PRIMORS
UNIVERSITÀ DEL LITOR
UNIVERSITY OF PRIMOR

Lucija Čok
Vesna Mikolič

Situated in an area of cultural, national and economic contact, as well as along important transit routes, the University of Primorska (UP) has a unique opportunity to fully realise its mission by observing, analysing, and researching the linguistic and cultural environment, and by implementing new policies within the European process of building the knowledge society.

Knowledge-based identity and intercultural awareness suppose knowledge as an understanding of otherness besides the knowledge of oneself. This approach in research stresses the difference between isolated national identities and a meta-identity as an expanded cultural resolution or cultural network for cross-cultural identification and re-identification of individuality and community within enlarged social relationships. The exploration of languages as the human potential of European societal and cultural diversity and of human capital as European added value are two priorities of the UP research programs. The facets of European citizenship and its multiple identities, as mirrored within different culturally bound concepts, the structures of the various ethnic groups forming the present European society, and the intrinsic cultural values generated by historical, social, political, economic, and other factors are analysed along the lines of ideas transpiring through language, literature and similar expressions of culture, intertwining observations from a number of disciplines to give rise to new knowledge and understanding. In addition to language knowledge and skills, intercultural linguistic competence is the best determined means of communication from the point of view of anthropology, involving the contents of utterances and their meanings, as well as the relations between the speakers manifested through encountering the speakers' cultures and languages (Čok, 2006). The inherent linguistic and cultural dimensions of southeastern and central Europe allow researchers to discern a distinct linguistic and cultural backdrop, revealing patterns of a historically and politically defined laboratory of European coexistence policy.

At the international conference "Intercultural Dialogue as the Fundamental Value of the EU", Ljubljana 7 - 8 January 2008. From the left: Vice-Dean of the Faculty of Humanities Dr Krištof Jacek Kozak, Dean of the Faculty of Humanities dr Vesna Mikolič and European Commissioner for Education, Training, Culture and Youth Ján Figel'

Researchers of the Science and Research Centre and the Faculty of Humanities of the University of Primorska run basic and applied research work and implementations of its findings dealing with intercultural issues, linguistics, cross-linguistic influences, identities in national mixed areas, ethnicity, language learning and teaching. The themes of research analysis include issues pertaining to the field of linguistic anthropology. Linguistic anthropology claims that the speaker cannot be discussed without taking into account the listener and his/her role in the the speech act. Differences in speech styles, linguistic manifestations of feelings, use of symbolism, metaphors and the role of artistic expression are all part of culturally bound traditions and signposts of intercultural communication.

Creative use of language is another interesting research aspect, especially when coupled with cultural identity, ethnicity and citizenship studies. The goal of this research is to contribute to the development of applied linguistics, by integrating it with insights from pragmatics, sociolinguistics, psycholinguistics, didactics, citizenship studies and the study of political relations.

Applied research analyses communication patterns of languages in contact and of those linguistic groups that use one of the official EU languages. Taking into account the trends to establish a multilingual and multicultural Europe, respecting and celebrating diversity, as well as cultural and linguistic identity, project methodologies integrate awareness of certain patterns of verbal and non-verbal behaviour and communication adaptations that promote efficient communication in new situations and follow the principles of coexistence among the European nations.

The relationship between mother tongue and intercultural awareness is a topic that is equally important for the preservation of cultural diversity.

Researchers at the UP also tackle the question of the role of the Slovene language at the national level, in the EU and in broader international contexts. Every language is the language of all its users and less used languages such as Slovene are used not only as first, but also as second or foreign languages. The University of Primorska also provides courses of Slovene for foreigners (Summer Course of Slovene in the Slovene Littoral: "Hello, This is the Slovenian Mediterranean!"). Modern language technologies represent a good basis for research in intercultural communication and are at the same time an excellent tool for direct intercultural interaction. At the Science and Research Centre, a multilingual corpus of texts on tourism is being developed. The intercultural dimension of this multilinguistic corpus represents an important basis both for the development of the bi- and multi-lingual lexicography of professional languages as well as for the theory and practice of the translation of professional languages, including the development of automatic translation.

As part of their intercultural-centred research, the Science and Research Centre and the Faculty of Humanities are jointly running several basic and applied research projects (e.g. Language as a Bridge to Intercultural Communication & Understanding; A Multilingual Corpus of Tourist Texts; A Dialectal Atlas of Slovenian Istria and the Karst; The Idea of the Nation in the Slovenian Reformation of the 16th Century and its European Context; Slovene Linguistic Impacts on the Italian Dialect of Trieste), targeted research projects (e.g. Language as Social Cohesion and Human Capital; The Efficiency of Bilingual Education Models in Ethnically Mixed Areas; A Dictionary of Tourism Terminology; Young People in Intercultural Positions), and cross-cultural business communication and Interreg projects (e.g. Identifying Training Models in Multilingual Areas; Swim the Language; Borders and Borderlines in Cultural Anthropology in University Education).

In order to conduct successful research and higher education programmes, the UP has integrated its educational, scientific, technological and human potential into infrastructural centres, networks and other formations (the University Centre for Languages and Intercultural Communication, the University Chair for Plurilingualism and Interculturalism, the Centre for Slovene Language and Culture at the Faculty of Humanities) that organise and carry out not only tasks common to all UP members, but also parts of study programmes.

The Science and Research Centre and the Faculty of Humanities organise numerous international scientific conferences, which focus on these topics. The Faculty of Humanities was also appointed by the Ministry of Culture of the Republic of Slovenia and the European Commission to organise the international "Intercultural Dialogue as the Fundamental Value of the EU" conference, which took place 7–8 January 2008 at Cankarjev Dom, Ljubljana, as part of the opening event of the European Year of Intercultural Dialogue. The conference provided the setting for an investigation of intercultural dialogue in the fields of culture, art, media, education and science, as well as in the field of sustainable economic development.

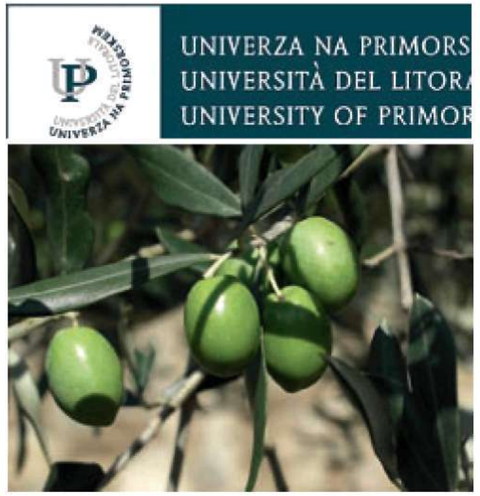
The following international conferences on intercultural dialogue planned at Science and Research Centre and the Faculty of Humanities of University of Primorska for 2008 should also be mentioned:

- International scientific conference "Modern Language Technologies in Intercultural Communication" (Koper, 24 May 2008)
- Conference of the AUF (Agence universitaire de la Francophonie) "L'oubli de l'histoire" (Koper, September 2008)

Research fields: Biodiversity and Mediterranean agriculture

Dunja Bandelj

Dr Dunja Bandelj



The "Biodiversity" research programme conducted by the University of Primorska (UP) focuses on the study of biodiversity patterns and processes at the genetic, varietal and ecosystem levels, with model groups including flowering plants, insects, arachnids and vertebrates. Geographically, the research focuses on southeastern Europe, the Near and Middle East, and southern Africa. One of the principal research aims is to understand the role of the Balkan ice-age refugium, which is the most important biodiversity hotspot in Europe. Characterised by long-term environmental stability, refugia are the most appropriate potential areas of natural preservation in times of global climate change.

The common denominator of all UP biodiversity research is the Mediterranean environment. Of all ecosystems on earth, those located in the Mediterranean have been subject to the earliest and most radical human interventions. As a result, the natural and anthropogenic habitats are so intertwined that it is impossible to objectively differentiate them. Our research programme therefore places special emphasis on the study of typical Mediterranean plants that are closely linked to Istrian tradition, cultural landscape, agriculture, culinary and ethnological heritage, and that are important elements of national rural diversity.

The research work mostly focuses on olive growing, which is, together with wine growing and production, the most important agricultural sector in Slovenian Istria. Previous experience has shown that direct contact with olive growers is of vital importance for the execution of applied research and for the transfer of knowledge from researchers to end-users. The co-operation between olive growers from the Slovenian Society of Olive Growers in Istria (DOSI) and UP researchers has resulted in the formation and recognition of a protected designation of origin: "Extra virgin olive oil of Slovenian Istria". In 2007, Istrian olive oil became the first Slovenian agriculture product to be listed in the EU register of agricultural products and foodstuffs with protected geographical indications and designations of origin.

The research on olives involves the study of the varietal structure of Slovene Istria olives. Production of typical olive oil is enabled by special climatic conditions, geographical position and an appropriate varietal list. The region boasts great genetic diversity, resulting from several attempts to revitalise olive growing, and research at the molecular level involving DNA markers is applied in order to preserve and manage the genetic resources of Slovenian Istria olives. Molecular research is also applied in studying key enzymes that trigger off the synthesis of major compounds influencing quality characters, such as biophenols, tocopherols and fatty acids.

Within the University of Primorska, a laboratory for olive oil testing has been established. The laboratory demonstrates its competence and compliance with the requirements of the SIST EN ISO/IEC 17025:2005 standard through an accreditation certificate (number LP-040) issued by Slovenian Accreditation, SA. The laboratory is one of the reference laboratories for the SI unit mol within Slovenia. The main activity of the laboratory is to establish and maintain an efficient national system of olive oil testing in Slovenia. The laboratory is also authorised to perform conformity assessment for the needs of official control or quality inspection. In compliance with Resolution no. RES-2/78-IV/98 of 4 June 1998 on the certificate of recognition for olive oil testing laboratories, the International Olive Council evaluated the laboratory's competence with a view to issuing recognition. UP ZRS – LABS laboratory was recognised for the period 2004–2008.

Laboratory staff also participate in research projects financed by the Slovenian Research Agency and the Ministry of Agriculture, Forestry and Food of the Republic of Slovenia in the field of olive oil chemistry and quality. The main research fields are: antioxidant substances in olive oils (secoiridoids and tocols), chemometric assessment of extra virgin olive oils from Slovenian Istria, sensorial and chemically related studies of autochthonous olive cultivars from Slovenian Istria, correlation and comparison studies of headspace and sensorial data for extra virgin olive oils from Slovenian Istria.

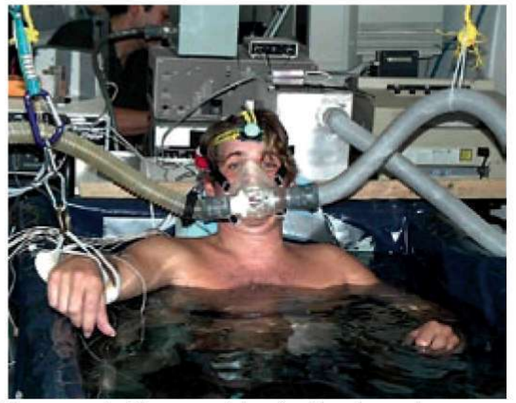
The European SIGMA project (INTERREG IIIA Slovenia-Itali 2000-2006) enabled us to expand our research field to olive protection. In co-operation with Italian partners, and the Slovene Chamber of Agriculture and Forestry, the project team developed a cross-border network for monitoring pests. Given the applied nature of the project, the results obtained were directly used by olive growers. Regular monitoring and supervised extermination of pests lessens the environmental burden caused by the use of phytopharmaceutical products, improves olive oil quality and increases olive protection. By monitoring olive pest populations, we formed a database that will be used as the starting point for conceiving a model system for forecasting pests, with respect to weather and the geographical position of olive groves.

The results gained through basic, developmental and applied research were used as the basis for conceiving two new study programmes in Mediterranean Agriculture and Biodiversity that were approved by the Council for Higher Education of the Republic of Slovenia in 2007 and will be offered by the University of Primorska in the 2008/09 academic year.

University of Primorska, Science and Research Centre of Koper, Institute of Kinesiology Research, Slovenia

Researching the Effects of Microgravity
The Valdoltra Bed Rest Studies in Slovenia

Rado Pišot, Igor Mekjavič, Boštjan Šimunič, Mihaela Jurdana, Petra Dolenc



Measurement of thermoregulatory functions in an extreme environment

With the construction of the space station Freedom and the ongoing preparations for the mission to Mars, man's presence in space is increasingly expanding. Numerous research studies have proven that the physiological changes in astronauts which can be observed on their return from space travel are very similar to the changes in the body after prolonged physical inactivity or in ageing.

Modern science investigates in detail the possible short- and long-term effects of space travel or living in a zero gravity environment. So called bed rest (BR) studies were introduced and recognised as a valid ground-based model for studying the effects of zero gravity on humans while the results might also be extrapolated from/to physical inactivity or ageing

Orthopaedic Hospital Valdoltra with the laboratories of the Institute of Kinesiology Research

studies. Such studies are performed in just a few centres across Europe, Valdoltra amongst them. Ethics, risks, co-ordination and expenses are just some issues organisers have to consider in planning studies of such magnitude. The Institute of Kinesiology Research (Science and Research Centre of Koper, University of Primorska) and the Jožef Stefan Institute, Ljubljana have successfully organised three BR studies to date, beginning in 2001. All studies were performed in the strict hospital environment of the Orthopaedic Hospital Valdoltra. Soon very close co-operation was established with the Karolinska Institute Stockholm, the University of Udine, the University of Trieste and Manchester Metropolitan University. The studies were supported in part by the Ministry of Defence of the Republic of Slovenia, the Slovenian Research Agency and the Italian Space Agency.

Experimental design consists of selecting healthy volunteers and exposing them to 35 days of strict horizontal bed rest. The study must be approved by the Slovenian National Medical Ethics Committee and performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. On the basis of interviews, a detailed pre-medical exam, and introduction of protocols, tests, rules and possible risks, written consent is obtained from every participant. Annually, research planning of the BR sub-studies differs from the main research goals. Therefore the research schedule has to be organised to avoid between-studies dependencies, to assure the time required for each experiment, to avoid participant exhaustion each day and to avoid impacts from the design of certain studies on the outcomes of others.

The oxygen uptake measurement

Research team of the Institute of Kinesiology Research, SRC UP with the Slovenian Minister of Defence, Karel Erjavec (fifth from the right), director of Orthopaedic Hospital Valdoltra, Dr Venceslav Pišot (second from the right) and director of the Science and Research Centre of the University of Primorska, Dr Darko Darovec (fourth from the right).

medication. Months after astronauts have landed, they are still losing bone mineral density.

Cardiovascular changes could be the most dangerous mortal threat in this area. Orthostatic intolerance is developed by more than 40% of space travellers. Zero gravity and/or physical inactivity triggers this phenomenon that makes functioning in the upright position impossible. Every person should be aware of orthostatic intolerance and prepared in case of its symptoms. Heart stroke volume suffers after exposure to zero gravity and with it also aerobic performance. We know that short-term cardiovascular changes are reversible but have little idea about long-term and perhaps even delayed effects on the human heart and circulatory system.

Functional systems of the body are affected too. Thermoregulatory functions in extreme climatic environment have been found to be impaired. Moreover, postural stability or balance has been evaluated and found to be reduced, not just within the first 24 hours but also up to 14 days after

One consequence of prolonged exposure to microgravity is muscle atrophy (loss of muscle mass). Preserving muscle mass is not an issue solely for space travellers but also for others. A loss of muscle mass results in a loss of muscle force and power. Astronauts can expect the biggest loss of muscle mass in weight-bearing muscles such as calves, quadriceps and gluteus. A gain in fat mass is another dangerous aspect of space flight or other physically inactive lifestyles (whether sedentary or via ageing). However, osteoporosis together with fat gain and muscle mass loss represents the biggest danger. We all know that muscle mass loss and fat gain are reversible but osteoporosis cannot be counteracted without reambulation. Intermuscular force sharing amongst synergistic muscles is also changed where different muscles share an overall joint torque.

Psychological factors play an important role in the processes of adaptation under conditions of extreme confinement and isolation, such as occur during exposure to weightlessness or simulation thereof. Adaptation to new conditions undoubtedly represents an important source of stress.

Research of psychological aspects within the framework of long-term BR studies is not only important in optimising psychological preparations and monitoring of subjects, but also in creating possibilities for the application of the results obtained to other groups

exposed to similar conditions (e.g. bedridden individuals suffering from longstanding illnesses or post-operative conditions that requires long-term recovery, physically extremely inactive individuals). Behaviour and mood status were found to be altered by BR confinement and restriction of body movement. Our future investigation of psychological changes will focus on head-down tilting BR, recognised as a better method of simulation weightlessness comparing to horizontal BR.

As in a prolonged sojourn in reduced gravity, reduced daily physical is also present during disease or in the process of ageing. The lower limbs of astronauts and bedridden or cast-immobilised patients show profound functional as well as structural adaptations, which have been attributed mainly to the muscular unloading caused by reduced weight-bearing activity. Therefore, experimental prospective studies of healthy human volunteers, subjected to either strict BR or unilateral limb unloading using crutches, is currently the main source of information on the progress and extent of skeletal muscle deconditioning in response to inactivity and unloading. Local bone loss has been demonstrated in hips and knees of elderly orthopaedic patients. Bone loss and muscle atrophy are considered to be closely linked.

The Institute for Kinesiology Research at the University of Primorska in collaboration with the Jožef Stefan Institute is one of the few researching in this field. The importance of the mentioned studies is the intersection between "space" and "earth" medicine, particular in the orthopaedic field and in understanding the influence of specific environmental conditions on the human organism.

Measurement of maximal voluntary muscle contraction.

35 days of bed rest – complete 24 hours restriction of body movement.

Associate Professor Rado Pišot studies kinesiology from all its three basic aspects: biomechanical, medical and didactic. His research focuses on motor development and the structure of motor space as part of integral development, with special emphasis on the neurophysiological basis of movement regulation (motor control), motor behaviour and motor learning. In the field of applied research, he has been studying the impact of motor/sporting activity and inactivity on health and lifestyle. He was a member of the founding group of the University of Primorska (UP) and the first Dean of its Faculty of Education. He is the Head of the Institute for Kinesiology Research and a member of the University Senate. With his rich expertise, he is a member of various professional bodies of Slovenia. In December 2007, the UP Senate appointed him Vice-Rector for Science.

Associate Professor Rado Pišot

Robert Cugelj, Director of the Institute for Rehabilitation, Republic of Slovenia

Franc Hočevar, Adviser to the president of the Republic of Slovenia

Prof. Dr Anton Zupan

The Institute for Rehabilitation, Republic of Slovenia

Dom iRiS Smart Home

Anton Zupan, Robert Cugelj, Franc Hočevar

Introduction

IRIS is an acronym for "Independent Residing enabled by Intelligent Solutions". The IRIS home is a demonstration apartment of about 90 m2, located at the Institute for Rehabilitation, Republic of Slovenia (IRRS), on the ground floor of the new building. It has been equipped with state-of-the-art equipment, technical aids and technology aimed at compensating for various types of disability. The apartment enables people with disabilities, as well as elderly people, to achieve the highest levels of functional independence. It has been equipped with appropriate technical aids and numerous electronic systems which allow the user to control the living space and to perform certain activities (opening doors and windows, drawing window blinds, switching the heating system on/off etc.) with minimal physical effort and in various manners (remote controls, voice control, wheelchair joystick, eye-movement control, etc.) The home has been also equipped with modern communication technology adapted to different types of disability, which enables people with disabilities to communicate with the outside world, partake in distance learning, work, leisure and entertainment.

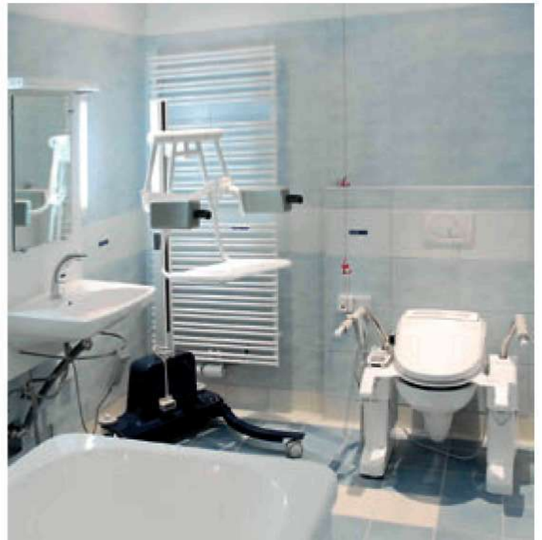
Literature and the Internet include reports on numerous European demonstrative and practical projects in the area of "smart houses". The lead role in the area is held by the Scandinavian countries (Sweden, Norway, Finland) and some others (the Netherlands, the United Kingdom, Germany, Italy, France, the United States, Japan and Singapore). Smart homes offer developmental, experimental learning and a demonstrating environment (examples in England, Italy, Switzerland, Germany, Belgium, France, Sweden, Finland and Norway). The results of numerous smart home projects have been transferred into residential areas for people with special needs, for example at Zwijndrecht (Belgium), North-Brabant (the Netherlands), Integer House – the Building Research Establishment, Portsmouth, York, Greenwich – Millennium Homes and Edinburgh (Scotland). The projects have integrated creative national potential (such as in the SENTHA group in Germany) and have surpassed the level of mere technological innovation by implementing solutions and providing services. Several studies have given reports on such projects with results of various approaches involving different collaborating parties, including local authorities and housing trust funds (Delta, Include, ASTRID, etc.). The projects have already demonstrated numerous experiences of attracting all interested parties and creating partnerships among providers of new technologies, public (state) institutions responsible for health care policies, health insurance companies, health care and social services, local communities, non-governmental organisations and potential investors.

One such example is SmartLab in Sweden – "technology that cares" (a demonstration apartment and a meeting place for the development of safer living). It is located at the Swedish Handicap Institute and it offers the basis for home adaptations, development projects, pilot activities and training. The Swedish Handicap Institute was founded and has worked under the Ministry for Health and Social Affairs, the Federation of Swedish County Councils, and the Swedish Association of Local Authorities[1]. In Italy, examples of demonstration homes include the "DAT Smart Home"

in Milan at the Don Carlo Gnocchi Foundation's S. Maria Nascente rehabilitation institute. There, people with various disabilities (mostly physical and motor impairments) can increase their ability to lead a more independent everyday life by means of contemporary technological solutions. The home includes occupational therapy programmes and a permanent exhibition of assistive technologies for mobility, activities for daily living and communication. The project has been carried out by the Bioengineering Centre of the Don Carlo Gnocchi Foundation. They perform therapeutic, demonstrative and research programmes[2]. In Bristol, in co-operation with BIME (The Bath Institute of Medical Engineering), Bristol City Council's Adult Community Care service, Bristol Primary Care Trust's Intermediate Care Service, Dementia Voice (the Dementia Services Development Centre for the Southwest of England) and Housing 21 (a national provider of home care and assistance for the elderly), a demonstration smart home has been created for people with dementia, where patients can reside for up to three months and are then advised on the most suitable technologies to be installed into their own homes[3]. The next example is from the Netherlands – "The Smartest House of the Netherlands, Smart Home Association" (van Berlo and Bierhoff), a 160 m² demonstration smart house with smart and assistive technologies and a house network with an information-communication system. The aim of that home is for the visitors to test out and experience the possibilities offered by contemporary technology[4]. In Germany, the SENTHA project has aimed at improving the living environment for the elderly by means of modern technologies. Here, one of the main interfaces for environment control is a TV set, the use of which is familiar to the elderly. The home gives emphasis on safety and security, education and entertainment as well as on tele-shopping and tele-monitoring.

Minister of Higher Education, Science and Technology, Mojca Kucler Dolinar:

"Inclusion and active participation of each individual and quality of life are our task and commitment. We should not allow society to divide itself into those who know and can and those who do not and cannot, but should make sure that there are no differences, that all people are equal and that we all 'can'. To live in and with an information society is a skill which has been increasingly affecting our lives and which has become almost indispensable in our everyday tasks. Therefore, we need to transfer modern information and communication technologies from the technical level to the levels of content and services. Only thus can we make contemporary technology a part of this society and a service to people, meeting their needs."



The Institute for Rehabilitation, Republic of Slovenia

The exact start of rehabilitation in Slovenia cannot be pinpointed, but it can be said that it started to develop quickly after 1952. The first initiator in the organisation of rehabilitation services was Professor Bogdan Brecelj, who in 1947 began work towards the establishment of a school for physical therapy. In 1953, in co-operation with international experts, he linked international experiences and the requirements of the time to create a programme for the development of rehabilitation services in Slovenia. In 1954, a written order was issued for the establishment of the Institute for Rehabilitation of the Disabled, which defined the role of the institute as a central body responsible for establishing a system of rehabilitation in Slovenia. The written order included, amongst others, two important points: firstly that the institute is responsible for medical and professional rehabilitation of people with disabilities, regardless of the cause of their disability, in order to compensate for their lost or impaired functions, and secondly that the institute is a national centre for rehabilitation of the disabled, and as such takes care of the organisation and professional management of such work within Slovenia.

The construction of the premises of the Institute for Rehabilitation of the Disabled was carried out from 1954 to 1962. The chief architect was designer Danilo Kocjan, who applied Scandinavian design principles to give the buildings their low and elongated form.

Between 1970 and 1980, a programme of physical medicine and rehabilitation was established, integrating the units for medical and occupational therapy, and the unit for scientific research. After that, the institute started co-operating actively with institutions from abroad. This period was characterised by the activities of the Rehabilitation Engineering Centre, which developed the use of low frequency currents in rehabilitation (FES – Functional Electrical Stimulation), giving the institute its national and international reputation.

The period from 1991 to 1994 was a phase of transformation. In 1994, the University Institute for Rehabilitation (SOČA) became a uniform public health care institution and was renamed the Institute for Rehabilitation, Republic of Slovenia.

During its 50 years of existence, the institute has gained international renown. Its knowledge, experience, research, and the numerous presentations of its staff at important international conferences and workshops have made an important contribution to the development of rehabilitation services.

Globalisation, joining the European Union, the fast development of rehabilitation science, constant changes and responsiveness to the globalisation of services have required and will continue to require a much more dynamic and selective dealing with patients and quality of treatment. Therefore, the values of the institute include expertise, responsibility, teamwork, affiliation, creativity and a patient-oriented mission aimed at improving quality of life, and enabling the return of disabled people to their living environment.

There exist numerous reports on large investment around the world: the United States, Japan, the United Kingdom, Finland, Denmark, Estonia, Spain, etc. The governments of those countries have allocated unimaginably high funds to the development of services providing for the needs of persons with disabilities and even more so for the elderly, who have been increasing in number dramatically, which in turn has led to increased health care costs. The United States has allocated $1 billion for the period 2002–2010[6]. The health ministry in the United Kingdom has reported that an additional £3 billion shall be allocated to the regular funding for the modernisation of social services (Department of Health, UK, Modernising Social Services), £647 million of which is intended for the promotion of partnership for increased independence[7]. In 2004, the ministry reported that it would allocate £80 million for the period 2006–2008 in England for development in the area of distance home care[8]. The Welsh Assembly Government has allocated £11 million for similar developments in Wales. Such investments have increased the number of people who by means of telecare can stay in their home environment and do not need to be placed into institutions.

The aim of the project

The IRIS home will allow its visitors to view modern technology aimed at assisting elderly people and people with various disabilities. People with disabilities and the elderly can test the solutions offered in the demonstration home in order to find those solutions that can enable them to live as independently as possible in their own homes. Professional staff will offer people with disabilities, the elderly and their carers demonstrations and advice on how to adapt their homes in the most rational and sensible (and inexpensive) manner with regard to their specific needs.

The IRIS home will be used by professionals for regular education, for the planning of specific activities for immediate users (people with disabilities and the elderly) and for organising their training. The demonstration environment will also be aimed at designers of similar environments, mostly architects of interior and exterior design and planners of technical documentation for the construction of new buildings or adaptation of existing apartments and other building to the needs and demands of IRIS users. The apartment will offer the preparation of modular solutions, from the most simple to the technically most advanced, which means that individual solutions can be transferred into various environments (home, social institutions, nursing homes, etc.)

The IRIS home will offer an educational environment to students of medical, social and technical studies who can learn about the needs and problems of people with various types of disabilities, as well as learn about appropriate solutions.

The IRIS home will also enable producers of equipment and providers of services in the area of technologies aimed at people with disabilities and the elderly to promote their solutions as well as test and upgrade them in an integrated test environment. The IRIS home programmes will be aimed at research in the areas of E-inclusion and E-availability in Slovenia. We wish to support activities for the promotion and implementation of the policy of E-availability in Slovenia.

Users

The IRIS home has been designed in co-operation with target user groups, which has enabled the highest possible level of inclusion of their actual needs and wishes. The target user groups include people with disabilities and elderly people. The programme has been designed for people with motor and physical impairments (spinal cord lesion, cerebral palsy, multiple sclerosis, neuromuscular diseases, spina bifida, cerebral stroke, head and brain injuries, congenital physical deformities, rheumatism, etc.), blind and sight-impaired persons, deaf and hard-of-hearing persons, and the elderly.

According to the World Health Organization, the prevalence of disability is between 11 and 16%, and among people with disabilities 4 to 6% have the most severe types of disability[9]. Considering those data,

The Laboratory for Telecommunications (LTFE) at the University of Ljubljana's Faculty of Electrical Engineering

is one of the creators of the Independent Residing enabled by Intelligent Solutions (IRIS) smart home. Combining Information and Communication Technology (ICT) expertise with the needs of health care and rehabilitation has long been one of LTFE's main focuses.

"In the IRIS home project, our experience from previous work related to E-accessibility and E-inclusion proved invaluable," explains Damir Kervina, a researcher at LTFE. "We designed the PC area featuring various assistive technology solutions, implemented a personal health system for blood pressure monitoring, provided an E-learning platform and supported the telerehabilitation solution."

Mojca Jenko and Matevž Pustišek also worked on the project at LTFE. They say the nature of the project brought with it a lot of planning and promotion activities as well:

"Such work included everything from writing a development plan for the smart home in late 2005 to mounting footage from the opening ceremony. Many of our colleagues also helped us in making the IRIS home a reality."

The team at LTFE understands independence as a key prerequisite for E-inclusion. Using technology to communicate, learn, work and stay healthy in the home environment enables users such as people with disabilities and elderly people to be an active part of the information society. "Providing alternative ways of reaching equality in terms of possibilities and quality of life – this is what IRIS is all about," concludes Damir.

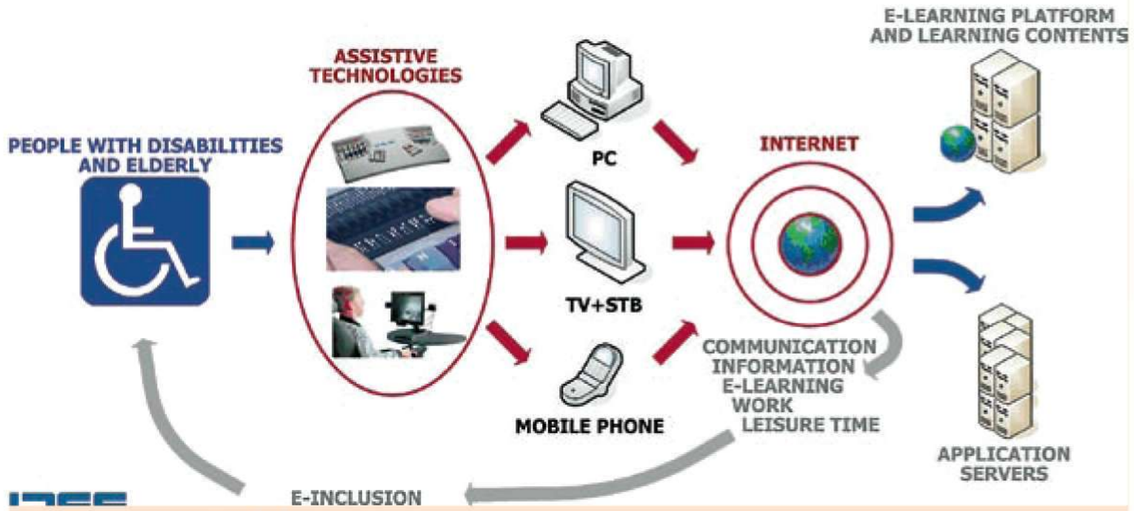


Figure 1: Assistive technology for E-inclusion

there are about 200,000 people with disabilities in Slovenia and of these, about 10,000 have the most severe types of disability. According to the data of the Statistical Office of the Republic of Slovenia, on June 30, 2006, there were 31,338 inhabitants older than 65, which equates to 15.7% of the population. The 2004 US Census Bureau[10] estimates that, by 2050, the proportion of the population older than 65 will have reached more than 20%. According to Administration on Aging[11], 19% of people over 65 face limitations in performing activities of daily living, and 4% of them have severe disabilities.

Direct goals

The IRIS home will provide a demonstration and test environment for potential users to learn about available technological solutions for high-quality independent life in their home environment. The IRIS home is a place where a potential user will gain all necessary information and advice on implementing suitable solutions in his or her home. The user will transfer the solutions demonstrated at the IRIS home into his or her own home and receive services directly from various providers. The majority of those services will be provided/performed as distance services. The "distance healthcare" services are mostly aimed at those areas which, due to the nature of the disease, require constant and long-term monitoring of the patient. Tele-

Arso Savanović

medical services and distance home care will be a part of such services, enabling maintenance of health or its restoration.
IRIS home programmes will ensure that people with disabilities and the elderly receive professional and high-quality rehabilitation treatment. By means of the latter and by using the technologies demonstrated at the IRIS home, they will be able to live in their home environment and achieve a higher level of independence and safe living. Consequently, the costs of home care will be reduced (health care, home nursing, etc.) as well as the need for placements into nursing homes or other institutions.

Activities of the IRIS Home

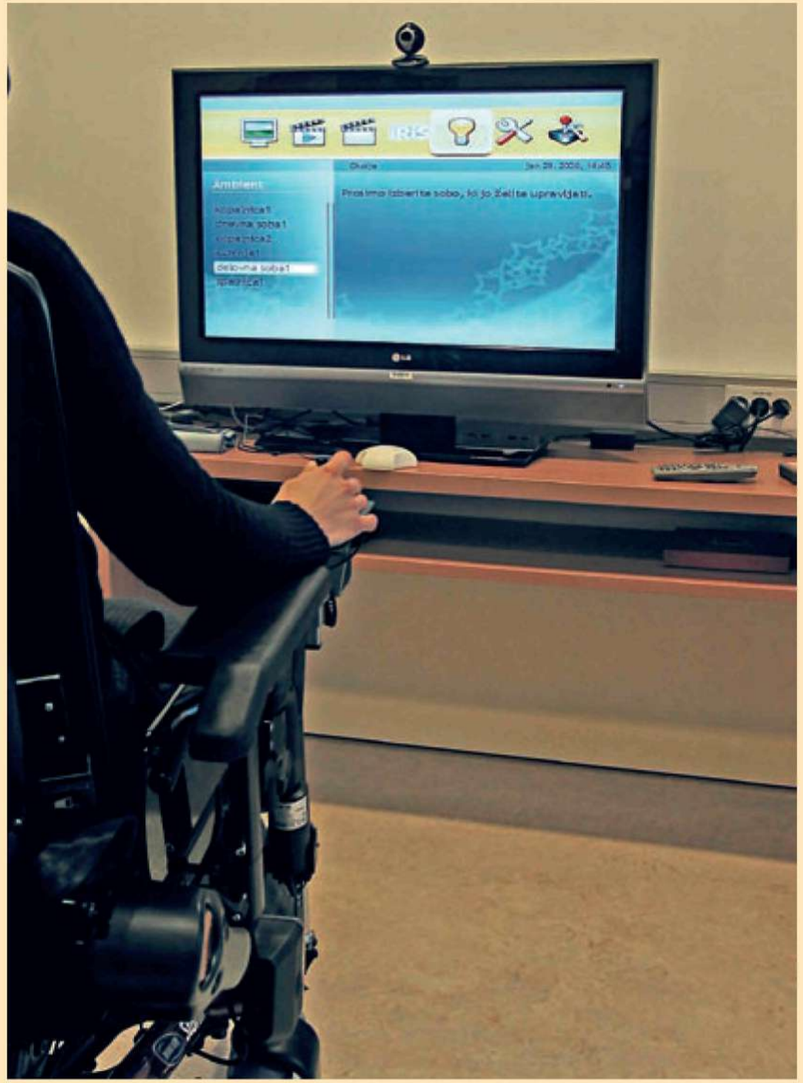
From the initial idea onwards, the entire project has been planned and managed in a way that would enable the IRIS home to serve its purpose and "live to the fullest". Wide promotion will be aimed at raising the interest of the Slovenian public so that individuals and families can use the centre for viewing and testing all the demonstrated solutions and find those that can bring improved quality of life to their home. The IRIS home will employ professional staff (occupational therapists and technical staff) offering demonstrations of individual technological solutions and information on how to reach those solutions as fast and as inexpensively as possible. The staff will give advice on the integration of the

Dr Arso Savanović
Technical Solutions Manager and
Head of Research and Development,
Smart Com

BeeSmart - Interactive Services on the TV Screen within the IRIS smart home

Arso Savanović

The innovative and advanced BeeSmart middleware platform is at the heart of the Independent Residing enabled by Intelligent Solutions (IRIS) smart home. BeeSmart builds on the Internet Protocol Television (IPTV) technology, extending and supplementing the latter in an innovative way, so that other interactive services can be integrated into the IRIS smart home in addition to the basic entertainment services, which are inherent in an IPTV system. The BeeSmart platform has been developed and integrated by Smart Com, an IRIS home technology partner.



The central role of the BeeSmart platform is manifested in two ways. On the one hand, it is the central technological hub of the IRIS Smart Home i.e. other technological modules are directly connected to BeeSmart and these modules communicate with each other via BeeSmart. The platform thus integrates various distributed information and communications technologies (ICT) modules and subsystems, each providing specific services to the end user, into a seamless multimedia and multipurpose system at the disposal of the IRIS user. Example subsystems include both internal subsystems, such as the EIB/KNX home-automation system and the ambient intelligence subsystem, and external subsystems, such as the dedicated servers located at the premises of various service providers (e.g. telediagnostics and telecare providers) and connected to the BeeSmart system via the Internet.

On the other hand, the BeeSmart platform provides the IRIS user with an intuitive and easy-to-use central control panel or control centre for activation and use of the IRIS technology-based services. A graphical user interface (GUI) allows the user to control and interact with various IRIS services via:

- the remote control and the TV set;
- the computer.

The look and feel of the GUI is the same in both cases. In the case of the TV-based user interface, various specialised universal remote controls have been integrated with BeeSmart, which further facilitates use of the IRIS services for disabled users. For example, the wheelchair-fitted remote control facilitates control of IRIS services via the wheelchair joystick, whereas the remote control with voice recognition facilitates control of the IRIS services via spoken (voice) commands or via a sip-and-puff switch. Similarly, in the case of the computer-based user interface, the computer is fitted with various specialised input devices to further facilitate use of IRIS services by people with disabilities.

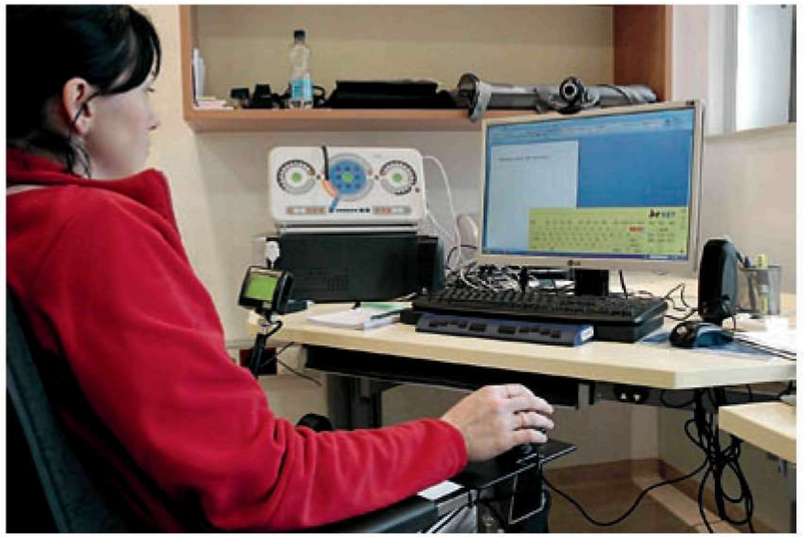
Services within IRIS-like environments are aimed at providing the user with the highest possible levels of safety, independence, and comfort of living. Example BeeSmart-based services within the IRIS home, accessible to the user via the TV set, include:

- entertainment (TV, radio, Video on Demand – VoD, Personal Video Recording – PVR, online games, etc.);
- environment control;
- remote TV-based shopping;
- remote social care service;
- remote health care services, e.g. telediagnostics;
- ambient intelligence – automatic environment personalisation.

Due to the nature of the IRIS home, it is expected that the list of interactive services will be extended in the future.

tested technology into the homes of people with disabilities. The IRIS home will be fully included into regular rehabilitation programs for patients with the most severe disabilities. By performing rehabilitation for those patients in the demonstration apartment, we will be able to determine the methods and technological solutions enabling the highest level of independent living in the patients' home environment, thus bringing quality to their lives.
The IRIS home will allow its potential users to view and test technological solutions and the programme's primary mission will be to inform the public on rehabilitation technology and practical solutions. Knowledge and experience will be disseminated with lectures, media presentations, etc. It is expected that two to three professionals will need to be trained in each Slovenian region. The IRIS home will offer regular education and training to regional professionals. It is expected that 15 to 20 people will need to be trained and educated with special skills and knowledge. The education will be carried out within the tertiary level activities of the institute.
Since the entire equipment, technical aids and services of the IRIS home can be presented and demonstrated on the Internet, we find it senseless to have several demonstration centres with expensive equipment and technology in Slovenia. We believe that it is more rational to have one demonstration home, and to upgrade its equipment regularly, while covering the rest of the Slovenian regions by means of modern information pathways and educational programmes. The regional programme locations will need to be equipped with all the necessary infrastructure for "on line" voice and display connection to the IRIS home.
The funds for opening the IRIS home (architectural design, the purchase of equipment, technical aids and technology) have been allocated by various sources (the Ministry for Higher Education, Science and Technology, the Ministry for Labour, Family and Social Affairs, sponsors). Additional funds will be necessary to cover the costs for employment of new professional staff, maintenance staff, for the maintenance of equipment and technology, and regular upgrading of technical aids and technologies.

The financing of new technical aids and technologies to be used by potential users of IRIS home programmes will need to be addressed. Compulsory health insurance covers certain advanced technical aids and technologies, such as special devices for wheelchair control, alternative communication systems, etc. In the future, however, we expect certain technical aids or technological equipment and services within the new programme to be funded by institutions such as the Ministry for Labour, Family and Social Affairs, the Pension and Disability Insurance Institute, the Employment Service of Slovenia, partly also by additional health insurance, various foundations,



Ambient Intelligence for the IRIS Home

SETCCE (the Security Technology Competence Centre) has a longstanding record in ambient intelligence (AmI) concept research, design and development. Participation in EU framework programmes, a number of research results and an extensive knowledge database enabled SETCCE to deliver practical experience of ambient intelligence for the Independent Residing enabled by Intelligent Solutions (IRIS) smart home. Project results have a profound local and global import and present one of the first implementations of ambient intelligence in a live environment.
"The concept of pervasive systems aims to extend and seamlessly integrate existing information and communication technologies (ICT) on one hand and emerging human-computer interaction (HCI) technologies on the other. The concept of AmI extends traditional pervasive systems by integrating sensor technologies to detect user activity and environment parameters and further extends it by adapting the ambient conditions according to the user's intent. Such AmI systems offer a proactive automatic response of the living environment, that takes the user's context, needs, and preferences into account." states Jan Porekar, the head of the IRIS home ambient intelligence project. "Our long-term vision is to provide support in transition of business environments, business processes and personal living environments towards AmI vision."
To support the IRIS home project with novel assistive living technologies, SETCCE has implemented AmI services to improve living conditions, support self-dependent living and enable better inclusion of the disabled and ageing population. The AmI services implemented are based on the iCore platform, specially designed and developed by SETCCE for smart house services. The iCore platform integrates smart items – a number of solutions and appliances for living environment automation, sensors for capturing environmental parameters and systems to detect user presence and movement. Integration is based on intelligent logic, which supports decision making with relation to the captured situation (actual environmental variables) and user preferences. The situation is interpreted within the iCore system as context – a database that manages user preferences, and environmental variables, such as user physical location, local temperature, lighting, daytime, etc. First-generation personalised services are developed and implemented on top of the iCore platform support features, such as intelligent window and door control, lighting control, living equipment and special furniture control. Control and automation of the living environment is based on digital representation of the environment where the user is positioned. For user movement tracking and position detection, a special dedicated RFID system was designed and deployed.
With the iCore platform for the IRIS home project, SETCCE has developed and implemented ambient intelligence enabling services including digital representation of the living environment, user position and activity monitoring, capturing user preferences, and management and conflict resolution that may arise from two users sharing the same living environment. These services serve as a foundation for further design and deployment of complex (contents) services, as demonstrated in the IRIS home project by intelligent control of room lighting, control of furniture and living appliances and of air conditioning. Long-term goals for the IRIS home project are focused on implementation of services for capturing, identifying and proactively responding to user behaviour patterns. Such mechanisms will provide integral support for user monitoring and control of user situations, and will provide proper feedback in a crisis or emergency.
The iCore technology was designed and developed for a range of smart and automated living environment services. SETCCE research activates are also focused in parallel with AmI research initiatives such as the ambient intelligence for living environments (AIBO) project in co-operation with the Laboratory for Telecommunications (LTFE) and PERSIST, an EU 7FP project in co-operation with the European Microsoft Innovation Center, Intel, DLR Space Center, Telecom Italia, the University of Athens, the University of Edinburgh and the TSSG institute as co-ordinator. Ambient intelligence services and solutions are based on knowledge gained through internationally supported research initiatives, such as integrated projects Daidalos and Serenity.

"The field of pervasive systems and ambient intelligence is being transferred from research visions into industry. The IRIS home project is only an example of the potential such technology has in the next development cycle for networking technology. While computer systems have dominated today's networks, we can expect that the number and variety of devices, such as house appliances and sensors will rise exponentially and eventually outnumber personal computers and servers. Pervasive systems will enable the design, development and deployment of personal, location-independent services, tailored to user preferences and context. Intelligent environment control is just one example," states Aljoša Jerman Blažič, SETCCE's CEO.

The next steps for the IRIS home project are focused on implementation of novel services, mostly content based and targeted to provide proper remote support for disabled people and an ageing population. Such goals expand the vision of the IRIS home project and this calls for redefinition of today's technology infrastructures on the technical level, alongside identification and better understanding of new technology, infrastructure and content provision roles.

Svetlana Šaljic, Head of Development and Jan Porekar, Head of Dom IRIS ambiental intelligence project.

Aleksej Jerman Blažič, CEO

charitable trust funds, associations of people with disabilities, and partly by the users' own funding.

The economic benefits of health care programmes similar to those carried out by the IRIS home have been demonstrated by results of research of the CUSTODIAN European project[12]. The results showed decreased costs of institutional and home care. The results of research on the impact of contemporary technology (smart homes) on the treatment of people with disabilities and the elderly[13, 14] have demonstrated the importance of a rehabilitation team in finding the simplest way of showing the user how to use the new technologies. Furthermore, it is important that the technological system is adaptable and simple, and that it includes a user interface adapted to each user individually, for him or her to control the environment as simply as possible. It has been shown that equipping individuals with modern technology accelerates their rehabilitation, increases their independence and psychophysical well-being as well as improving their quality of life. It has also been reported that such equipment saves large amounts of public funds intended for the treatment of people with disabilities and the elderly.

Conclusion

The IRIS home will make an important contribution to Slovenian rehabilitation medicine. A new activity will be introduced – learning about, testing and applying modern technological solutions aimed at compensating for various disabilities, improving the quality of life of people with the most severe types of disability and integrating them completely and equally into education, work and social life. Rehabilitation programmes will be transferred into the user's living environment and that environment will be included in continuous programmes of rehabilitation and care.

Summarised from: Rehabilitacija; Rehabilitation Engineering and Technology: rehabilitation medicine, March 16 and 17, 2007, Volume v6.

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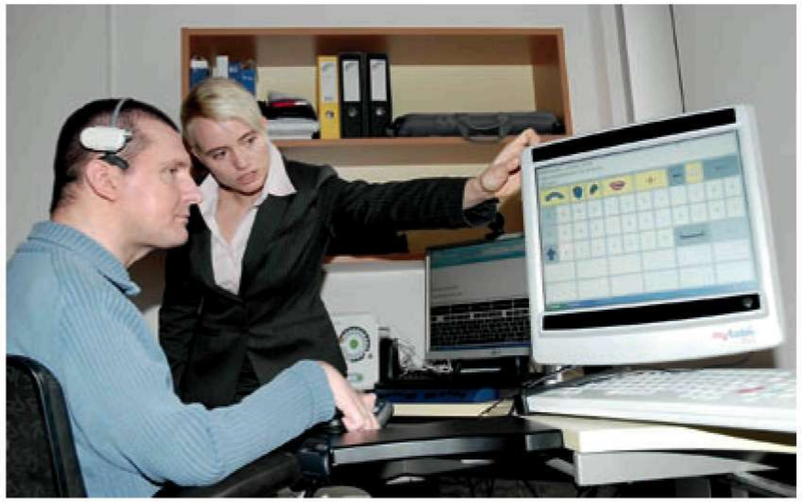


Drago Rudel
MKS d.o.o., Ljubljana

"My healthcare personal reminder"

Project partners: MKS d.o.o. Ljubljana, SIIX d.o.o. Ljubljana

Forgetting things is one of the burdens that elderly people must live with. But it could be a larger obstacle in their independence when living alone in their home environment. A reminder, which would alert them regularly when to take the medicine, go to the doctor's or a physiotherapist, or to perform a telemetric measurement at home, would be highly valuable.

"My reminder" is a service that we developed to fulfil the above expectations. Its user may receive a reminding message in three ways: as a voice message on an ordinary or mobile phone and as a written message as an SMS on a mobile phone or email in a mail box. The messaging system is customised for single or repetitive events. For the latter different regimens are prepared e.g. to take medicines within a limited time period or with no time limitation (pills for blood pressure reduction, for example). "My reminder" will send one or more daily messages at selected hours or regular time intervals. The service is Internet based. A potential user, his/her carer or even a nurse can input data over the Internet and start the service.

"My healthcare personal reminder" user receiving a reminder voice message on an ordinary phone

"My reminder" was developed for users with special needs but is now available to anybody who might benefit from it. We are confident that it will be appreciated not only by its users but also by their carers (daughters, sons, neighbours etc.) who will be released from daily care for their beloved. The service is now available for testing also within the IRIS (Independent Residing enabled by Intelligent Solutions) smart home.

"Red button" telecare service

Project partners: MKS d.o.o. Ljubljana, Centre for community home care, Ljubljana; SIIX d.o.o. Ljubljana

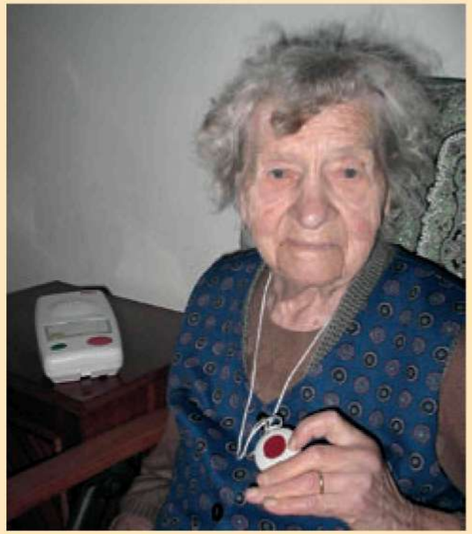
The telecare service called "Red button" is an ICT-based service aimed at:

- Enabling elderly, disabled and chronically ill people to live independently and safely at home and maintain their social and support networks;
- Providing a means of obtaining help when needed; and reassurance to the user, their relatives and carers.

It is based on a carephone installed at a user's home. He/she may wear or carry a radio trigger device that, when pressed, activates the device. A staffed monitoring and response centre is contacted. The person in need is then able to tell the operator of the nature of his/her problem and the operator is then able to give advice or reassurance and, depending on the circumstances, contact relatives, neighbours or the relevant emergency services.

The carephone may also be activated automatically by other triggers like a smoke, flood, heat or cold detector, or even a fall detector. A part of the system is also an electronic medication reminder that alerts a person when to take medications. It triggers a call to the response centre if pills are not taken on time.

The service has been available for years at a starting price of €25/month in some regions of Slovenia. So far, more than 800 users have been enjoying the benefits of this service. It is now available for testing within the IRIS smart home.



Telecare service user presenting her "red button", with which she can summon help at any time

Data on home services at the user's TV screen – The "Red button" service example

Project partners: MKS d.o.o. Ljubljana, SIIX d.o.o. Ljubljana, Smart Com Ljubljana

For independent living at home many elderly, disabled and chronically ill people need help that comes to their home directly (e.g. nursing, meals on wheels, home maid) or remotely (e.g. telecare or telemedicine service). Only by external support may they fulfil their health and/or social needs. For many of them it would be of great value if they had at their hand a monthly agenda on who will enter or has already entered their home and when, what services will be or have already been delivered, and also how much the services cost for the particular month. Service providers have these data, so they can share them with their users.

To demonstrate its feasibility we have developed an Internet-based solution that returns the user's data to the user and presents them on an interactive IP based TV in the IRIS home. Data on calls done by a "red button" carephone in the IRIS home to the community response centre of Ljubljana were used as an example. A user in the IRIS smart home showroom has only to select "Telecare service" from the menu on the iTV to see the history of the calls and the user data available to telecare operators to efficiently respond when needed.

"Design for All" principles were used when developing the solution. Consequently, it can therefore be used for any other service and implemented for the general public as well. We believe that solutions like the one described contribute to a "user empowerment" paradigm.

Telecare service-related data returned to a telecare user's IP TV.

The Laboratory for Telecommunications, Faculty of Electrical Engineering, University of Ljubljana

Where Advanced Telecommunication Solutions and Services Are Born

Andrej Gregorc

Communication as the essence of human society

Throughout history, the skills of communication and information-exchange have been key factors in the development and functioning of societies. The ability to obtain the correct information in a timely manner has often been more important than the content of the information. The history of mankind is full of turmoil, conflicts, wars and disputes. Although a certainly dark side of our past, this further underscores the importance of having the right information at the right time. With the aim of achieving a fast transfer of information, mankind reached for technological solutions. Only a few thousand years have spanned between ancient couriers or horse-drawn carriages and wireless networks with global connectivity – a short period of time which, however, involved an extreme pace of technological development; one of the fastest within science and technology. The technologies supporting communications have greatly changed almost every sector of present societies, not only in hi-tech solutions and sophisticated electronics, but also in the everyday activities of average people. Letting ourselves be swept along by gadgets, constantly improved and upgraded services, and endless technological possibilities, we sooner or later face the danger of being "over-connected" but, at the same time, alone. The convenience of telecommunication services should not and cannot replace personal interaction among individuals; it should only enhance it or make it easier.

Laboratory profile

The Laboratory for Telecommunications at the Faculty of Electrical Engineering (LTFE) was founded in 1946 by Professor Rafael Eržen and is thus the oldest laboratory in the field of telecommunications in Slovenia. Between 1965 and 1997, under the leadership of Professor Beno Pehani, the laboratory started to play an important role in the development of new products and systems for Slovenian industry. Research and project work interested many students, who joined the laboratory as junior researchers, researchers and teaching assistants. Today, the research work of around 50 laboratory members is oriented towards many areas in information and communications technology (ICT), including traffic measurement and traffic theory, simulation of switching and routing of traffic in synthetic and real networks, quality of service mechanisms in combination with transmission of data, audio and video traffic over wireline and wireless Internet Protocol (IP) networks. Security in IP and mobile systems is also one of the important research areas. Significant effort is also given to exploration of the use of telecommunications and information technology for people with disabilities. Project work is related to development of information technology systems and services, including key telecommunication technologies such as NGN, IMS, IP, xDSL, FTTx, MPLS, UMTS, WiMax, TM, as well as XML and Web applications. Important fields of work include the design and development of signalling system no. 7, converged services and multi-accessible portal systems based on fixed, mobile, IP and voice platforms. An important area of research, development and implementation is the role of telecommunications and networking technologies in distance learning. The LTFE closely co-operates with the Slovenian and EU telecommunications industry, including vendors, service-providers and content-providers. In addition to strong industry co-operation, several projects at the national level, funded by the Ministry of Economic Affairs, and Ministry of Education, Science and Technology are being conducted. The telecommunication and information technology infrastructure of the LTFE is being updated regularly, through co-operation with the local and international telecommunication industry, and, therefore, the most important up-to-date telecommunication technologies, systems and services are always implemented for education, development and research purposes. The LTFE is a member of the TeleManagement Forum, its members are active in the Institute of Electrical and Electronics Engineers (IEEE), ComSoc, the Electrotechnical Association of Slovenia (EZS), the Institute of Electronics, Information and Communication Engineers (IEICE), the Association for Computing Machinery (ACM), the International Federation for Information Processing (IFIP) and International Telecommunications Union (ITU) organisations. All members of the laboratory are strongly involved in the organisation of workshops and conferences in different areas of telecommunications.

Figure 1: Staff of the Laboratory for Telecommunications

Research work in the LTFE

Broadband and IP networking

Broadband is the common term for a high-bandwidth connection. It is associated with a faster way of connecting terminals to the Internet using different technologies, such as DSL, cable, LAN, etc. Broadband provides seamless on-demand delivery of data,

audio and video, sometimes also including mobility. Delivery of these services comes through a multitude of devices including computers, set-top-boxes, telephones and handheld devices. From a user's perspective, broadband solutions represent the convergence of multiple independent networks into a unified broadband network. Broadband closely affiliates with IP networking which ties together servers, networks and clients into one integrated system, delivering a communications solution that is easier and more cost-effective to implement and manage. Special attention is paid to engineering and management of various broadband networks (IP, MPLS, xDSL, LAN, WLAN), assuring quality of service with different approaches and the development of new converged multimedia services (IPTV, VoD, NVoD, GoD, MMS, E-learning).

Figure 2: Professor Dr Janez Bešter, Head of the Laboratory for Telecommunications

Convergent applications and services

Besides computer and media industry synergy, we are faced with convergence of telephone, data and broadcast networks and services. Therefore, the development of technologies in these areas stresses the role of Internet applications, which act as leverage for creation of convergent applications and services. They are used for various mobile and fixed services (e-commerce, E-learning, Internet portals, SMS, MMS and Voice, Internet TV, streaming video). Because of the variety of existing technologies and solutions, development of convergent applications and services requires extensive knowledge from different areas, such as protocols, networking, programming, user-interface design, streaming technologies, and similar. The LTFE participates in research, development, integration and validation of convergent applications and services. Special emphasis is placed on technologies for the user interface layer (HTML, WML, cHTML, CSS, JavaScript), dynamic content delivery (ASP, ASP.NET, PHP), the business layer (COM-ActiveX, .NET), databases (MS SQL, XML, MySQL) and XML technologies (XSL, VoiceXML, XQuery, CC/PP). Video technologies are very important within the development of convergent applications, especially video streaming, audio and video compression, and digital rights management (DRM). Examples of the LTFE's convergent applications include the Internet-based E-learning System E-CHO, Web Educational TV Program

SiTV, and many applications integrated with TV-Teletext (SMS chat, SMS voting system).

NGN / IMS systems and services

Next Generation Network/IP Multimedia Subsystems (NGN/IMS) represents a broad concept of evolving telecommunications systems and services towards new, more flexible and mainly packet-based architecture. Three key principles are introduced. First NGN/IMS has a layered architecture, which separates network functions into four independent planes – access, transport, control and intelligence, and service, which means they can be upgraded or modified independently. Next, these planes are connected by open interfaces enabling operator interconnection and integration. Open interfaces also provide third-party access to network functionality. Finally, NGN/IMS is a multi-service network, which allows implementation of converged and new services enabling users to access their home services from any type of network. NGN/IMS is, therefore, opening the world of telecommunications for the creation of new, innovative, services and content. It enables the development of third-party services and content without knowing the whole complexity of underlying systems. Special attention in this field is paid to signalisation (SS7, SIP, SIP-T, etc.), protocols (MGCP, SDP, H.248, etc.), open interfaces (Parlay, Parlay X, JAIN, Web Services, etc.), systems (Softswitch/Call Server, media gateways, parlay gateways, application servers), services and content (voice, data, video).

Signalling systems

Signalling System 7 (SS7) is an architecture for performing out-of-band signalling in support of the call-establishment, billing, routing, and information-exchange functions of the public switched telephone network (PSTN) and the Integrated Services Digital Network (ISDN). The hardware and software functions of the SS7 protocol are divided into layers, which closely correspond to the OSI seven-layer model. The lowest three levels – MTP1, MTP2 and MTP3 – are responsible for accurate, reliable transport of messages between signalling points. The ISDN User Part (ISUP) provides call control and other services for ISDN calls. The Signalling Connection Control Part (SCCP) and Transaction Capabilities Application Part (TCAP) together provide support for Intelligent Networking services. As we move toward the NGN/IMS, PSTN/ISDN is being upgraded by broadband capabilities, carrier-grade Voice over Internet Protocol (VoIP), and other media services. The most important protocols are SIP and DIAMETER. Interoperability is achieved via different types of gateways, such as H.323-to-SS7 or SIP-to-SS7. The main field of work within this research group is to develop signalling protocols (SS7, SCTP, MUA) for switched circuit, different drivers (HDLC), and especially new protocols and APIs within NGN (SIP, Parlay, DIAMETER).

E-Learning

The area of E-learning, based on and integrated with modern ICT technologies, is one of the main driving forces of sustainable development and progress of an information-based society in Europe and the world. E-learning applications and related content support the rise in information and electronic literacy combat the digital divide across the world. The LTFE's research, development and implementation activities in this field consist of provisioning complete E-learning solutions that enable target environments to develop, implement and maintain E-learning service on the local scale (corporate, academic and other organisations), as well as on the national scale. With several years of experience

in development and design of multimedia-based E-learning content, the LTFE has developed and successfully used a complete E-learning system named E-CHO, which consists of a Learning Management System (LMS) as well as a Learning Content Management System (LCMS). Our solutions have been introduced within large Slovenian corporate environments, such as Telekom Slovenije, Nova Ljubljanska Banka, Mobitel, Ministry of Defence and others. We also co-operate with academic and school environments in Slovenia and abroad. The LTFE is the co-ordinator of the Slovenian national project "Complete E-learning Introduction on the National Scale in Slovenia", which aims to develop a "Slovenian National E-learning Strategy". Our current and future activities consist of complete implementation of E-learning projects (technology implementation, content development, pilot delivery, evaluation, dissemination and final deployment) and knowledge transfer.

Mobile systems and services

Research and development (R&D) of mobile systems and services are divided into three key areas – underlying wireless networks, platforms and frameworks providing services, and mobile services themselves. Wireless networks enable data flow from service providers to customers. This is a combination of many interesting technologies from the fields of personal, local and wide-area networks, usually mixed with fixed lines and Internet. The main representatives are Bluetooth (WPAN), 802.11x family (WLAN) and global wireless cellular communications (WWAN), evolving from voice-based GSM and its data improvements HSCSD, GPRS and EDGE, to UMTS, HSxPA, LTE and succeeding generations. The platforms and frameworks consist of hardware, interconnecting to essential parts of wireless networks, and software, which enables efficient service development, billing and maintenance to third-party service providers. Mobile services are mostly converging

to a form which embraces voice, data and messaging. The LTFE participates in development and integration of mobile services from different categories such as voice, SMS, WAP and mobile WEB. A special focus is placed on research of user-friendly customisation and personalisation, achieving success on the Slovenian market and transferring multimedia content to connection and performance-limited mobile devices.

Telecommunications engineering

Network traffic measurement provides basic information for the control of the network. The analysed information describes the basic traffic characteristics, and thus allows modelling, and provides an opportunity to develop and plan the use of network resources. Modelling is the process of producing a model; a model is a representation of the construction and working of some system of interest. A model is similar to but simpler than the system it represents. A simulation of a system is the operation of a model of the system. The LTFE performs measurements, modelling and simulations as a part of its research work and project work. Measurements of IP traffic in academic and business environments have been conducted and models of this traffic built; several measurements of video traffic in Ethernet, ADSL and wireless environments have also been carried out. The collected data has been used in simulations with the aim of predicting the quality of service mechanisms of modern telecommunication networks. NS2 and Comnet III are used for these measurements.

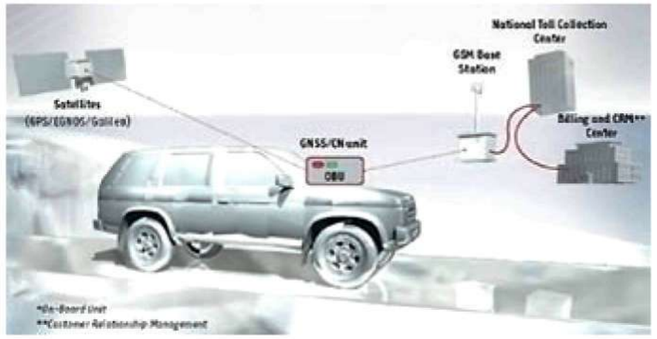
Accessibility in telecommunications

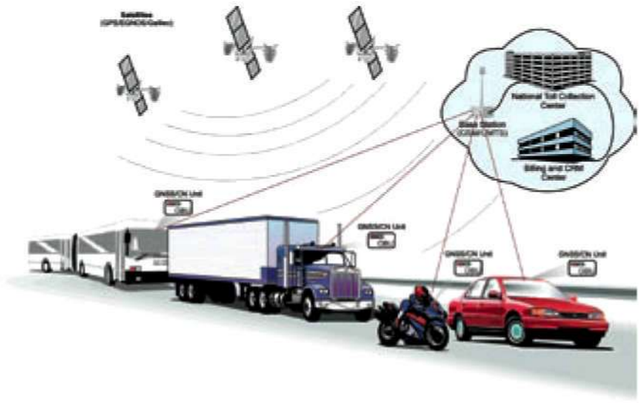
The main objective of research in this field is the accessibility of next-generation telecommunication services and terminal equipment for elderly people and people with disadvantages or disabilities. Development includes design and adaptation when required, and also promoting and establishing the appropriate supplementary services and equipment. Design for All is currently a very popular topic in Europe. The scope of these activities is to develop guidelines and standards as well as to adopt regulations, legislation and other public activities, which will make it easier to achieve a barrier-free public solution for access to communication systems. The LTFE actively participates in these projects. Especially productive is co-operation with the Institute for Rehabilitation, Republic of Slovenia in the field of development, customisation and testing different telecommunication technologies, services and applications. The lab also encourages national telecommunication and Internet providers to follow recommendations and guidelines for accessible telecommunications, and to adopt contemporary technologies, services and applications for people with special needs and elderly people.

Selected projects

The Centre of Excellence for ICT

The Centre of Excellence for ICT (CE ICT) is a consortium of partners with complementary knowledge and skills,





The results proved that, with the satellite-based EFC system, governments may introduce a fair toll-collection system based on the actual number of kilometres/miles driven in all European countries for all vehicle types.

with long experience of co-operation in national and international research projects. The main goal is to improve the organisation and implementation of research and thus achieve better use and value of the current strength and potential of know-how. Larger investments in intellectual capital enable a new way of co-operating in partnership, which is better adapted to the challenges of present-day research, providing innovative techniques to improve new or existing objects. The CE ICT should be the single point of contact for support or reference for partners in order to better a product, concept, idea, or device, or to seek advice from a think-tank of highly qualified R&D experts. The CE ICT focuses on efficiency, perfection, knowledge-exchange and distribution. The findings and outcomes of CE ICT research are published and presented in eminent scientific journals, and the results of projects are transferred to industry and ready to use. The CE ICT is managed by the Faculty of Electrical Engineering, University of Ljubljana, and comprises 17 companies as well as 9 institutions, which presently participate in 6 different project complexes.

Satellite toll-collection systems

In 1998, the EU accepted a resolution mandating a fair toll-collection system for use throughout the EU based on fair fees for roads and highways and the ability of governments to influence traffic growth. The project "Electronic Fee Collection for Free-Flowing Traffic" is the result of co-operation between Slovenian companies, universities and a national mobile telecommunication operator. Using the latest telecommunication and information technologies, the project has resulted in a prototype solution that works on all highways in Slovenia. The results proved that, with the satellite-based EFC system, governments may introduce a fair toll-collection system based on the actual number of kilometres/miles driven in all European countries for all vehicle types. The system has many advantages over the existing toll-collection system, among which are: fee collection for the actual number of kilometres/miles driven, toll-collection without vehicles stopping or slowing down, greater flexibility in fixing prices and thus the ability to influence traffic density and flow, lower environmental impacts and an active role in reducing pollution, higher total income and ease of determining toll and non-toll roads and highways, additional services for users and toll-collection operators, increased safety for participants in traffic, and new business opportunities.

The IRIS home

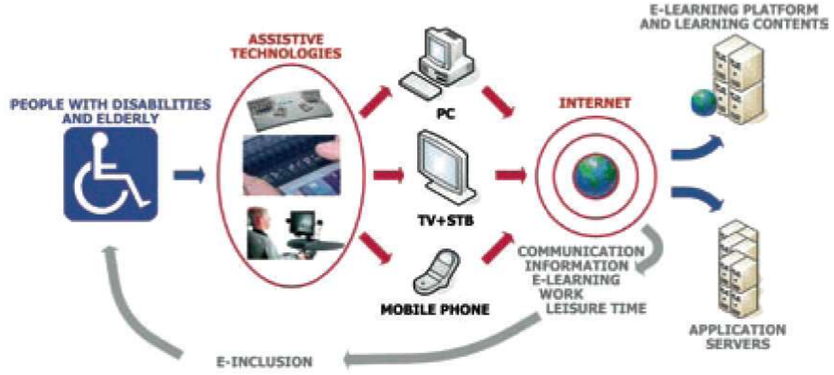
The Independent Residing enabled by Intelligent Solutions (IRIS) home enables an elderly individual or an individual with a disability to continue living and communicating independently with the help of advanced technologies. The project is based on solutions for intelligent homes that enable residents to operate them partially or completely remotely, and without much physical challenge. The intelligent home is upgraded with state-of-the-art technological equipment and solutions from the field of health care, medicine and nursing. It can be applied to hospitals, nursing homes, healthcare institutions, spas, resorts, retirement communities and homes, thus allowing each individual to choose the solutions and level of automation to meet their needs and the extent of the disability. Using the IRIS home greatly reduces the costs of home healthcare or nursing care, it provides a better and constant control over the individual's condition, improves the resident's safety, reduces the need for placement in retirement homes and other similar institutions, and gives health professionals, family members and friends an easier method of communication with the resident. Above all, it gives the resident the prolonged ability to continue with independent living even when to do so requires constant care and supervision.

SINTESIO – ETSI Interoperability Test Laboratory

The Bled-based SINTESIO is an open, not-for-profit NGN testing laboratory, approved by the European Telecommunication Standards Institute (ETSI), established by industry partners, standardisation bodies and the University of Ljubljana. SINTESIO provides testing sites for interoperability testing and methodologies. The testing laboratory is financed through the costs covered by participants in events, through sponsorship and public-private financing.

Technology platforms

Technology platforms are a mechanism of EU development policy, where the challenges of individual fields are met, and strategic advantages and opportunities of individual technology areas are determined. They encourage target-oriented investments in the field of R&D and thus promote a more efficient approach to innovation as well as co-ordinated activities within European and national research programmes. Technology platforms also support a continuous development of appropriate knowledge related to individual technology areas and the application of new technologies. In technology platforms, economic initiative is emphasised. Platforms are an open structure, which means that in order to achieve greater effectiveness they must include all the key economic players, as well as institutes, universities, public institutions and state agencies. They must also promote partnership with other sectors, thus forming the basis for political dialogue. Following the example of European technology platforms, Slovenian platforms have been organised, uniting key participants in the formation of common strategic programmes. Members of the ICT Technology Network have, together with the Chamber of Commerce and Industry of Slovenia, established three technology platforms: the eMobility Technology Platform, NESSI Technology Platform (Technology Platform for Software and Service) and NEM Technology Platform (Media in e-Networks Technology Platform).



University Innovation Center – Technology Design Center

The University Innovation Center and Technology Design Center for Information and Communication Technologies and Electrical Engineering (UIC TDC ICTEE®) is an example of a new, fresh approach to integrating the educational, research and business spheres. Established as an independent institution, the centre is, in a way, conceived as a hybrid between a faculty, a research institute and a company. It functions as a provider of postgraduate education, R&D services and technological solutions for the problems of contemporary society. Although based on ICT and electrical engineering, the activities of the centre will encompass numerous fields including technology, natural sciences, social sciences, economics, law and design. Essentially, the centre focuses on uniting individuals with higher knowledge in different fields into research and think-tank groups with the aim of providing new, different or better solutions, opinions, ideas, services, products or entrepreneurial concepts meeting the brief. The centre will provide state-of-the-art research equipment, the required administrative and logistic support, and a relaxed, informal working atmosphere, which will enable the participants to mingle their work and spare time within the "living lab". When its doors open, it will seek highly motivated individuals who want to be at the centre of creativity, ideas, action and knowledge with no regard to their profession, age, background or motive.

The ICT Technology Network of Slovenia

Following the trends of integration, convergence and a multidisciplinary approach, in 2003, leading Slovenian companies in the field of ICT formed a technology network with the main goal of achieving efficient technological synergy. The network binds together companies and institutions in the largest context of ICT, which includes electronic communications, networks, applications, security, laboratories, testing, surveillance, e-business, demo centres, system management, services, knowledge-exchange, education, etc. Based on individual projects, high-level knowledge and R&D capabilities, the technology network enables and facilitates a creative and inventive environment for the upcoming strategic challenges. The network excels in its own R&D, knowledge-exchange, high-level ICT and dynamic enterprises. Many of its member companies have a long tradition in manufacturing and marketing ICT products, systems and services on the global market. All of these advantages make an excellent basis for the establishment of an international ICT test centre in Slovenia, which will stimulate formation of new companies, thus contributing to higher competitiveness on the global scale via multiplier effects. The ICT Technology Network of Slovenia connects 49 members with an annual income of over EUR 2 billion, 17,000 employees, of which over 1,000 are researchers, and a 27% export share, mostly of hi-tech products.

Interview: Jadran Lenarčič, director of the Jožef Stefan Institute

The State Must Create the Market for Innovation

Sara Lunder
The magazine IRT3000

A central task of the Jožef Stefan Institute (IJS) is intensive cooperation in promoting technological and economic development in Slovenia. The role of the IJS is evident in both the training of personnel and in developmental research intended for users, and as part of which the knowledge of researchers assists the industrial and commercial sectors in resolving complicated issues. The recent past has not been favourable for cooperation between the scientific and research spheres, but in more recent years both fields have discovered the advantages of exchanging knowledge, personnel, equipment, organisation and joint involvement in international projects. The Institute promotes collaboration through numerous activities. As our interviewee, IJS director Jadran Lenarčič, says, last year a total of 114 projects were carried out for domestic and foreign industry, and in this the partners were helped to develop new materials, products, devices and technologies.

In the last few years, those in charge of development in Slovenia have become increasingly aware of the importance of cooperation between the sphere of science and research and the sphere of development within the economy. What restricted such cooperation in the past?

Following Slovenia's independence, technological development was not vitally important for the economy. The question was more of survival, so both spheres, science and business, found themselves in a special situation. On the other hand, in the nineties there was also a change in the attitude to financing science. The number of published scientific papers, especially in international magazines, started to be promoted and emphasised, and this contributed to the very survival of science in Slovenia. If it were left to the market – at least I believe this – it would have met with a sad fate similar to that experienced in other transition countries. The emphasised orientation of science towards the academic sphere not only helped to preserve it, but in certain fields it even succeeded in breakthroughs on a high level internationally.

Since technological development was more in the background, industry and science found themselves on opposing banks, and for several years we have sought to bring them together and strengthen their cooperation. This problem was more pronounced after 2000, when the need arose within the economy for products with a higher technological value.

How far in your opinion has this cooperation improved in recent years?

This involves primarily changes in the thinking on both sides, something to which we are being forced by Europe, which is allocating enormous funds for science and technological development. The awareness of and need for urgent investment of this kind also became clearly apparent in companies, since only in this way can they compete successfully on the global market. On the other hand, researchers have also ascertained what kind of role they play in economic development. In any event, insufficient money, including public, is channelled into this. Above all there is insufficient synergy between public and private investment.

How much funds are allocated for science and development in other European countries, and what proportion of GDP is allocated for this in Slovenia?

The greatest amount, more than 3 percent of GDP, is allocated for science in Sweden, Finland and Norway, followed by approximately 2.5 percent in Denmark, Ireland and Switzerland. In Slovenia we are talking about one and a half percent, and in recent years this has fallen.

How far has the state helped improve cooperation between science and the economy through appropriate mechanisms and what are these mechanisms?

We need only one mechanism for better cooperation. It is not important how it is implemented, what is important is just that a suitable market for innovation is created. The main task of the state is therefore to prepare a basis for innovation to pay off. Innovation is a broad process, which requires the close cooperation of both spheres.

Thus far the state has provided tax relief in the area of investment in science and development. So this is not investment in equipment, as was the case previously, but in living work. I believe this is one of the highest levels of relief in Europe, but this benefit is very poorly exploited. Certain other measures were introduced, and while they were not so far-reaching, companies still did not use them sufficiently.

Certainly greater cooperation between the economy and science was fostered two years ago by the scientific and research projects which the Ministry of Defence and the Slovenian armed forces initiated. These were development projects which industry alone or science alone could not offer, but in cooperation it is possible.

What is preventing even better cooperation, and how could this barrier be removed?

The biggest barrier is without doubt a lack of funds for science and technological development. We must take a step forward at the earliest opportunity. We need a consensus in the area of scientific and technological development, since only in this way will we be able to create a "team" of all three partners – researchers, business people and representatives of the government – who will formulate a quality national project of technological development. Here everyone should recognise that such a national project also requires some forbearance, since it involves not a short-term but a long-term investment, whose positive effects can only be seen in five or ten years. This is an investment for the next generation, without which Slovenia will not move forward from its current position.

Slovenian medicine for a number of years

Last December, as part of this cooperation the Institute was visited by the Minister of Health, Zofija Mazej Kukovič. She met with the Institute director Prof. Dr Jadran Lenarčič, as well as with the heads of individual departments dealing with physical and organic chemistry, environmental science, health, biochemistry and medicine. Some of the most important research on which collaboration is being pursued includes modelling environmental processes and risk assessment, which as interdisciplinary tools contribute to the linking of natural science with environmental policy, with evaluation and social objectives. Equally important is the collaboration on research enabling progress in treating certain diseases (cancer, arthritis, neurodegenerative diseases etc.) and on research aimed at identifying and validating tares for planning medicines. Cooperation is also under way on training for the use of sources of radiation in industry and medicine.

Institute director Prof. Dr Jadran Lenarčič and Minister of Health Zofija Mazej Kukovič

At the IJS you have been striving for several years through numerous activities to establish a link between the research sphere and companies. This has also included meetings which you called "the Institute without fences". What exactly is involved in these meetings?

Perhaps to begin with I could describe an incident. A few years ago a gentleman from the European Union was visiting IJS, and he was interested in how the Institute cooperated with industry. There were several scientists at the meeting, and some of us responded that it was very hard to cooperate with industry, because at IJS we were working on the highest level of science, and the industrial sector was not interested in that kind of science. The gentlemen then responded to this by saying he was not asking what the industrial sector had not done, but what we had not done to establish cooperation with the industrial sector. I will not forget his words, and I am trying to adhere to them as far as I am able.

It is true, at the Institute we have implemented several activities which are good not just for the economy and the national interest, but also for the development of IJS itself. Through cooperation, which I understand as a two-way street, the Institute will indeed be able to develop successfully in both pure and applied research. In fact both systems promote each other, so you cannot develop just one of them.

As you mentioned, one of our activities is meetings with companies, which we have called "the Institute without fences". Any company seeking opportunities in knowledge and the chance of cooperating with us, can visit IJS on an appointed day with any group of its personnel. On that day the Institute is entirely at the disposal of the company, all the laboratory doors are open, talks are held with any group at the Institute, and this is especially an opportunity for us to get to know each other better.

Thus far we have been visited by the companies Gorenje, d. d., Lek, d. d., Krka, d. d. and Kolektor Group, d. o. o. Companies can prepare the programme of the visit themselves. With Gorenje, for instance, the meeting preparation took three months. When they arrived for their visit, we had already met for individual projects, and then we toured the laboratories. During the visit by Kolektor we gave a presentation of the Institute, and they presented their company, toured the laboratories and then we talked about where we could help them. The Institute was already cooperating with both companies, but in numerous areas and with greater possibilities we want to strengthen this cooperation. The most important thing is that such meetings often give rise to new ideas for projects that we had not thought about previously. It also often happens that at a meeting we create an entirely new concept that is different from those for which we set up the meeting.

It appears that such visits are more suited to bigger companies. How do you attract smaller companies? Do

you have any other projects that promote cooperation?

Of course we also want to draw in small companies, too. So this gave rise to the idea of doing something similar with the Slovenian Chamber of Craft, except that we would be covering several smaller companies at the same time.

One of our activities is conducted under the title "Coordinators for companies". If a company wishes to establish more permanent links with the Institute, we can appoint a coordinator for that company at IJS. This helps create new links with individual research groups at the Institute, and informs the company of possible projects, new developments, interest in cooperation and so forth. Another job for the coordinator is to bring into a potential project with the company several research groups at the Institute in different fields, or by agreement to establish contacts with relevant partners in Slovenia and abroad.

Last year at IJS we also initiated meetings aimed at creating awareness of the role of scientific research work for social and economic development. The meetings are aimed at all three actors – the state, industry and science – since we are aware that each one on their own could not achieve the right results. To date we have organised meetings such as "the Institute and industry", which was attended by around 100 CEOs of the biggest companies, followed by the meetings "the Institute and opportunity", "the Institute, environment and health, science and art – the new Renaissance" and "the Institute and creativity in school". At first the media were very interested in these meetings and reported on them, but now their interest has been progressively dwindling. The meetings are polemical and as such are interesting for all three actors and the general public. The whole of society must be aware that we can only do something together, and that you need to invest when you have something to invest. Slovenia now has something, so now is the right time for long-term investments. In five years there might be a different economic situation and that possibility will be gone. This could mean that instead of taking a step forward we take a step backwards.

So what can the Institute offer companies?

We offer companies numerous development opportunities, be it the

Kolektor Group is one of the largest Slovenian-based multinational companies and has branches worldwide. Its major market niche is production of commutators. A fruitful collaboration with the Jozef Stefan Institute lasting for over a decade has brought to development different technologies nowadays familiar in mass production. Successful research and development (R&D) projects have included the development of hard and protective coatings for saws, development of technology for metallisation of graphite-polymer composites, for selective etching and surface functionalisation of polymer materials, and for discharge cleaning of components made from copper and nickel. The company devotes much of its attention to solving ecological problems. All its technologies are environmentally friendly. They produce practically no waste since processing is carried out under a controlled atmosphere, often in vacuum conditions, and gas outlets are all equipped with specially adapted catalysts, assuring an almost perfect recombination of processing radicals to harmless molecules. The outlook for the collaboration is rosy: joint research groups are working on applications for newly developed nanomaterials in production. The most promising projects include the development of novel lubricants and of magnetic nanoparticles for medical applications.

A novel technological process developed in collaboration between Kolektor Group and the Jožef Stefan Institute has been protected by 12 patents in EU countries, the USA, Mexico, China, Japan and Korea.

Fruitful collaboration between Kolektor Group and the Jožef Stefan Institute

Impossible becomes reliable

Some materials are incompatible due to exclusively different surface properties. A modern material used for gasoline pumps is a graphite-polymer composite. It exhibits excellent thermomechanical and electrical properties and is an ideal substitute for metals that tend to corrode during exposure to aggressive liquids. The drawback of this material is poor surface energy

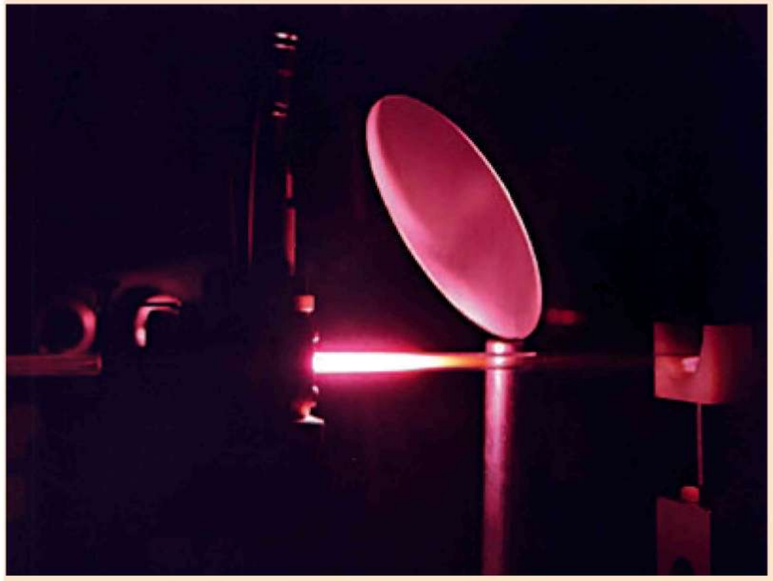


Figure 2: Gaseous discharge is an excellent source of plasma radicals

Graphite-based composites are promising substitutes for metals. Unlike most metals, the composites are immune to corrosion and exhibit excellent thermomechanical and electrical properties.

that prevents metallisation by standard electrochemical processing. Previously, the only known method was based on application of different ecologically harmful wet chemical treatments. The Executive Director New Products at Kolektor Group, Univ. Dipl. Engineer Ludvik Kumar, however, was resolved to overcome this problem. He contacted the head of the Plasma Laboratory at the Department of Surface Engineering and Optoelectronics of the Jožef Stefan Institute, Prof. Dr Miran Mozetič and together they ran the project entitled "Plasma Technologies for Treatment of Composite Commutators". The project was partially funded by the Ministry of Higher Education, Science and Technology of the Republic of Slovenia. In less than three years, the project team developed a novel technology for treatment of the graphite-polymer components that allows for excellent adhesion of the metallisation layer on the surface of the composites. The technology is based on application of different dry gaseous processes. A plasma reactor was constructed that allows for generation of an extremely non-equilibrium state of gas. At the neutral gas temperature below 300°C, the inner temperature of the gaseous molecules exceeds 30,000°C! The dissociation fraction of gaseous molecules exceeds the ionisation fraction by about 1,000,000 times. Such conditions are achieved only through the proper choice of plasma reactor materials as well as optimised coupling between the discharge power supply and the plasma inside the reactor. An extremely high flux of gaseous radicals on the surface of the graphite-polymer composite assures rapid removal of the surface layer of the polymer as well as of loosely bound graphite grains. The surface of the composite becomes free of polymer and extremely rough.

Furthermore, the surface of the graphite grains becomes nanostructured as shown in Figure 3. An extremely rough surface, however, is not sufficient for good adhesion of a metallisation layer on the modified material. In the next step, the composite is exposed to a proper dose of oxygen radicals. This final procedure leads to formation of extremely polar functional groups on the surface. The richness of the functional groups on the polymer-free surface of the composite, together with the extreme roughness, causes a transformation of the surface properties of the composite. If the untreated material is heavily hydrophobic, the processed material becomes highly hydrophilic. Furthermore, project researcher Dr Uroš Cvelbar found that, under limited process conditions, the surface becomes superhydrophilic. This state has never previously been reported in the scientific literature for the surface of a hydrophobic polymer matrix composite. The superhydrophilicity leads to excellent adhesion of the metallisation layer on the surface of the composite. This method for treatment has been protected by international patents and is currently used in mass production: over 3,000,000 pieces are produced annually and the quality of the products is superb.

The research team from left to right: Prof. Dr Miran Mozetič, Ludvik Kumar and Dr Uroš Cvelbar

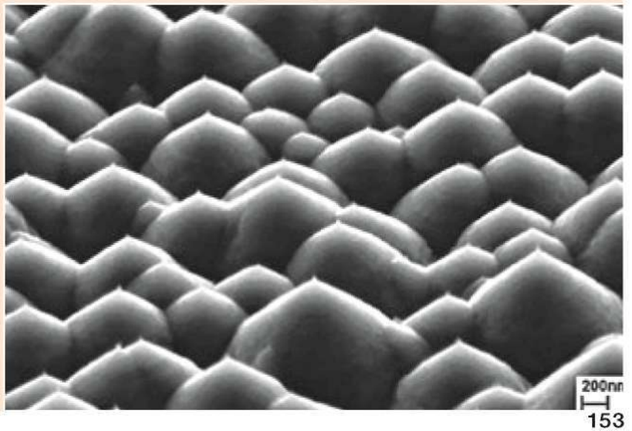


Figure 3: Nanostructured surface of graphite grains

development of technologies, devices and products, consultation, training for innovative personnel or the joint use of equipment and organisation of joint development groups. During company visits I frequently stress that they have done well if they have come to us for knowledge, but here they will not acquire it just like that. The point is, we will only arrive at real knowledge through joint work. The Institute also facilitates help for companies in becoming involved in international projects and networks. Each year we participate in around 180 European projects, but sadly to date only a minimal number of Slovenian companies have taken part in them. All these projects are tied to companies abroad, so we suggest to Slovenian companies that they should also seek opportunities for breaking into the European technological arena through us.

What desires do entrepreneurs have most frequently in making contact with you, or what do companies lack most of all? How can you help them?

Usually this does not involve projects where we would develop a product in its entirety. Most commonly they have technological problems which they cannot resolve themselves, and they want to know how they could improve an existing product, whether this involves better materials, new technology or automation. We as an institute are keener on having them work with us and our ideas to develop products that will be successful on the market and will create among buyers the need for such products.

Cooperation with industry takes various forms. The first has been a kind of sponsorship, where the Insti-

Prof Dr Marija Kosec
Head,
Electronic Ceramics Department
Jozef Stefan Institute

Planar antennas based on ferroelectric thin films

Dr. Barbara Malič

As part of the EU FP6 RETINA project, we have collaborated with HYB, d.o.o. in developing and fabricating a planar low-cost antenna, which will enable broadband access to the Internet aboard mobile platforms, such as aircraft.

The antenna is composed of a mesh of ferroelectric phase-shifters allowing beam steering of an electromagnetic signal in a selected direction i.e. towards a dedicated satellite.

The ferroelectric capacitor, which is the active component of the phase-shifter, is a (Ba,Sr)TiO3 (BST) thin film deposited on a ceramic substrate by Chemical Solution Deposition. The BST film is less than 1 μm thick, with electrodes patterned by lift-off photolithography and wire-bonded in the phase-shifting cell.

Dr Barbara Malič

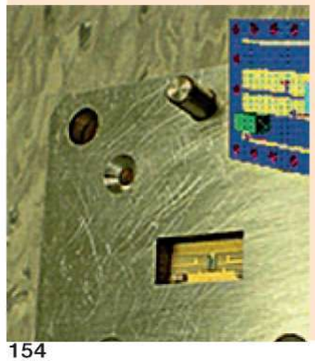


Figure 2: Photo and schematic representation of a unitary phase-shifting cell.

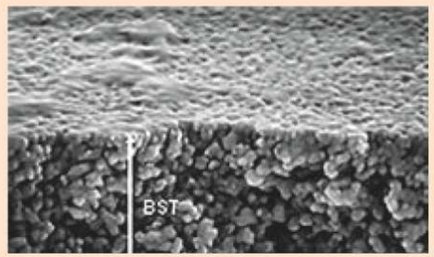


Figure 4: Cross-section microstructure of a BST thin film on a ceramic substrate

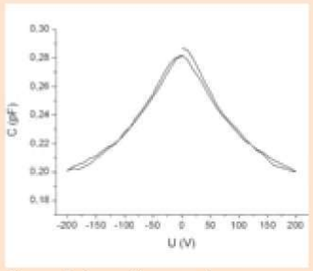


Figure 3: Capacitance-voltage response of a BST thin-film capacitor

The Ceramic-MEMS is the result of research activities on materials, construction, design, electronics, and fabrication and characterisation of materials and devices. The research activities were carried out by research organisations HIPOT-RR, d.o.o. and the Jožef Stefan Institute. Part of this research was funded by the national "Hybrid Micro Electro Mechanical Systems" (L2-6462-1704) project and part by the EU FP6 MINUET (FP6-505657) project. Both were also financially supported by the Slovenian company HYB, d.o.o.

Ceramic MEMS

Micro-electro-mechanical systems (MEMS) can be fabricated with a variety of technologies and from a range of materials. MEMS are normally made by micro-machining silicon, but in some applications ceramic materials are a very useful alternative. The laminated 3D structures made using low-temperature cofired ceramics (LTCC) are especially practical for ceramic micro-electro-mechanical systems (Ceramic MEMS). Pressure sensors, which are an important segment in the MEMS market, can be based on different technologies and principles. Thick-film ceramic pressure sensors are typically larger (in the meso size range) and mostly used in a physically and/or chemically demanding environment. Sensor elements made with thick-film technology on a deformable diaphragm are most common in ceramic pressure sensors. Diaphragm dimensions must be chosen and material must be selected very carefully to, on the one hand, maximise the sensor's signal and, on the other, to stay within the elastic limits of the diaphragm material and avoid fracturing the diaphragm. For this purpose, several construction details were studied and then verified using a simulation of test structures with the ANSYS finite-element-analysis software package. An example of such analysis is shown in Figure 1.

Darko Belavič
Head, HIPOT-Research group
HIPOT-RR, d.o.o.
c/o Jožef Stefan Institute

The sensing principles of the thick-film ceramic pressure sensors are piezoresistance, capacitance and resonance. The piezoresistive pressure sensor is made with four thick-film resistors on the diaphragm. Each thick-film resistor acts as a strain gauge that is capable of translating a strain into an electrical signal. The working principle is piezoresistivity – the property of resistor materials to change their resistivity under strain. The capacitive sensor is based on changes of the capacitance values between two electrodes. One electrode is fixed and the other is movable and made on the diaphragm. The displacement of the movable electrode depends on the applied pressure. The piezoelectric resonant pressure sensor is based on the piezoelectric properties of ferroelectric thick films on the deformable diaphragm. The ferroelectric structure works as an actuator and generates stresses in the diaphragm, and these induce vibration of the diaphragm at its resonant frequency. The applied pressure bends the diaphragm and shifts the resonant frequency, which can be used as the output signal of the piezoelectric resonant sensor. The thick-film piezoelectric resonant pressure sensor is a relatively new device made with new thick-film PZT material. Two types of piezoelectric resonant pressure sensor are shown in Figure 2.

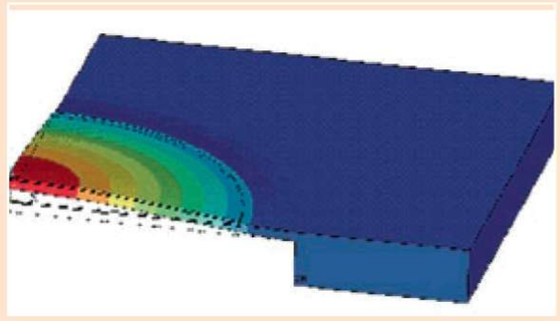


Figure1: Bent diaphragm of ceramic pressure sensor analysed using finite elements

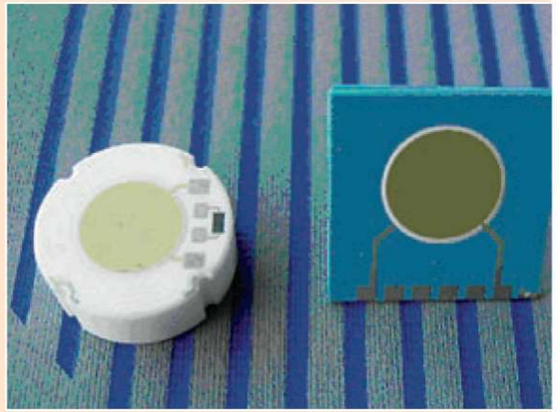


Figure2: Thick-film piezoelectric resonant pressure sensors made by thick-film PZT material on an alumina capsule (left) and on a 3D LTCC

tute received a sum of money from a company and used it for a project where it was more or less all the same whether it succeeded or not. At that moment this was good, but negative consequences soon became evident. Whoever receives the money usually does not produce any major results, and the company itself is not interested in what happens with the money, so the project usually ends with a report, and rarely with a prototype. This form of cooperation is undoubtedly the worst, since it usually causes more harm than benefit. The next method is what I call buy-sell. A company has a technological problem, and wants new materials or development. The Institute fulfils the company's order and is paid for the service. Yet in this case, too, we cannot speak of real cooperation. Good cooperation is partnership, in other words when we arrive together at the concept of how to deal with a problem, and we are somehow mutually dependent. In addition to the concept, we also exchange people, their technological knowledge comes to us and vice versa. A long-term partnership is created, since both sides know what they can offer each other and that only together can they arrive at the final result.

Entrepreneurs from which sectors most commonly approach you?

Most companies are from manufacturing, such as the car industry. It is true, however, that they could also come from entirely different sectors, but they don't. For instance we have tried to establish contacts with retail, but have not succeeded. They see no advantage in science and technology, although I believe that at the Institute they still have considerable opportunities, whether we are talking about product control, logistics or internet sales. The possibilities on which in a few years their lives will depend are great.

What criteria do you use to decide on cooperation?

It happens that we might not have mastered some field or we lack sufficient knowledge. Occasionally there are complications with money. Many people still believe today that we are financed from the budget and that our services are free. But IJS does not live off the national budget. The Institute's operations are financed through projects for which we tender in the national and European market, both in the public and private sectors. Equally, we have no funds to implement a project for free which is not part of the projects through which we are financed. It is true, however, that at IJS we do not embark on projects where the basics would be learned. We only accept projects where we can sell the knowledge we have, and which for individual projects we also enhance appropriately.

Has IJS in the past worked in cooperation with domestic or foreign companies on such a far-reaching project that it has ranked as a breakthrough on the world scale?

Given that each year we have many more than 100 projects, it is hard to highlight any one in particular. I should mention perhaps just two companies, Domel, d. d., and Droga Portorož. For the first company our researchers developed a cell for laser testing of the quality of engines, which was a very important achievement on the world scale. For Droga we provided automation, IT support and robot operation for the tea production line. A special feature of this was that we provided it as a turnkey project.

If an entrepreneur visits you and you determine that you cannot help him, do you contact other domestic and foreign institutions of knowledge?

We cooperate with all the universities and institutes in Slovenia and numerous institutions of knowledge abroad. In recent years our portfolio has been dominated by European projects, with about 200 going on each year. Last year we signed a cooperation agreement with the Austrian technological institute Joanneum Research, which deals primarily with development for industry. Through them we are linked to the biggest technological institute, TNO, which is headquartered in the Netherlands. This involves enormous synergies, with them seeking from us primarily basic knowledge and us seeking technological knowledge from them.

This means that through IJS Slovenian knowledge is being increasingly transferred to the economies of other European countries.

Of course. Direct cooperation with industry abroad is increasing by around 50 percent annually. We are not talking big numbers, just a few percentage points of our total revenue, but it is significant that it is increasing so much. We are being approached most of all by Austrian and German companies. And across the pond we have primarily scientific links. The USA is a traditional area of cooperation for us, but in terms of the number of bilateral projects in recent years (alongside the USA) we have cooperated most with Japan.

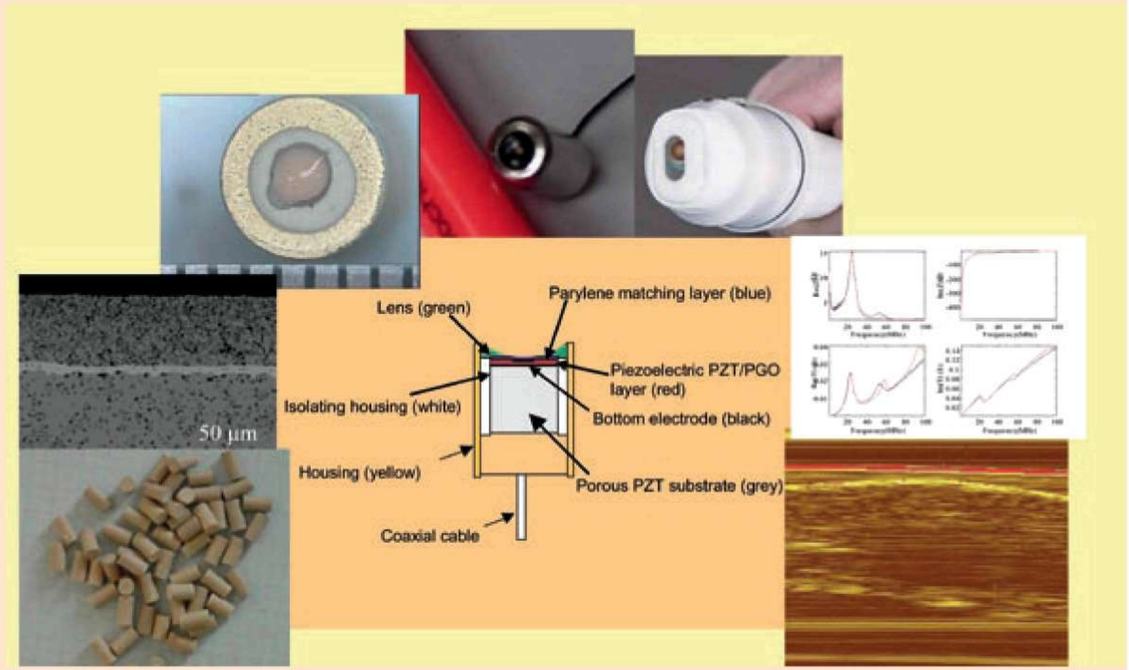
Finally, a question which is not entirely connected to the Institute's cooperation with industry. How in your opinion could IJS market its intellectual property even better?

The field in which Slovenians are certainly not present in the European and world map is that of spin-off, that is, companies created from knowledge or ideas. There are very few such companies in Slovenia. In this field Europe is significantly better, since it has determined that our main lag behind America is in the establishing of small companies created on the basis of technological discoveries.
A little time ago I started developing an idea that I called "from doctorate to company". In Slovenia each year there are between 20 and 30 new doctoral graduates. The basic concept was to provide for all these young researchers at the Institute an incubation period and funds, so that the idea they developed in their doctorates – if of course they wanted to – could be developed up to the founding of a company and the sales of their first products. This preliminary period would last three to five years, and then the company would relocate to a technology park. We would facilitate work through our equipment and personnel and also our monetary fund, which we would set up for this purpose. The doctoral graduate would be the majority owner of the company, and we would be co-owners. Once the company was on its own two feet, IJS would sell its share. Unfortunately my idea has run into numerous formal problems, so I have shelved it for the moment.

Medical transducers based on ferroelectrics thick films

Recent development trends in piezoelectric devices are towards smaller size, higher resonant frequencies and a low driven voltage. For high-frequency transducers in medical imaging applications, thin (i.e. <50 μm) piezoceramic elements are necessary. These are usually produced by lapping and machining. However, the elements tend to chip and break, and this is a major problem when joining the element to the backing. This problem may be avoided by an integrated device with a thick piezoelectric layer on a suitable substrate that also serves as a backing. To provide this function, porous PZT ceramics were chosen for the substrate.
Piezoelectric lead-zirconate-titanate, Pb(Zr,Ti)O3, PZT-based thick films were processed by screen printing and firing on porous PZT. To lower the firing temperature of the PZT layers to 800–900 oC, the composition was modified with lead germanate (PGO) that forms a low-temperature liquid phase.
A structure composed of PZT/PGO thick films, a gold bottom electrode, PZT barrier layer and porous PZT substrate delivers the best performance in terms of electromechanical properties of the active layer and acoustical properties of the substrate (acoustical impedance and attenuation). This has allowed us to determine the dimensions and final structure for fabrication of the transducer. In co-operation with GIP Ultrasons of Tours, France, within the EU FP5 PIRAMID project, the integrated thick-film transducers have been fabricated. The image obtained with the PZT/PGO thick film has a very good axial resolution and good sensitivity, which make this integrated thick-film structure promising for medical imaging transducer applications.

Dr Janez Holc



A) Schematic of the integrated thick-film transducer.
B) A substrate with the function of backing was produced from PZT powder and a pore former to obtain the defined porosity after sintering.
C) Cross section of the thick film structure after sintering of PZT/PGO layer.
D) Front of the transducer after thick-film processing, sputtering of the top gold electrode and poling. Diameter of transducer is 5 mm.
E) Transducer in metal housing after processing of parylene matching layer and lens (made by GIP Ultrasons).
F) Transducer in medical ultrasonic probe (made by GIP Ultrasons).
G) Real and imaginary part of electrical impedance of PZT/PGO thick-film structure (measured at GIP Ultrasons).
Image of a forearm obtained with an integrated PZT transducer. It has very good axial resolution and sensitivity compare to a classic bulk transducer (measured at GIP Ultrasons).

Intelligent Systems and Agents

Matjaž Gams

Intelligent systems simulate intelligence so that a typical user perceives them as truly intelligent. In reality, these systems have more or less pre-programmed patterns of human behaviour. Due to limited application areas in real-life domains, most standard replies can be pre-programmed in advance through special methods and techniques. Intelligent systems are aimed at extending the applicability of computers, and providing a technological basis for new and improved information services.

Prof Dr Matjaž Gams, Head, Department of Intelligent Systems Jožef Stefan Institute

Another important factor is the growth of the information society. A growing number of functions are supported by computers at the same time as humans are becoming overloaded with information. Huge amounts of data are processed by computers several orders of magnitude faster than by humans. Technical possibilities in recent years have grown much faster than they have been exploited. In reality this means that we are dealing with a huge space of generally available intelligent information technology (IT) capabilities. Intelligent systems in the information age enable more new applications than we actually manage to implement. This is analogous to those times when all that was needed to grab new land was a good horse, a good idea and determination. IT "horses" are cheap and available.

One of the most promising intelligent approaches is based on intelligent agents. Agents have two basic properties: autonomy and sociability. Autonomy denotes the capability of an agent to perform actions on its own. This is unlike previously programmed systems, which were nearly always used as tools or slaves. Information overload disables humans from making decisions entirely on their own. To achieve better performance, a certain amount of free will is delegated to agents. The other ability – sociability – makes agents in principle potentially stronger than universal Turing machines.

The Department of Intelligent Systems focuses its activities on the development of methods and techniques for intelligent computer systems, with applications in the areas of information society, computer science and informatics, Slovene language and speech processing, and network communication systems. The main research areas are language and speech technologies, agent technologies, the semantic Web, evolutionary computing, data mining, search algorithms, decision support, intelligent sensors, distributed supervisory systems and network voice services. The department collaborates closely with the Faculty of Computer and Information Science of the University of Ljubljana on the joint research programme "Artificial intelligence and intelligent systems", led by Prof Ivan Bratko.

The department was founded in 1979, initially as an Artificial Intelligence (AI) group. In the first ten years, the emphasis was on theoretical research that provided a solid background for later application projects. In 1982, the development and implementation of AI tools started and soon resulted in practical applications. By now, over 60 projects with several high-impact practical applications have been completed in different domains such as intelligent information systems, data analysis, decision-making, intelligent agents, medicine, ecology, language and speech processing, intelligent manufacturing, security systems, and the economy, including business and management, technical domains, and medicine.

With more than 30 years of tradition in AI research and development (R&D), the "Artificial Intelligence and Intelligent Systems" joint research group was proclaimed in 2006 by the Slovenian ministry of science and education to be one of the best ever research groups and first in the field of information and computer technologies.

Members of our research group have introduced several new R&D fields in Slovenia, from AI, intelligent systems, and intelligent agents to intelligent services in information society.

In our vision, Slovenia has to move faster towards an intelligent information society to foster efficient progress and a better life.

Intelligent systems are becoming more and more advanced intelligent assistants, and they are improving their communication skills in terms of speech and expression. Intelligent robots, such as the Roomba cleaner, are entering our homes at affordable costs. Intelligent systems are becoming part of our everyday life and Slovenia is joining progress in this area.

The international Information Society multiconference

A traditional activity of the Department of Intelligent Systems is the organisation of the international Information Society multiconference. In October 2007, the 10th multiconference was held in Ljubljana, consisting of six independent conferences: intelligent systems, cognitive sciences, data mining and data warehouses, education in information society, collaboration in information society, and Slovenian demographic challenges in the 21st century.

The Information Society multiconference (http://is.ijs.si) continues as one of the leading conferences in Central Europe gathering the scientific community with a wide range of research interests in the information society. The information society displays a complex interplay of social, economic, and technological issues that attract the attention of many scientific events around Europe. The broad range of topics makes our event unique among similar conferences.

The motto of the multiconference is synergy of different interdisciplinary approaches dealing with the challenges of the information society. The major driving forces of the multiconference are the search and demand for new knowledge related to information, communication and computer services. We present, analyse and verify new discoveries in order to prepare the ground for their enrichment and development in practice. The main objective of the multiconference is presentation and promotion of research results, to encourage their practical application in new ICT products and information services in Slovenia and the broader region.

The most recent multiconference ran in parallel sessions for five days and featured over 150 presentations of scientific papers. The papers were published in the conference proceedings, and in two special journal issues – one of them Informatica, with its 30-year tradition of excellence in research publications.

The multiconference is co-organised and supported by several major research institutions and societies, among them ACM Slovenia (the Slovenian chapter of ACM), and SLAIS i.e. (Slovenian society of the European AI association, ECCAI). The conference is supported by the Slovenian Government, in particular through the Ministry of Higher Education, Science and Technology and the Slovenian Research Agency.

Figure 1: In 2007, the Information Society multiconference rewarded academician Prof Dr Ivan Bratko for the introduction of the information society in Slovenia.

Multi-agent learning

The department introduced agents into Slovenia. In a recent PhD by Andraž Bežek, the Multi-Agent Strategy Discovering Algorithm was designed; this is able to discover and describe successful soccer strategies based only on simple domain knowledge and a multi-agent game trace.

By tracking low-level agent behaviour and basic domain knowledge, it is able to discover a common agent strategy which represents an important achievement in terms of computer creativity. Efficiency was confirmed with testing: measurements of accuracy, recall and precision, domain expert analysis confirmed the strategies obtained.

Our department also has recent experience with multi-agent software engineering. We designed and implemented a highly efficient load-balancing system. The multi-agent approach enabled high scalability, increased fault tolerance and better upgradeability.

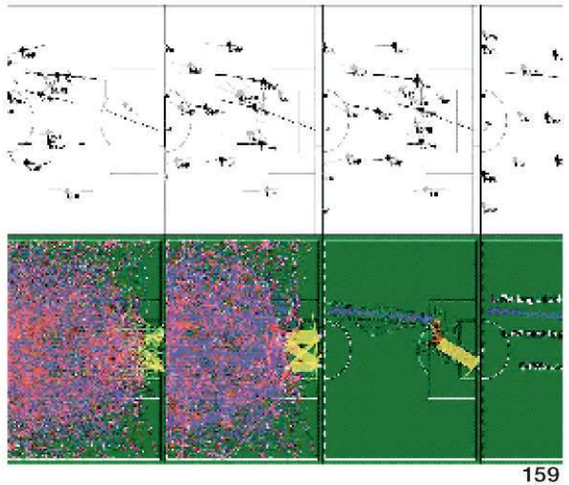


Figure 2: Modelling strategic multi-agent behaviour with the Multi-Agent Strategy Discovering Algorithm (MASDA) in the robot soccer domain

Intelligent access control

The Department of Intelligent Systems developed an intelligent event-driven supervisory system for near-real-time and mission-critical operations with biometric-based access control and an intelligent expert system (CIVABIS) for the Slovenian Armed Forces. The project was sponsored by the Ministry of Defence of the Republic of Slovenia, and was developed in collaboration with the industrial partner Spica International and the Faculty of Electrical Engineering.

The network of Spica companies is the leading supplier of data collection systems in the Adriatic region. Spica International was founded in 1989 in Ljubljana, Slovenia. R&D has always been the key component of Spica's strategy, and the company's current successful operation is undoubtedly rooted in firm reliance on its own knowledge base and the skills built through systematic R&D programs.

Spica has offices in five West-Adriatic countries, where it acts as the leading regional AIDC (automatic identification and data collection) distributor-reseller and integrator. An impressive market share of about 50% could not possibly be achieved without a strong network of local partners in each country.

For local AIDC markets, Spica turned to a selected group of world-leading vendors. Spica's partnership policy relies on long-term co-operation and intensive exchange of expert knowledge, which enables the company to provide state-of-the-art solutions that fully meet international standards.

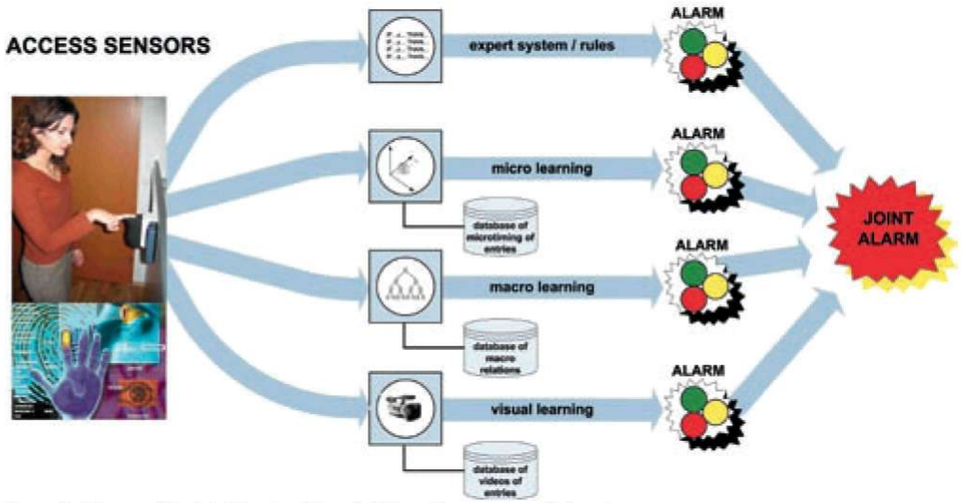


Figure 9: Schema of the intelligent multi-modal biometric access control system

The joint Civabis research group.

International co-operation

The department took part in seven FP6 projects and several other international projects with emphasis on collaboration with industrial partners:

- ALVIS (Superpeer Semantic Search Engine)
- SEKT (Semantically Enabled Knowledge Technologies)
- WINDECT (Wireless Local Area Network with Integration of Professional-Quality DECT Telephony)
- COST 526 (Automatic Process Optimisation in Materials Technology, APOMAT)
- We-go (Enhancing Western Balkan e-government Expertise)
- AgentLink III (Co-ordination Action for Agent-Based Computing)
- ASPIC (Argumentation Service Platform with Integrated Components)

The Alvis project conducted research into the design, use and interoperability of topic-specific search engines with the goal of developing an open source prototype of a distributed, semantic-based search engine. Aleksander Pivk's PhD was closely related to the Alvis project, dealing with HTML tables in relation to the semantic web.

The Department of Intelligent Systems also developed methods for automatic classification of web pages into genres for the project.

Figure 6: The "We-Go" project aims to transfer and to successfully adapt "e-Government Good Practice and Knowledge" and will enable follow-up implementation projects including accompanying measures targeted at reinforcing and producing innovation in e-Government research

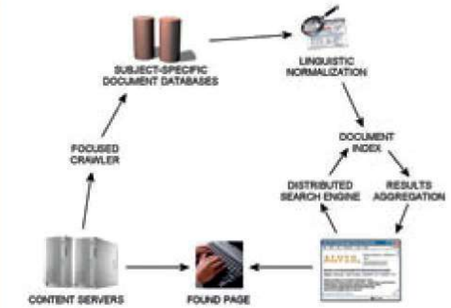


Figure 8: Distributed semantic search engine ALVIS

DOX - entry controller.

Intelligent interfaces

In co-operation with the Slovenian tax office, the Department of Intelligent Systems provided expert advisory support, analysis, consultations and proposed modifications to "Vida", the virtual assistant for Slovenian taxpayers. Placed on the website of the Slovenian tax office, "Vida" provides answers to common taxpayers' questions and provides an alternative high-quality tax-related information source as part of Slovenian e-government services.

In the area of language and speech technologies, the Department of Intelligent Systems developed new language resources for the Slovene language, new algorithms and procedures for Slovene speech synthesis, and was engaged in syntactic parsing of Slovene texts. In co-operation with other research groups, the department continued the development of the syntactically annotated corpus of Slovene text (the "Slovene Dependency Treebank"). Its current size is about 35,000 words. The corpus is intended to serve in research of automatic syntactic parsing of Slovene text.

Together with the Amebis company, the department's researchers developed a new version of the Slovene text-to-speech (TTS) system, Govorec (Speaker). It is the first and only widely available commercial TTS system for the Slovenian language. It is capable of automatic conversion of any Slovenian text into speech. For example, it is also integrated into the teletext service provided by national Radio-television Slovenia. It was designed for and donated to blind and partially-sighted people as a tool for keeping up-to-date with news. The system was awarded the first prize for innovation in the field of life improvements for people with disabilities by the Government Office for the Disabled and Chronically Sick of the Republic of Slovenia.

Figure 3: "Vida", the virtual assistant for Slovenian taxpayers

Figure 4: The Govorec interface (from the Amebis web site).

Defence Ministry experts evaluating the research prototype.

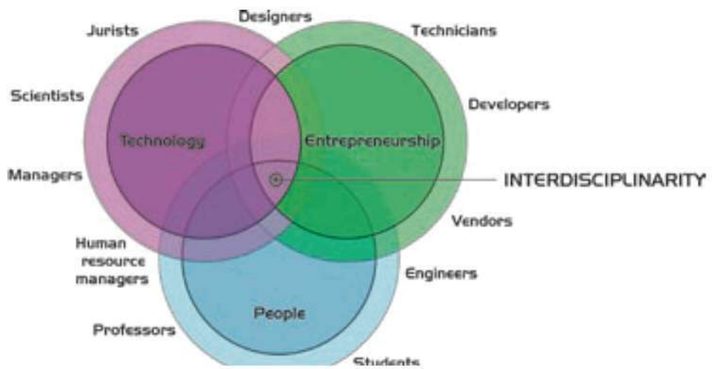
The pioneering concept of a creativity design centre based on ICT to provide living lab conditions for interdisciplinary postgraduate education, swift transfer of useable ideas into companies, knowledge and workforce exchange and formation of new, high-tech companies.

University Innovation Center – Technology Design Center

Andrej Gregorc

Lifelong education for competitive knowledge

Information and telecommunication technologies and services have become an essential part of social and economic infrastructure. Advanced information and telecommunication technologies and solutions are developing at an extremely high pace and are nowadays present in all areas of life, work and leisure. The information era, especially in its technologies for communication, has greatly changed the behaviour and the everyday lifestyle of society and has had a drastic influence on the process of education and knowledge-acquisition as well. In the past, obtaining a formal education at a university level more or less sufficed for a whole career, the knowledge only required to be occasionally updated and refreshed. Over the past few decades, the "life expectancy", or the usable duration of acquired knowledge, has been shortening steadily. A formal education to university level nowadays represents only the initial stage in the process of sustaining a level of knowledge, and especially the ability to use the acquired knowledge, in the following years. The latter requires constant contacts with an individual's professional environment, and expansion, upgrading and specialisation of knowledge and know-how. The former once-in-a-lifetime process of schooling has been replaced with a lifelong process of education and continuous learning. Simultaneously the enormous amount of information available and the large spectrum of skills required to successfully perform a highly demanding professional task have shifted the emphasis from narrow, specialised fields of knowledge to wider, interdisciplinary or multidisciplinary knowledge and abilities. The recent rapid and ongoing political changes in the larger European region, which enable unrestricted flow and exchange of people, goods, ideas and knowledge, have greatly stimulated the intermingling of different sciences as well as cultural diversity. All of the above-mentioned processes are a strong contributory factor driving universities, faculties and other scientific, research and educational institutions towards establishing types of educational and research environment which will better address and serve the needs and challenges of modern education and research.



Schema 1

Is technology alone still good enough?

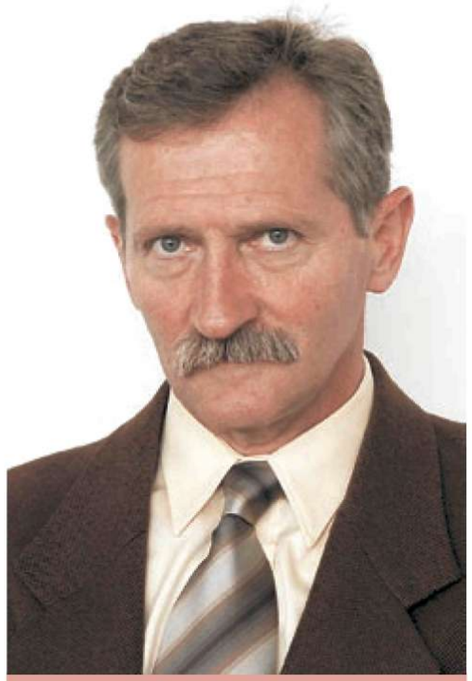
Slovenia and the University of Ljubljana are no exception in introducing new techniques, methods and forms of technological development combined

with research and education. Slovenia boasts well-developed companies in the fields of information and communication technology (ICT) and electrical engineering (EE), which have a long tradition and are widely, even globally recognised. Slovenian and European Union strategic documents define the field of ICT as one of the most significant to achieve the goals of the Development Strategy of Slovenia, the National Research and Development Programme and the renewed Lisbon Strategy. The latter focuses on endeavouring to find the way to long-term global competitiveness. The ICT branch is thus a recognised priority at European level and is one of the most innovative economic sectors of the EU. Research and development (R&D) investments within the ICT sector account for 18% of all EU R&D investments. However this share is still far lower than in the USA (34%) or in Japan (35%). Considering the existing Slovenian potential, the field of high-tech industries and the development of knowledge-based dynamic services are still underdeveloped, partially due to the lack of co-operation between scientific research institutions and companies. To improve the position of ICT and EE in Slovenia, industry and the University of Ljubljana initiated the establishment of an unparalleled centre for creativity in Slovenia. The centre will be based in Ljubljana within the future Ljubljana Polytechnic, the development of which is mandated by the Resolution on National Development Projects for the 2007-2023 Period, verified by the Government of Slovenia.

Combining knowledge, technology and real life experience

The creativity centre will be named the University Innovation Center (UIC) and Technology Design Center (TDC) for Information and Communication Technologies and Electrical Engineering (ICTEE®). The centre connects entrepreneurship and research work, engaging companies and universities, faculties and institutes. Experts, postgraduate students, researchers and entrepreneurs will, regardless of their expertise, join their abilities at the UIC TDC ICTEE® to develop new competitive products with high added value. In accordance with the implementation of the Lisbon Strategy goals, the financing of the UIC TDC ICTEE® will include funds from universities, companies, European and national programmes and, above all, structural funds, the 6th and 7th framework programme, technology networks and centres of excellence. The main goals and advantages of the UIC TDC ICTEE® can be summarised as follows:

- to exploit excellent development possibilities;
- to enhance connection between economy and science;
- to transfer and exchange knowledge and experience;
- to stimulate development;
- to develop new, highly demanding job posts;
- to form new, high-tech (also spin-off) companies;
- to achieve world-wide recognition and more foreign investment;
- to achieve higher economic competitiveness;
- to offer new, international inter-university post-graduate programs;
- to advance an interdisciplinary and multidisciplinary approach;
- to transfer knowledge transfer directly into market products;
- to develop more investment from companies;
- to provide an innovative environment;
- to engage highly motivated top young project researchers.



Prof. Dr Janez Nastran, Dean of the Faculty of Electrical Engineering:

"The importance of the ICTEE field as the backbone of numerous other services and fields makes it well-suited to function as a core for the establishment of a technology design centre. The Faculty of Electrical Engineering, its professors and students will take great pride in and will benefit significantly from such a distinguished facility."

The main aspect of the operation of the UIC TDC ICTEE® focuses on high-tech and innovative common projects, in which R&D and education institutions collaborate with companies. This mutual co-operation guarantees the quality and market value of the final product, service or solution, along with the establishment of a highly skilled workforce pool and the creation of market-oriented knowledge and skills, which are incorporated into the international postgraduate program. Joining the UIC TDC ICTEE® brings many advantages for companies, namely having highly skilled experts and adequate high-tech infrastructure at their disposal for fulfilment of their R&D plans, thus lowering the costs of development significantly. Participating in joint projects enables students and young researchers to accomplish their innovative ideas. The creativity centre provides not only the possibility of putting their innovative ideas into practice, but also the legal protection of intellectual property and opportunities for technology licensing, as well as formally recognised education obtained through project work.

Why the UIC TDC ICTEE® is different

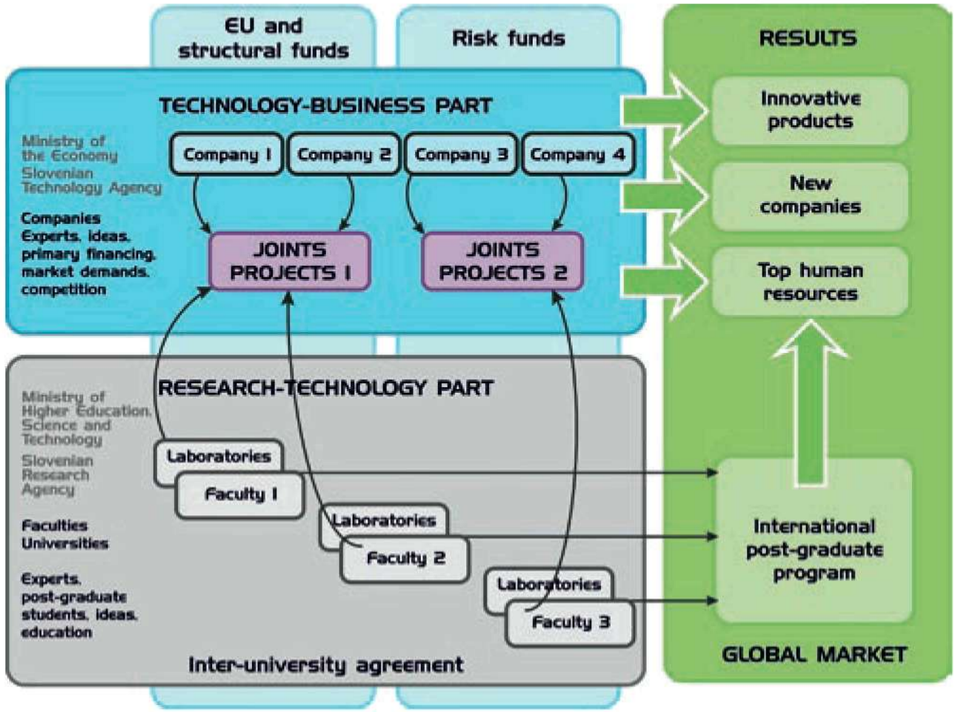
The proposed concept of the operation of the UIC TDC ICTEE® is based on the following key elements: a project focus; a business approach; a top-quality postgraduate programme and leading experts; interdisciplinary and multidisciplinary methods; networking (regional and international connection); a dispersed convergent infrastructure; open-minded design thinking and a living lab.

The project focus supports planning and presenting the original

ideas through a project. This process includes a detailed definition and realistic evaluation of the original idea in terms of realisation possibilities, which diminishes the risk of final execution. The business approach, included in the idea realisation from the very beginning, leads and directs the design, thus increasing the possibilities of a successful commercialisation of the final product, service or solution. The top quality postgraduate programme provides individual, interdisciplinary and international education, supported by project work. Syllabuses and educational programs are co-managed by companies, and this process develops even more highly skilled experts. Interdisciplinary and multidisciplinary methods are present both at educational and business levels. Although based on ICT and EE, the activities of the centre encompass numerous different fields including technology, natural sciences, social sciences, economics, law and design. Networking and connecting comprises co-operation with other similar and related institutions, associations and companies on a local, regional and global scale. A dispersed convergent infrastructure guarantees the basic conditions for successful and competitive functioning of the centre, providing a stimulating and motivating environment for creative, free, innovative thinking and idea conception. Open-minded design thinking in the context of the UIC TDC ICTEE® can be defined as a process of creative and critical thinking which enables the organisation of information and ideas, decision-making, improvements of conditions and acquisition of new knowledge. And finally, the living lab concept represents superb working facilities where participants enjoy being even after their research work. Informal socialising through spare-time, recreational or fun activities further stimulates creativity and the exchange of information, opinions and views.

The UIC TDC ICTEE® prioritises the following joint project segments, which are subject to further expansion or adjustment at any time, depending on new technological developments:

- dispersed broadband wireless and optical infrastructure;
- satellite toll-collection, and intelligent transport systems and logistics;
- energy measurement and control systems;
- e-medicine and e-health;
- digital television and digital multimedia content;
- intelligent energy networks;
- monitoring of the development of the information society and the status of information societies in EU Member States and candidates;
- intelligent and safe homes, and the intelligent connected office;
- new, environmentally friendly technologies;
- location-based and ambience-based services in the fields of navigation, tourism, traffic, national spatial databases, leisure activities;
- electronic government services;
- global network and service interoperability;
- future technological solutions, forms and activities for multimedia learning;
- knowledge exchange and storage, e-content, technologies supporting the processes of lifelong education.



Shema 2

The networking concept – connecting companies, institutions and end-users

In addition to companies, the centre plans to co-operate with other technology centres or complementary initiatives, such as technology networks and parks, science parks and business incubators (Kranj ICT Technology Park, University of Ljubljana Development Institute, Technology Park Ljubljana, the Science Park of the University of Maribor, University Incubator Ljubljana, etc.). The UIC TDC ICTEE® will also be connected with the international test laboratory SINTESIO, the first European laboratory for testing next-generation network and service interoperability, supported and recognised by the European Telecommunication Standards Institute (ETSI). The centre will also ensure, stimulate and nurse international connections, as this is the only way to achieve the critical mass and globally competitive results, projects and knowledge.

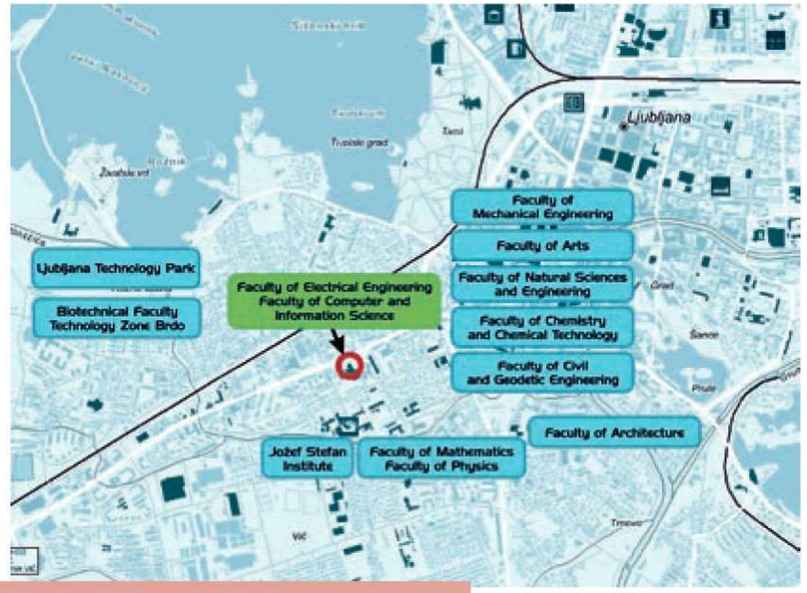
The premises will be located in Ljubljana, a mid-sized European capital city in the heart of the country, with good local and regional public transport networks, a low crime rate, half an hour's drive from a ski resort and only an hour from a seaside resort. Ljubljana, with its 300,000 inhabitants, perfectly matches the preferred location for science parks or technology design centres as, globally, over 40% are located in a city with a population of under 500,000. The UIC TDC ICTEE® will be in the direct vicinity of, and connected with, the Faculty of Electrical Engineering on Tržaška cesta. Almost 50% of similar centres worldwide are, likewise, directly co-located with the university. This particular location has many advantages over other location options and can be compared to the well-known concept of the polytechnic in some other countries. The main characteristics and advantages of the planned location at Vič are: proximity and a direct link to the Faculty of Electrical Engineering and the Faculty of Computer and Information Science, which together represent the main hub of the ICT field in Slovenia; the existing infrastructure of the Centre of Excellence for ICT and the ICT Technology Network of Slovenia; multimedia capacities; the several technical and natural science faculties nearby (the Faculty of Mathematics and Physics, the Faculty of Mechanical Engineering, the Faculty of Civil and Geodetic Engineering, the Faculty of Architecture, the Faculty of Natural Sciences and Engineering, etc.); closeness to the Jožef Stefan Institute (the central science-academic institution in Slovenia), closeness to the seat of the University of Ljubljana and also its constituent bodies (the Faculty of Arts, Faculty of Chemistry and Chemical Technology, Biotechnical Faculty, etc.), proximity of the student dormitories (Gerbičeva and Rožna dolina), proximity to the recreation area of Mostec-Tivoli and the brand-new Technology Park Ljubljana, easy access to Ljubljana beltway, and (with the completion of a connective tunnel in 2008) excellent and quick access to international flights at Ljubljana Jože Pučnik Airport (30 km).

Prof. Dr Andreja Kocijančič, Rector of the University of Ljubljana:

"In times when inter-faculty and even inter-university studies, student exchanges and visiting programmes are part of modern university education, the initiative for the establishment of a multi-disciplinary technology design centre is more than welcome. Besides further strengthening interdisciplinary studies and student mobility, it could help narrow the gap between social and natural or technical sciences and further diversify the range of studies and the research role of the University of Ljubljana."

A creative and stimulating working environment

The specially designed facilities are one of the advantages and a very distinctive feature of the UIC TDC ICTEE®. They create the most suitable, comfortable and pleasant conditions required for quality and successful work by research workers, postgraduate students, professors and other experts. The main advantages of the creativity centre are as premises for creative brainstorming and design thinking, stimulating creative freedom of mind, spontaneous new ideas and acquisition of new knowledge supported by modern communication infrastructure and equipment. Also different from common practice are the state-of-the-art laboratories that, at a single location, support quality project work, prototype development, integration, verification and immediate presentation of results. There are several research/study rooms and lecture halls for teaching and learning, while relaxation and spare-time facilities are also planned. The whole UIC TDC ICTEE® complex is designed to function as a living lab, enabling its regular users or daily visitors to spend most or all of their spare time within the centre, participating in recreational and social activities. The facilities are designed to be multi-functional, thus enabling individual rooms to be used for different purposes, quickly joined or divided or changed into a completely different layout. The planned complex of 7000 m2 includes 10–15 rooms for creative



Schema 3

Prof. Dr Jadran Lenarčič, Institute Jožef Stefan, Director:

"Research institutions must always work hand-in-hand with companies and educational institutions. Due to the different nature and organisation of work processes, this co-operation sometimes does not function as smoothly as it could. Therefore, the idea of bringing all three different spheres together at one location and providing them with excellent working conditions is superb. We should expect nothing less from its results."

Schema 4

brainstorming and design thinking, 15 laboratories, 2 spacious plenary lecture halls, 100 research/study workstations, relaxation and free-time facilities, rooms for gathering and socialising, a main hall with an info point and a demo centre, a cafeteriand, an underground garage, along with project, administrative and support offices and rooms.

What can the UIC TDC offer you?

The project of establishing the UIC TDC ICTEE® is a joint initiative of the companies of the ICT Technology Network of Slovenia, Technology Park Ljubljana, the Centre of Excellence for ICT, and in co-operation with the Ministry of Higher Education, Science and Technology, the Ministry of the Economy, the Government Office for Growth and the University of Ljubljana. Companies of the ICT Technology Network of Slovenia, in partnership with the Faculty of Electrical Engineering, have also jointly published a brochure laying out the strategies of the establishment of the UIC TDC ICTEE®. According to analysis, 40% of European economic growth is based on ICT, and this applies also to Slovenia. Slovenia is one of the few countries in the world that has the knowledge, capabilities and opportunities for development and

production of integrated information and telecommunication systems, services and solutions. However, in spite of the great potential, the high-tech industry is not yet developed enough. The UIC TDC ICTEE® therefore represents a breakthrough solution which could contribute to advanced development. The UIC TDC ICTEE® equally combines and connects science research and educational institutions and companies, which guarantee the quality and market value of the final products, services and solutions through co-operation in joint projects. This kind of co-operation also ensures excellent personnel, who gain individual, interdisciplinary and international education through their involvement in the UIC TDC ICTEE®. Their acquired knowledge will be formally recognised in the form of academic titles. Through its operation, the UIC TDC ICTEE® will guarantee the market value of the projects it develops, and leading experts, thus giving the Slovenian economy a unique opportunity to become more competitive. At the same time, education at university level will benefit from a leading technology development centre. A technology centre can also function as an important linking factor between the university, the local economy and the local environment, which it diversifies and enriches. It is an example of a new, fresh approach to integrating the educational, research and business spheres. Established as an independent institution, the centre is, in a way, conceived as a hybrid between a faculty, a research institute and a company. It functions as a provider of postgraduate education, R&D services and technological solutions for the problems of contemporary society, across a number of fields in ICT, EE and beyond. Essentially, the technology design centre focuses on uniting individuals with higher knowledge in different fields into research and think-tank groups with the aim of providing new, different or better solutions, opinions, ideas, services, products or entrepreneurial concepts meeting the brief. The centre will provide state-of-the-art research equipment, the required administrative and logistic support, and a relaxed, informal working atmosphere, which will enable the participants to intermingle their work and spare time within the living lab. When its doors open, it will seek highly motivated individuals who want to be at the centre of creativity, ideas, action and knowledge with no regard to their profession, age, background or motive. You're welcome to join.

Franc Dolenc, Iskratel, Director of Products & Solutions:

"Although our company, especially its R&D department, is in constant contact with faculties, laboratories and research institutions, we salute and support all new forms and possibilities of co-operation. Being directly involved in research projects gives us even faster results and information, and enables us to establish contacts with prosperous students and researchers at home and abroad."

Rudi Vončina

Slovenian Power Research Institute

Elektroinštitut Milan Vidmar is the leading Slovenian scientific, research and engineering organization covering the entire area of the electrical supply industry.
The Slovenian electric power system has been operated in compliance with the national and international standards. In the past, the focus has been in particular on its safe and reliable operation, while nowadays special care is also taken towards protecting the environment against its eventual harmful effects and risk management.
The institute's activities are several. They are performed in seven departments specialised in technical and cost-benefit studies, applicative research and special technical support to electricity generation, transmission and distribution. It has established a strong link with:

Director Prof. Dr Maks Babuder

a) Slovenian Government:

Electricity has become an indispensable component in our lives. Its importance can best be understood when there is a power blackout. The greatest impact of power supply interruptions is on the overall economy. When adopting medium or long-term gross domestic production plans, it is of utmost importance for the government institutions to know the power system potential. Long-term analyses of demand meeting and the related policies must be prepared for a period larger than the one covered by the GDP plans, which is hardly ever done.
An important role of the government is to meet safety, reliability and quality parameters of the electric power infrastructure, enforced by legislation and controlled by authorised inspection bodies.

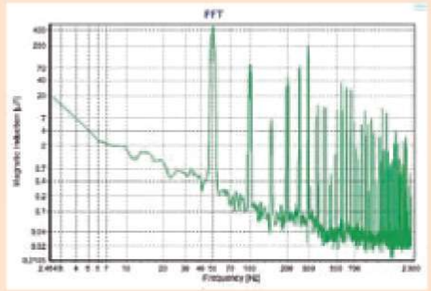
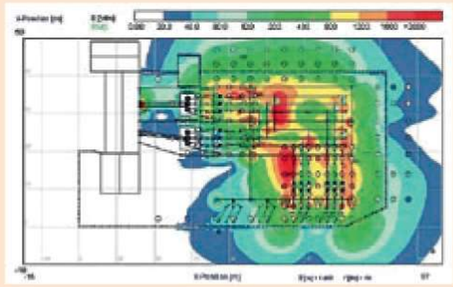


Figure 1: Polarization of the electromagnetic field assessment by an analytical method and measurements



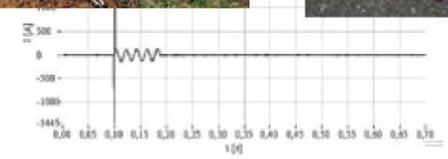


Figure 2: Occupational safety at short circuits in high-voltage network research

To allow for specialised inspection and management of the electric power infrastructure, the Institute offers professional assistance. It is authorized to issue expertises by the Ministry of Economy, Ministry of Labour, Family and Social Affairs, Ministry of Environment and Spatial Planning.
The Institute's expertise is based on findings of numerous measurements, analytical tests and researches. Some of them are shown bellow:

b) HV equipment manufacturers:

In electric power generation, transmission and distribution, one of the major problems is the insulation quality of the high-voltage equipment. If inappropriate, break-downs occur, the result of which are enormous national financial losses. They are often caused by inadequate electric field distribution. To avoid these problems, analytical and technical studies in high-voltage phenomena are made.

Figure 3: Synchronous generator supervision and insulation testing in the Institute's high-voltage laboratory

c) Investors:

Cooperation with potential investors takes place at the very beginning of the investment process. In the pre-investment phase, various possible technical solutions are technically, economically and environmentally assessed and adequately included in the design and later in the construction process. Results of past experiences of the kind have enabled reduced costs and minimized environmental impacts.

New tasks and changes, such as new institutional arrangements, opening of the electricity market, environmental constraints, and availability of new advanced technologies, are carefully taken into consideration when setting up strategic development planning principles in order to assure reliable and safe operation of the overall power system. The GREDOS software package is an important tool developed for

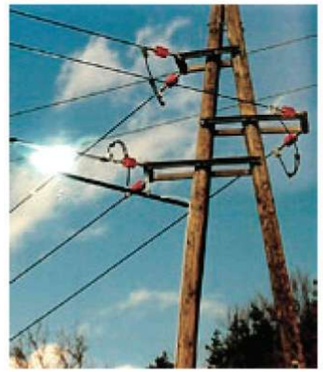


Figure 4: Electromagnetic compatibility testing inside a power substation

this purpose. Its use has already yielded very effective results.

d) Infrastructure operators:

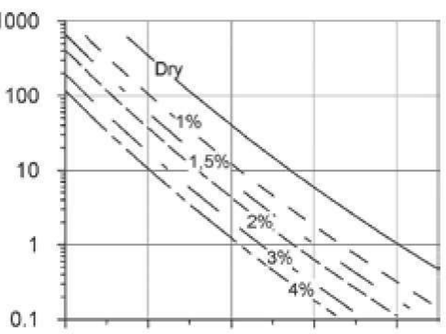
Enabling the operational life of the performed investments to be as long as possible has always been a task hard to achieve. Nowadays, when funds for equipment maintenance are cut down to their minimum, it is even more important to know the factors that may affect the equipment operational life duration. When a proper approach is taken, much money can be saved.
An efficient tool towards this target are risk management methods and refurbishment, retrofitting and upgrading of the used equipment without decreasing safety and reliability of the overall power system. To have all these activities well performed, a lot of specialised knowledge is necessary.

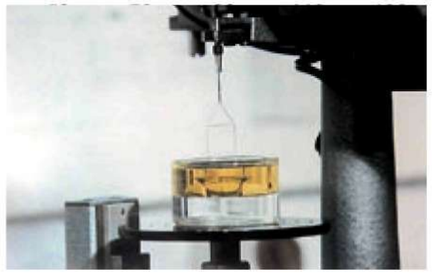
One of the fields of the Institute's research contributing to the power system integrity is lightning protection of large infrastructure systems. This is enabled with the SCALAR system designed for real-time detection of location and determination of electrical characteristics of lightning phenomena. It is useful in various applications protecting large infrastructure systems from atmospheric damages.

Since 1997 the Institute has been collecting data about lightning locations, their polarity, number of return lightning flashes and strength of atmospheric discharges. These data are used in insulation coordination, lightning protection design, understanding of unexpected infrastructure system disturbances, detection of damages in infrastructure systems, etc.

f) General population:

Acquainting the general population with the role of the





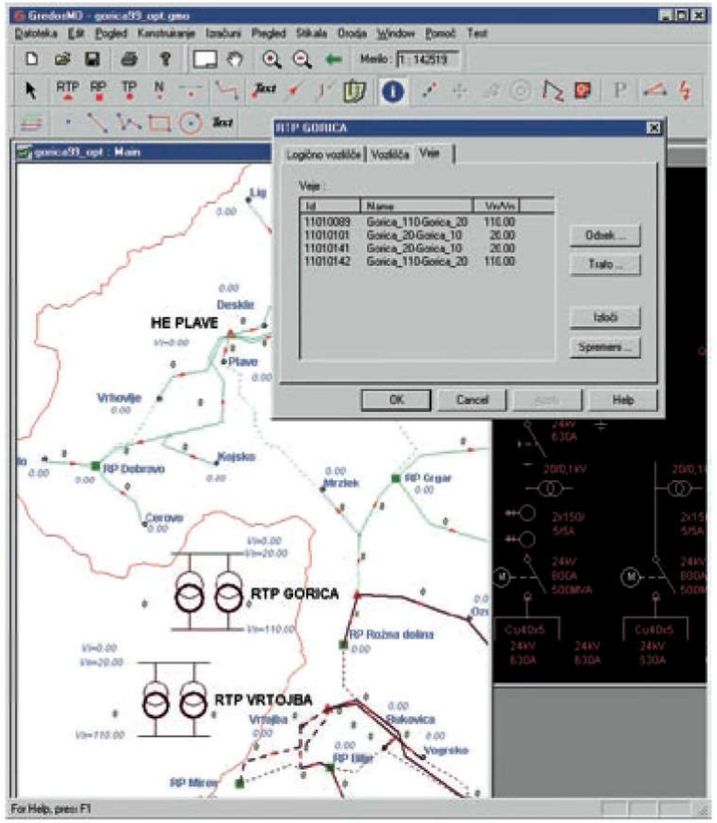


Figure 5: Snapshot of the GREDOS software package

electricity supply industry is another important task for the Institute.
The general population should know which are the possible dangers that may arise from misuse, inadequate knowledge or unpredicted circumstances involved with the power system operation. The related experiences are extremely valuable. They contribute to a safer and more reliable operation of the power system by decreasing the number of undesirable factors and events, particularly now that maintenance funds are minimised and the demand meeting is in a constant growth.
Keeping the environment as clean and healthy as possible has been a persistently pursued goal of the Institute's activity. Awareness of this importance has been "installed" in any reconstructed and newly sited power utility. Extensive environmental care is duly considered already in the design process of individual power system components and later in their operational life.
An example of the Institute's applicable research towards environmental protection assurance is air pollution monitoring, enabling measuring and evaluating of emissions of SO2, NO2, NOx, O3, floating particles and meteorological data.

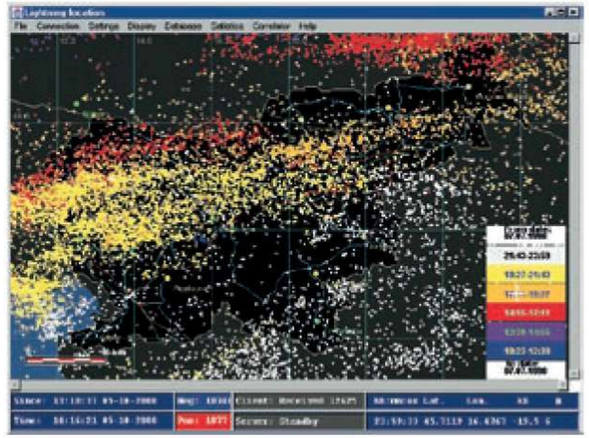


Figure 6: Recorded atmospheric discharges in Slovenia

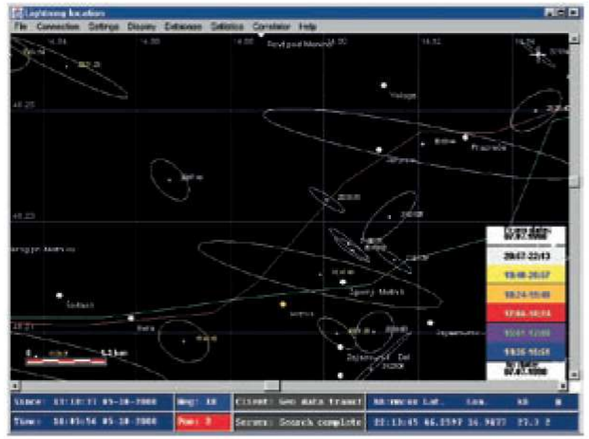


Figure 7: Correlation between interrupted operation of a 400 kV power line and locations of atmospheric discharges

Figure 8: Locations of the Institute's permanent air pollution monitoring and a monitoring station

Iskra Avtoelektrika

We Continually Increase Our Investments in R&D

Robert Žerjal

Robert Žerjal, Director of Insitute for Electric Rotary System

R&D enables Iskra Avtoelektrika to be an innovative, environmentally friendly group, which on a global basis co-operates in creating sustainable development and modern development orientations in programmes of automotive electrical products, mechatronics, and electric drive systems and generators for electric and hybrid vehicles and marine applications. Meeting the requirements and expectations of our customers is based on competent people, advanced R&D equipment, and flexible processes for innovation.

In the Iskra Avtoelektrika Group, we stress the importance of globalising R&D activities. The strategy for globalising these activities presents a network of region-oriented, specialised R&D centres, supported and co-ordinated from the parent Institute for electric rotary systems and/or parent R&D departments. Globalisation of R&D activities will enable efficient R&D support to our customers and intensify the co-operation of Iskra Avtoelektrika in the international R&D network, and in European R&D programmes and projects.

We continually increase our investments in R&D, which already exceed 4% of the value of sales. In the product field, we employ over 153 people, including 2 young researchers, 4 doctors of science, 18 masters of science, 85 higher specialists and 50 R&D specialists. We emphasise the importance of partnership development with customers, suppliers, and educational and scientific research organisations. Efficient use of assets invested in R&D is demonstrated by the high efficiency index of our innovation processes and/or developmental activities. The sales share of new products in all programmes exceeds the target set and for 2007 is over 37%, which places us as a "highly innovative" company using OECD criteria. The investments realised in R&D equipment intended for planning and/or concurrent development, rapid prototype manufacture and verification substantially contribute to competitive development, a shorter time to market for innovative products that add value both for Iskra and our customers. In addition to considerable investments in R&D resources, we increase the ability of Iskra Avtoelektrika to innovate by investing in our personnel and recruiting competent new people.

When planning R&D projects, we give priority to the requirements and expectations of the market, while considering new technological challenges and the business and development strategies of the company. As the share of electronics in the transport technology industry, (in which Iskra plays an important role) is increasing steeply, we especially wish to increase innovation in the field of electronics for automotive mechatronic systems, and generators and electric drive systems for electric and hybrid vehicles and marine appli-

Aleš Nemec, President

Iskra Avtoelektrika is a global supplier of starters and generators for internal combustion engines, electrical drive and mechatronic systems and parts. Completing these product lines, we also design and produce flexible manufacturing systems.
Iskra Avtoelektrika develops, manufactures and sells on a global basis through its own manufacturing and distribution network, which, besides providing support to its industrial customers, also offers a broad range of aftermarket products.
Iskra Avtoelektrika is known for innovations, sustainable development, high-quality products and processes, business excellence, and strong marketing and development support to its customers. Its recognition is based on the competence of its people and on the flexibility of its processes.

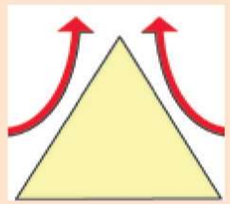
The strategic aim of the Iskra Avtoelektrika Group is to create long-term profitable growth, sustainable development and the satisfaction of all stakeholders based on innovation, globalisation, excellence, competent people, efficient processes and IT support.
In the Iskra Avtoelektrika Group, events and changes are controlled by competent people, creative co-operation, an entrepreneurial spirit and awareness of the importance of quality and excellence. We change the organisational culture by implementing our common values and emphasising development for the future.

In implementing our strategic aims, we operate and make decisions to ensure growth of market share, profit on sales, return on capital, enhancement of financial strength and security of employment.

The vision of the Iskra Avtoelektrika Group is to create sustainable development and be one of the leading suppliers in the world of battery-powered electric rotary machines and systems in selected market segments, based on innovations, globalisation and excellence.

Goals of growth:
Long-term profitable growth,
Sustainable development,
Satisfaction of all stakeholders

Ways of growth:
Innovativeness,
Globalization,
Excellence



Strategic abilities for growth:
Competent people,
Efficient processes,
IT support

Motto: INNOVATION IN ROTATION

Since Iskra Avtoelektrika's foundation in 1960, we have been aware of the fact that research and development (R&D) activities and innovations are of key importance for long-term successful growth and global competitiveness. Our orientation towards "knowledge for the future" was inscribed on the foundation stone of the then-new Institute in 1987. However, the Institute was registered as a research body the previous year, 1986.

A high growth rate in volume and the wider success of Iskra Avtoelektrika's business operations in the last years are mostly a consequence of globalisation and efforts to ensure meeting the competitive demands of our customers, of world economic growth and the formation of new and growing markets, strengthening of trust of business partners in the competitive and development abilities of Iskra Avtoelektrika, and in R&D of innovative lines of products, mostly in the fields of automotive mechatronics, starters, generators, and brushless electric drive systems for electric and hybrid vehicles and marine applications.

cations. Development suppliers in the transport technology industry can only be those that offer system solutions for individual functions. Added value can be increased mostly in those fields where we will ensure our position as a development supplier.

The requirement for additional electrical energy for electric and hybrid automotive four-wheel drives, and drives for electric and hybrid vehicles and marine applications, orient us to develop efficient generators, electric motors with high rotational speed, high specific torque and electronic controls for high system voltage over 300 V. Challenges in the field of environmental protection, and rational energy consumption and the use of alternative, renewable energy sources, stimulate our R&D endeavours towards using materials which are friendly to both human health and the environment, and towards planning a mobile electrical energy supply with integration of alternative energy sources.

Mobile electric generators and hybrid drives for marine and industrial applications

Jože Seljak, Manager R & D Automotive

IHMD controller

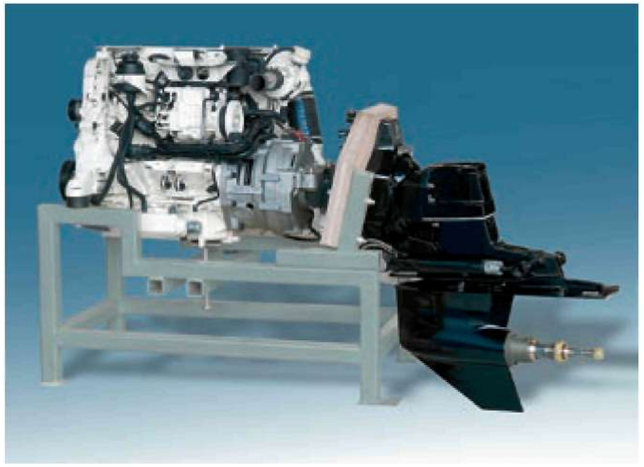
A hybrid drive means a drive train with at least two kinds of engines and with at least two kinds of energy (storage) devices for traction purposes.

Integrated Hybrid drives for marine applications – 28 V/48 V

An integrated hybrid drive for marine applications consists of an electronic controller, an electromechanical engine unit, battery and internal combustion engine. The electromechanical engine unit is installed between the internal combustion engine and the reduction gear of the marine drive. In operating the integrated hybrid drive for marine applications with a mechanical clutch, we are able to disconnect the internal combustion engine from the electromechanical motor unit.

The system allows four modes of operation. It starts the internal combustion engine and in this way replaces the existing starter. It works in parallel with the internal combustion engine and hence increases the output power of the entire drive by/to 10 kW for a short time. During the internal combustion engine's operation, it functions as a 5 kW generator for supplying power and charging batteries. The system can also function as an independent 5 kW electric drive for a vessel.

VW TDI 165 with IHMD



VW TDI 165 with IHMD

Elan Impression 384

The integrated hybrid drive is particularly appropriate for smaller vessels, hovercraft, motorboats and smaller yachts, houseboats, commercial, purpose-built and other vessels.

Special advantages of the integrated hybrid drive for the vessels are continuous control of the electric drive for fine manoeuvring of a vessel, quiet and ecological navigation with an electric drive for reduced noise and emissions of CO_2 in the ports, high generator efficiency for more electric energy, and additional power for the driving motor for acceleration.

Production

Iskra – mobile electrical energy supply with integration of alternative energy sources (MESIA)

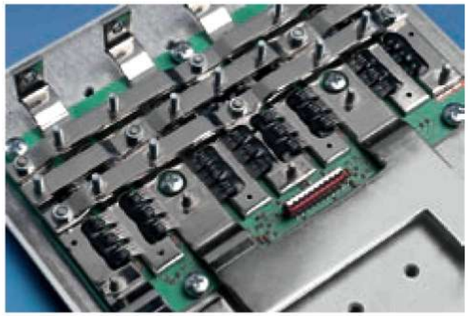
The mobile electric energy supply with integration of alternative energy sources(MESIA) project is being carried out based on the public tender for project funding within the "Technology for Safety and Peace 2006-2012" technology programme of the Republic of Slovenia in 2007.

Modern military and professional systems require both AC and DC voltages of different levels to operate. If electric energy is required at locations and in conditions with no public mains, an autonomous source, which provides enough electrical energy for reliable operation of the connected devices, is required. The devices operate at different levels of supply voltage and frequencies; therefore such a source requires appropriate power converters.

For autonomous operation of a source, it is possible to concurrently use a range of sources of electric energy, from electric generators to different alternative energy sources, such as fuel or solar cells and also accumulator batteries. Electric generators can be driven by fossil or biofuel internal combustion engines, along with water or wind turbines.

The flow of electrical energy through the converters can be either one- or bi-directional. When we connect the sources of supply, we have a flow from the source to the system, whereas on the load side, we have passive consumers. In the case of connecting active loads (motors and electric mains), it is possible to carry the energy from the load direction back to the source in the battery or mains, by using transducers that allow bi-directional energy transmission.

Electronics



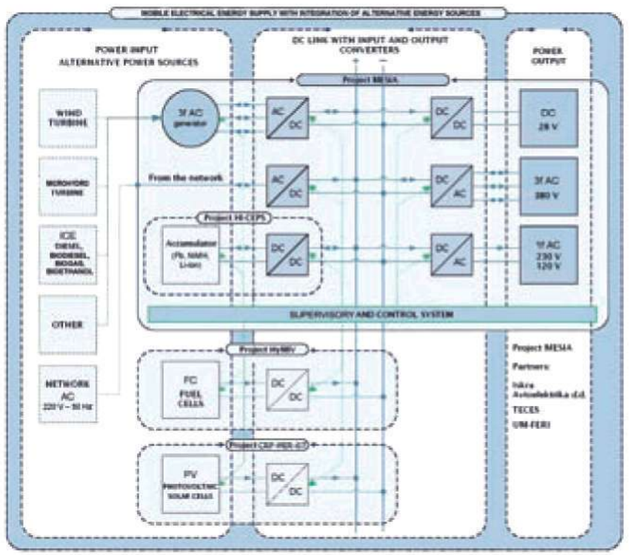
Electronics

Due to the simultaneous connection of a considerable number of energy sources and consumers, the system has a monitoring and control unit, which enables quality and reliable operation with optimal efficiency. Implementation of the source of supply voltages must be open for possible future connections of other sources. Power and information systems also have to comply with this requirement.

The project's goal is to develop a mobile system of 4 kW and implement its power and information connections. The final system will be used as an autonomous mobile unit that will be able to operate entirely independently; however, interconnection of more such units or connection to the public grid will also be possible.

The system and/or its components and the acquired knowledge and experience can, with appropriate adjustments, be used in military and civil applications, and this strengthens the position of Iskra Avtoelektrika and its partners on existing markets and facilitates their entry to new markets.

Our development focuses on electromechanical electric energy generators with the ability to connect to diesel engines, various water and wind turbines, and also on a mobile source for electrical energy supply with DC voltage and single-phase and three-phase AC voltage. The quality system development is based on the highest possible civil and military standards in force.



Mobile electrical energy supply with integration of alternative energy sources

Iskra hybrid drives for industrial applications

Hybrid technologies bring many advantages to drive systems, which can mostly be seen in reduced consumption of fuels, improved ecological characteristics of drive systems with less emissions and improved flexibility regarding energetics, design, and value for end-users. At the same time, hybrid drives also offer additional functions that enhance conventional drives and provide more benefits to the user.

Iskra high-efficiency, high specific torque and high-voltage (c. 300 V) hybrid drives for industrial applications bring important advantages in functionality, dynamic performance, ecology and economy, above all for wheel loaders, tracks and tractors in transport, and load and carry applications, fork-lifts, aircraft tractors, telehandlers, excavators, etc.

Sine vibrator

Anechoic chamber

Rapid prototyping

Production

Iskratel: The Secret Is in the Co-operation

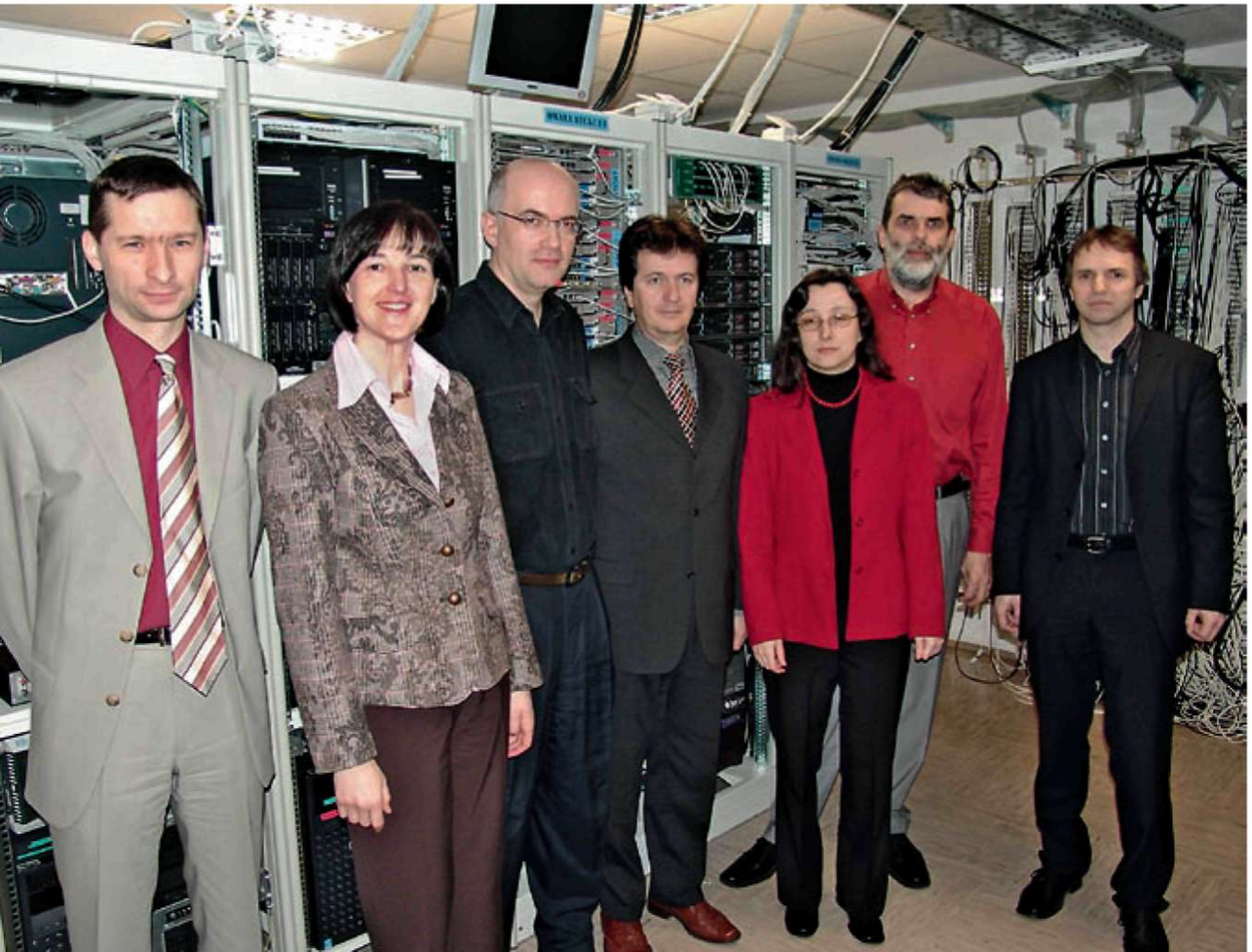
A communications company's strategy is determined by the market, technological development and science.

Uroš Jenko and Marjeta Pučko, Iskratel

Uroš Jenko and Marjeta Pučko, Iskratel

This article is based on a string of interviews with Iskratel R&D heads during December 2007 and January 2008.

Telecommunications have been undergoing a period of intensive transformation for more than five years. The attentive observer will have noticed a renaissance. The world of telephone exchanges, voice calls and dial rotation is changing into an all-embracing communications space that collects distant interaction among humans on a common technological and functional foundation.



This communication revolution is a child of the Web, its applications and newly formed roles and relations between individuals and organisations. Iskratel has been aware of and following trends in global telecommunications development since the beginning. The change of the basis of branches – the transition to communication systems based exclusively on Internet Protocol (IP) – had been expected. It demanded a complete renewal of the product range, a readiness for changed market conditions and a renewed mode of dealing with current and potential future customers.

The value offered to service providers and, in the end, to all of us as end users, has become the criterion of success for telecommunications companies. Telecommunications have lost their exclusivity. Larger and more-prominent communication equipment providers are facing the phenomenon of specialised, small application providers that stimulate continuous testing and never-ending development. The Web is the environment that can give a prototype the status of a finished product.

Why co-operation?

Business-operation modes are being reformed by network equipment providers as well as by network operators and providers of communication services. Iskratel, together with its competitors, is forced to balance the influence of three groups of factors: the market, technological development and the progress of science.

Because of the necessity of adjusting to changing conditions, the company must build an extremely flexible internal organisational structure. In establishing processes, the principles of dynamics must be followed. A modern communications company is a flexible system that is able to adjust its own creative capacities to the order of processes and conditions in the external technological and marketing environment.

A competitive environment requires the formation of a clear and exactly defined strategy built on a well-organised monitoring of similar companies and market requirements. Making sure the company's advantages are evident to customers is of key importance. The messages of the company must be clear and unified to prevent any overlapping with the offers of competitors. Iskratel believes in customised network solutions during the transition from legacy telephone systems to network architectures based on IP technology.

Franc Dolenc, Director of Iskratel Products and Solutions:

"Iskratel builds its strategy on exceptionally economical solutions for the transition from legacy telephone networks to IP-based broadband multimedia networks. A connection with the domestic and foreign development spheres, smaller creative companies and a network of technological partners represent for the company new sources of knowledge and a model for testing its technological and business decisions."

Franc Dolenc, Director of Iskratel Products and Solutions:

The Iskratel way

Manufacturers and network-equipment providers are innovative and progress-oriented companies. Despite being competitors, similar companies are interdependent, and technological co-operation between them is inevitable. It is increasingly common for customers to build their networks with heterogeneous building blocks, and therefore standardised products are required.

How then to ensure growth and survival in a tough market environment? Iskratel's heads of development sectors believe in choosing the right people and trusting the experiences gained from completed projects – either pilot or already-established network infrastructures. Even during the development phase the company must simulate the on-site state as frequently as possible, and systematically spread knowledge among its organisational units and individuals.

Iskratel is a continuously learning organisation. Its operation is governed by group dynamics and individual incentives. The company's ideas are its driving force. Because of the relatively small number of people engaged in the development process, the company cannot organise typical teams based on the specialised knowledge of individuals. Each employee simultaneously participates in several projects, i.e. they are a part of a balanced project-development matrix. Work in the company offers an excellent opportunity to all who are striving for professional, research and personal development. Researchers regularly publish their research and development (R&D) achievements in scientific and professional publications and regularly receive awards for their R&D work and innovations.

Sani Rus, Head of System SW Development:

"It is a must for a high-tech company to intensively specialise its development activities and ensure well-regulated relations between individual work processes. A systematic exchange of information and close contact with developments in science and across the whole spectrum are inevitable requirements for competitive market operations."

Head of Iskratel Products & Solutions business unit Franc Dolenc discussing with Janez Potočnik, European Commissioner for Science and Research.

Prof. Dr Zmago Brezočnik, FERI, University of Maribor:

"Joint projects between the faculty and various companies are useful for both sides. Science acquires feedback on the usability, advantages and deficiencies of its findings. Each company, together with the whole of Slovenian industry, strengthens its competitive edge. The development of their professional staff is an additional advantage."

Andrej Ciglic and Drago Škarabot at the hardware testing center.

Co-operation as a hidden advantage?

The result of Iskratel's teamwork with the Universities of Ljubljana and Maribor, as well as some other Slovenian and foreign universities, is a string of successful projects for combining network technologies and the new generation of communication services. These projects include the preparation of analyses of network elements required for the delivery of Television

Ana Robnik, Head of Network Management at Iskratel:

"A successful telecommunications company is well acquainted with market operating principles and the formation of technological and business partnerships. Its operation is supported by an information and communications infrastructure appropriately adjusted for co-operation in the ecosystem of marketing, development and research activities."

Prof. Dr Janez Bešter, LTFE, University of Ljubljana:

"A good professor or a successful researcher should remain in a company for the same length of time as a good entrepreneur stays at a faculty or at a scientific institution. Market conditions and factors demand the exchange of experiences and knowledge pooling."

Dr Andrej Duh, MG-SOFT

"Small companies, such as MG-SOFT, that have big partners are much faster at conquering new markets. In turn, big partners that are linked to small companies are quicker at achieving modern technological solutions. Co-operation brings about the exchange of knowledge, ideas and experience, which is the basis for excellence in new products."

Nikolaj Vidic, Head of Telecommunications Applications at Iskratel:

"Our operating mode is based on specialising our development activities, order of processes and the methodical development of our developers' skills. Open communications, permanent contact with top-level technologies and the systematic expansion of knowledge are the prerequisites for a development-oriented company."

IP, Voice over IP, convergent mobile services, the development of signalling, protocols and new services, as well as the organisation of training courses on emerging network architectures, services and solutions.

Outside partners introduce the possibility of a continuous examination of the company's strategic development decisions. Because faculties often do not have such expensive test equipment as companies, the latter are an excellent environment for testing innovations. Common laboratory use, pilot projects and ample checking of network-element functionality decrease the risks when introducing a new product to the market.

Because research institutes – the Universities of Ljubljana and Maribor included – have to perform their tasks using the logic of business, co-operation with companies has become an important success factor. The conditions in which the academic institutes operate are becoming increasingly similar to the marketing environment of companies. The activities of young researchers in companies contribute to their knowledge of economic, marketing and legal aspects of communication services.

Despite its evident advantages, any co-operation with outside partners is intensive and demanding for the participants. Some company representatives consider the introduction of partner companies' elements into their own product portfolio as the most demanding of development endeavours.

(Footnotes)

1 This article is based on a string of interviews with Iskratel R&D heads during December 2007 and January 2008.

E-Business in Merkur

Milan Jelovčan

The beginnings of e-business in Merkur reach back to 1994, when Merkur first used computers to co-operate with its partners. In 1999, development intensified and, since then, IT in Merkur has been developing rapidly. The company has prepared strategies and projects to create conditions for e-business between suppliers and Merkur as a buyer. In the period from 2001 to 2006 inclusive, the most important strategic programme in the company, "E-B2B in Merkur", was implemented, including two other projects, "E-Catalogue" and "MerkurPartner". Thanks to them, the website is now used by more than 400 wholesale business partners, who use it to place more than 15% of their total wholesale orders.

In 2007, Merkur designed a new comprehensive strategic programme, "B2X", which is due to be completed at the end of 2010. The name indicates that Merkur plans to extend existing solutions in the future, and establish e-business with all important business partners who have not yet been included in the e-business system. The company also plans to thoroughly remodel its online shopping site.

Mag. Milan Jelovčan, Member of the Management Board – Director of IT and Organisation

Merkur has also been active in the wider e-business arena. The company has participated in preparing schemes in XML technology on the invitation of Chamber of Commerce and Industry of Slovenia. The schemes were a part of the project on "E-Style". The company has also appeared at the Infos conference, the eCommerce Conference in Bled and at other such events. Merkur plans to act as host to the meeting of e-commerce graduates and postgraduates organised by the Faculty of Organisational Science, Kranj for the tenth consecutive time. The event is named Merkur Day, and has already grown beyond state borders and become oriented towards the Innovative Cross-border eRegion. Merkur has invited high-ranking state officials from Slovenia and neighbouring countries, and European Union officials to participate in the event.

The volume of buyers' and suppliers' invoices in Merkur is larger than in any other trading organisation in Slovenia (if bills paid at the cask desk are not included). The number of documents received is substantial and includes orders, order confirmations, and delivery notes, to mention just a few. E-support to operations is essential to increase the productivity and competitiveness of Merkur.

E-business is developing too slowly in Slovenia. Merkur has been very actively engaged in the implementation of e-invoicing, but the state should also actively participate, through institutions, legislation and regulation, in tax bodies and in other state organisations. The introduction of e-invoicing throughout the country would be beneficial for the state and would improve the competitiveness of all Slovene companies and the economy.

Merkur was established in 1896 as a small local hardware shop. The company gradually expanded in Slovenia, and entered the international markets twenty years ago. Merkur has recorded rapid growth ever since, so it is essential to constantly develop information technology to support further expansion.

In the past ten years, Merkur Group has recorded a 15% annual growth and its size has increased by four times. In 2007, the number of employees in eight countries – Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Macedonia, Italy, Germany, and the Czech Republic – reached 4,500.

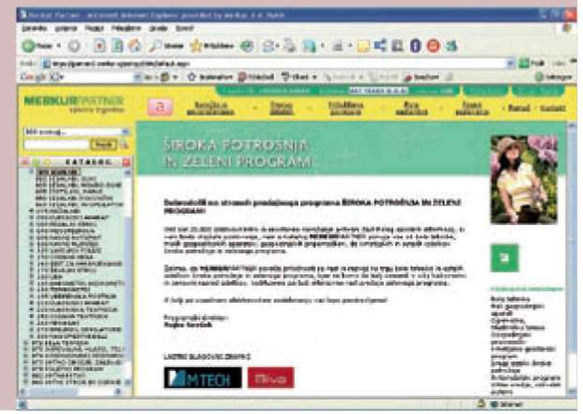
The core programme of Merkur Group includes 360,000 active articles sold wholesale and retail from 86 sales centres, shops and franchise outlets. Since 2000, products have also been available online.

Company Profile

Merkur Group employs 4,500 people, sells goods from 86 Merkur and Big Bang sales centres and shops in Slovenia, Croatia and Serbia, and has established an extensive wholesale network. Employees of the company are eager to meet customers' needs and demands. Merkur Group deals in construction materials, home improvement and maintenance materials, and items for comfortable home living. In addition to quality products, the Group offers excellent services, and an attractive customer-friendly shopping environment.

Staff in sales centres primarily attend to retail buyers, but they also pay full attention to wholesale buyers, especially when they need prompt service and a product "here and now". The largest buyers generally plan their needs in advance and are served promptly by an extensive wholesale and warehousing network. In addition to this, customers may opt for online shopping at http://nakup.merkur.si and http://www.bof.si. MerkurPartner is an information-rich online portal for companies and may be accessed at https://partner.merkur.si/.

Merkur Group has been building shopper-friendly sales centres, constantly developing its existing sales centres, and constructing new centres. In 2008, the Group plans to start preparatory works and construction of another 20 sales centres, and to extend the retail network to the market of Bosnia and Herzegovina. Merkur Group intends to become the market leader in non-food products in the markets of South Eastern Europe.



The proposed business to business (B2B) model

The MerkurPartner Business Portal

Tatjana Huber

MerkurPartner targets legal entities that buy goods from Merkur. A partner wishing to shop for goods enters the MerkurPartner portal through the Internet, and needs no additional technology to enter the site.

MerkurPartner allows buyers to opt for any of 130,000 articles from the six core programmes: metal products, construction materials and wood, tools and hardware, household items, installation and electro-materials, and chemical and paper products.

MerkurPartner is seamlessly combined with Merkur's other information systems. Users do not have to enter any additional data because the portal finds all data required in other systems. The integration of data entered by the user and the data in other systems is optimal and, thanks to this, the work of sales personnel in Merkur has become much easier.

Brief Presentation of MerkurPartner

MerkurPartner is an online portal that includes many components that have been organised in a user-friendly way, and are very practical and useful:

- Registration: The user registers to view goods, prices, and processing of individual orders. User names can only be obtained in agreement with the person responsible for an individual partner in Merkur.
- Catalogue: MerkurPartner shows individual items on the level of an article. The visitor may see the selling price, the quantity kept in stock, supply readiness, additional data on individual articles, pictures, substitute articles, country of origin, buyer's article number, EAN code, etc.
- Browser: The portal offers a wide variety of products, and the browser allows easy search by different criteria, including description of goods, trademark, article number, EAN code, manufacturer's catalogue number, etc. The browser can look for an article in the entire Merkur online shop, or in individual groups of items.
- Ordering and Enquiring: The user can place orders by entering the required quantities in provided tables of articles, online catalogues, or by direct entry of codes and quantities (i.e. quick orders). The information system and the portal are well integrated, so the user can view the status of an order or enquiry, and follow the goods in the process of distribution from time of purchase until receipt.
- Favourites: In observance of needs and requirements, the buyer can create individual catalogues or favourite groups of articles (e.g.

Tatjana Huber, Project Manager

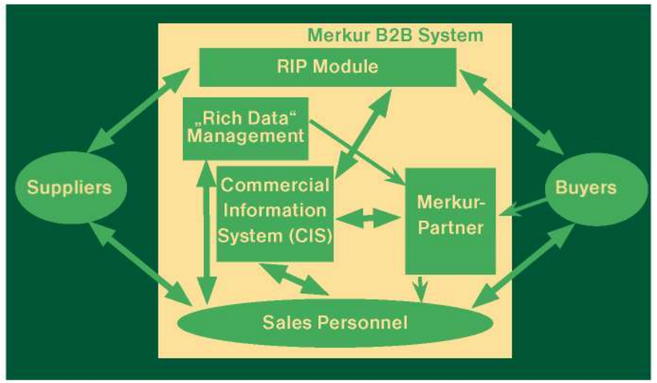


Figure 1: Planned structure of the B2B system in Merkur

all articles purchased so far, the required assortment of product lines, goods by manufacturers, etc.). Thanks to this option, looking for articles and ordering goods becomes easy.

- Sales Promotion: The user can view current wholesale sales promotion. This option can be used to get information on and order articles on special promotion.
- Downloading Data from Merkur Partner System: A user can download data to the order or enquiry from various external sources, e.g. from an individual information system or a handheld terminal etc. The data can be downloaded from the portal in different formats, and the user may select from among Excel, Access, text, xml, and pdf formats for further use.
- Business Terms: Business terms from the current sales contract concluded between the partner and Merkur apply for all orders submitted through MerkurPartner.
- Help: For better understanding of how the portal works, Merkur has designed the "Help" bar, where the individual parts of the online store are described clearly.
- Contacts: In case of questions or doubt, the user may refer to the relevant contact person. Assistance and replies will be provided by Merkur's staff in charge of individual partners. The list of contacts comes in two parts: "Commerce" and "Sales Programme".

Merkur organises its commercial and supporting functions – especially information technology and marketing – in a way that allows sufficient control over MerkurPartner. Selected staff have been properly trained to carry out procedures and control the portal. System documents defining control over the portal have been adopted. MerkurPartner is a stable and flexible system and allows expansion and control to cover a large number of customers.

Advantages of MerkurPartner

The most important advantages of the MerkurPartner portal for partners of Merkur are as follows:

- The portal is available online 24 hours a day, seven day a week.
- The use of MerkurPartner reduces transaction and administration costs.
- The required data on goods and business terms can be accessed promptly.
- The selling process is swift and results in increased customer satisfaction.
- Accurate data ensures a reduced number of claims.
- The portal allows users to place orders and enquiries, and follow their orders throughout the process.
- Combining e-business operations with a more traditional mode of business is simple.
- Partners may communicate with contacts in Merkur if necessary.

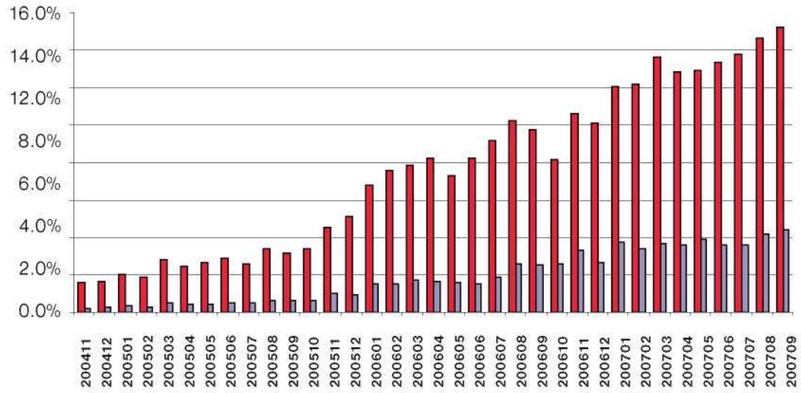
The most important advantages of MerkurPartner portal for Merkur are as follows:

- The standard mode of operations includes much administration, which the portal makes redundant, so transaction and administrative costs decrease.
- The automation of business processes is high.
- The ordering system is very efficient.
- The productivity of the employees in other areas has also increased.
- Working time has become optimally exploited.
- The number of mistakes and claims placed by partners has been reduced.
- New marketing opportunities have emerged.

MerkurPartner has become an efficient information solution. It has been completely linked to and integrated with the current IT systems of the company. The portal is cost-efficient, and savings made will bear interest in the long run. The transfer of data from log files in the portal and the database has served to upgrade the analytical system for portal applications. Importantly, the solution has been applied in practice, and the number of users has been increasing. It will also provide opportunities for further rationalisation of business procedures, and for application of new findings in practice.

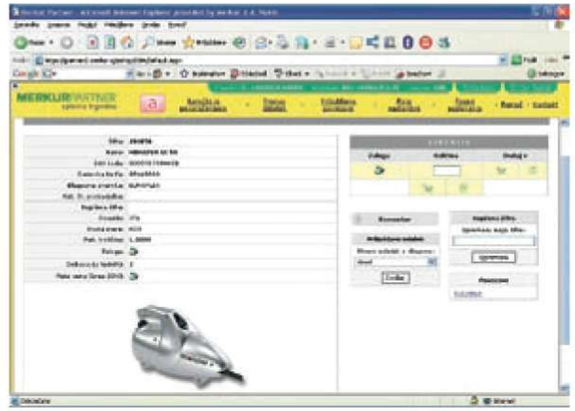
Further Development

Merkur has already started developing new components for the portal and



Graph 2: Increase of sales items and orders thanks to Merkur Partner portal
Share of Product Items – Externally
Share of Net Product Value - Externally in Net Product Value

the computer data exchange system for partners. This will allow the company to exert complete control over eB2B operations, make flow of goods in the chain of supply faster, reduce costs, establish tighter links with partners, and generate benefits for all parties involved.



SiShop, a Complete Approach to E-Business in Trade

Matej KOVAČIČ

The use of advanced communication media in modern economy has become vital for every business. They are especially beneficial for better relationships with the buyers, partners and suppliers. E-business allows global access, is available non-stop 24-hours a day, and reduces costs, to mention just a few advantages for the customers. It allows companies to satisfy very demanding requirements.
In its B2B, Merkur has opted for the SiShop software solution. It was developed and fully integrated in Merkur's system by the Slovenian company S&T Slovenija. SiShop is an open software platform for e-business in small, medium size, and large companies. It supports not only the B2B concept of operations, but the B2C concept as well. SiShop has resulted from S&T's experience and more than ten years of research on e-business in some of the largest Slovenian trading organisations and tourist agencies.

Matej KOVAČIČ, Director Customized Software Segment

Prompt Integration and Adaptation

Merkur is the largest dealer in non-food articles in Slovenia and offers a wide range of goods from various catalogues. To satisfy the demanding customers by supplying a wide variety of products, special forms of adaptation and optimization must be applied. The customers expect the online service to be cost-efficient and time-saving. SiShop by S&T has been developed as a very flexible and scalable solution, and implemented in observance of specific customer's requirements and business strategy. The solution's actual capacities are limited exclusively by the provided information infrastructure. The implementation of the S&T's system in Merkur has been very complex and included all project stages. These ranged from the initial consultancy, planning, integral solution, system integration, to services which provide smooth operations.
SiShop meets Merkur's requirements, and has been adjusted to promptly display and manage a large number of articles from comprehensive catalogues. Its database includes more than a two hundred entities. SiShop has been developed in the .NET technology, and supports all large databases, e.g. Microsoft SQL Server and Oracle, and can be fully integrated in any ERP system. It can function as an independent solution as well, but Merkur has opted for direct control from its information system, from which all necessary parameters are downloaded. Any actions, e.g. admission of new users, order transfers, setting control, definition of online shopping parameters, transfers of article data, catalogue additions, display of prices and inventories, are all implemented directly through the information system.
The solution is scalable, so its capacity doesn't relate to the number of users, intensity of applications, good network connections, and capacity of servers.

Effective Presentation of Articles and Optimization for Browsers

The buyers use online shopping sites more often, if these provide necessary information that replaces doing the shopping in classical stores. SiShop offers an important advantage: The choice of articles may be limited by different attributes. This allows filtering by different criteria, and the buyer can find the articles in demand easily and quickly. The attributes are used in parallel comparison of unlimited number of similar products.
When developing SiShop, S&T Slovenia paid special attention to the optimisation of the internet site for browsers. The software observes several criteria that are suitable for searching and allows placement in the Internet search engines. SiShop does not encumber the administrator, because all processes for the preparation of the website contents are automated.
For safe online operations, passwords and fire walls are required and the connection between the user and the server is coded. In addition to these safety measures, the SSL protocol guarantees the identity of the website. The online shopping site is not completely safeguarded to allow faster operations, but key elements are coded, especially registration, payment procedure or all personalised contents.

Luka Koper – an Ideal Entrepôt for Central and Eastern Europe

The Port of Koper, the only Slovenian commercial port, was established in 1957 and is one of the youngest in the European Union. It lies in the Northern Adriatic Sea, where the Mediterranean penetrates most deeply into the European continent. Consequently, it represents the shortest link from the Far East via Suez to Europe with a distance that is about 4,000 Nm shorter compared with other Northern EuroThe geographical position is not the only advantage of the port. It is a modern, well-organised and well-equipped multipurpose port. It operates day and night, all year long. The port is a Border Inspection Post for the European Union, and the entire area has Free Zone status. The port operators are also distinguished by a responsible attitude toward the environment.

Photo: Jaka Jeraša

The company that operates all the terminals and the entire infrastructure in the port is Luka Koper, whose shares are listed on the prime market of the Ljubljana Stock Exchange. Together with our daughter companies, we form the Luka Koper Group, employing about 1,000 people.

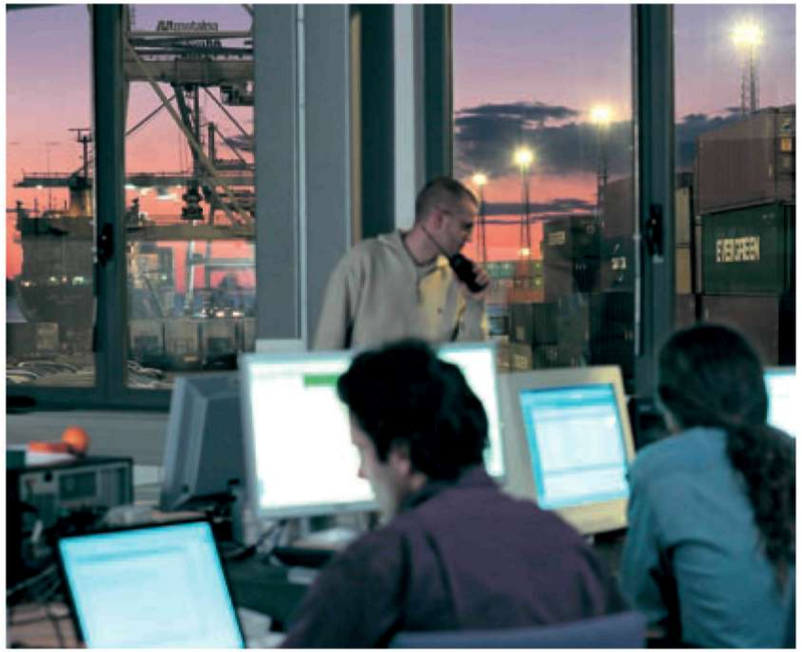
The basic port activities of handling and warehousing are conducted in 10 specialised terminals. We offer a wide spectrum of additional services, which are being upgraded to cope with the changes in the transport field. We are introducing new services that are typical for advanced distribution centres and at the same time support integrated logistics solutions. Adjustment to customers' necessities and requirements is our basic guidance. The quality of our services is ISO 9001:2000 certified. In 2006, we were selected as a finalist for the European Business Excellence Award.

All our terminals are connected to road and railway infrastructure, which enables direct manipulation from ship to truck or ship to wagon. Railway transportation accounts for 70% of cargo coming to or leaving the port by land.

Luka Koper is completely connected to international trade and global business. Only 30% of our traffic is for Slovenian customers, with the remainder involving transport to and from the hinterland – mostly Austria, Italy, Hungary, the Czech Republic, Slovakia, South Germany and the Balkan countries.

A strong network of representatives enables a constant presence on the foreign markets and direct contact with the customers to whom we ensure all necessary support. The latest representative office was opened in September 2007 in Kuala Lumpur to strengthen the position of the company in Far East markets.

Traffic in the port of Koper is constantly growing; in the last period by about 1 million tonnes per year and in 2007, the port is expected to handle 15 million tonnes of cargo.
Container freight has risen steeply over recent years, and the average annual growth rate was 19% between 2002 and 2005. This year has been particularly successful – three months prior to the year's end, the total had already surpassed the annual record (set in 2006). Based on the current trend, we anticipate a throughput close to 300,000 TEUs by the end of 2007. Furthermore, a total traffic of 500,000 vehicles is expected to be reached by the end of the year.



New capacities for containers and cars

In order to adjust to contemporary requirements based on developments in maritime trade, as well as the existing range of services at the port, a new container terminal needs to be constructed at the third pier. A final decision on the new terminal has yet to be made, but the fact remains that Luka Koper needs new facilities. A temporary, medium-term solution is the proposed project for the extension of Pier No. 1, which will provide the current container terminal with an additional berth, as well as new quayside areas for container handling. The initial step will be the creation of a dyke around the area, after which the water can be drained. Next is the construction of a 146 by 34 metres quayside, together with an apron 45 metres wide. The new quayside will be built on steel piles driven into the seabed. The third phase will encompass the completion of the remaining 60 by 51 metres inland area. It is anticipated that these works will be completed in 22 months. The total area of the new storage facility (not including the new quayside) will ultimately amount to 22,570 m2, thus extending the existing container terminal area by about a third.
Parallel to the construction of new container capacity, new multi-storey car parks are being built. Works are now in full swing and, by the end of 2008, a car park with an additional 2,751 parking spaces will have been completed near the present facility.

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At Hyb we understand quality as a combination of activities which, when united into one, produce a synergetic effect to ensure the highest possible level of quality of our products and business operations, the satisfaction of our employees and, above all, of our customers.

We offer Original Equipment Manufacturers and/or distributors a wide range of hybrid circuits, pressure sensors and pressure transducers developed and manufactured by Hyb.

Hyb develops, designs and produces wide variety of sensors, transducers and other electronic devices for industrial, automotive and other applications under the brand HybySens.

Representing the new, second generation of Hyb sensonic products is the upcoming series of sensors developed and based on the LTCC technology that will enable new and versatile applications of sensors in different and even more challenging solutions and environments.

EST 2233

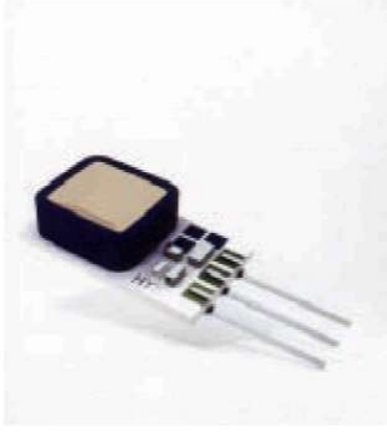
- Differential digital pressure sensor
- Through hole mount
- Temperature compensated (0 - 70°C)
- Ratiometric analog output in volts
- Digital I2C output (pressure + temperature)
- High long term stability
- High accuracy: 1% (all effects included) in compensated temperature range
- High performance OEM applications
- Differential, gage and absolute configurations
- Pressure ranges: 10 mbars to 7 bars
- Pressure media: all non-corrosive gases

ETZ 1112 & ETZ 1144

- Digital pressure switch sensor in fiB metal housing (harsh environment)
- Temperature compensated (0 to 70 °C)
- Analog output in volts
- Externally adjusted switching output (potentiometer) with LED indicator
- Digital I2C output possible
- EMC, overvoltage + short circuit protection
- High accuracy: 1% (all effects included) in compensated temperature range
- High performance OEM applications
- Pressure ranges: 10 mbars to 7 bars
- Pressure media: all non corrosive gases and liquids

EST 2213

- Digital pressure sensor
- Temperature compensated (-10 °C to 85 °C)
- Ratiometric analog output in volts
- Digital I2C output (pressure + temperature)
- High accuracy: 1% (all effects included) in compensated temperature range
- Through hole mount (THT)
- High performance OEM applications
- Gage and absolute configurations
- Pressure ranges: 350 mbars to 7 bars
- Pressure media: all non-corrosive gases



EST 2227

- Digital pressure switch sensor
- Temperature compensated (0 to 70 °C)
- Analog output in volts
- Externally adjusted switching output (potentiometer) with LED indicator
- Digital I2C output possible
- Overvoltage + short circuit protection
- High accuracy: 1% (all effects included) in compensated temperature range
- High performance OEM applications
- Standard M8 electrical connector
- Pressure ranges: 10 mbars to 7 bars
- Pressure media: all non corrosive gases and liquids

EST 2210 & EST 2235

- Differential digital pressure sensor
- Through hole or SMT mount
- Temperature compensated (0 to 70 °C)
- Ratiometric analog output in volts
- Digital I2C output (pressure + temperature)
- High long term stability
- High accuracy: 1% (all effects included) in compensated temperature range
- High performance OEM applications
- Differential, gage and absolute configurations
- Pressure ranges: 10 mbars to 7 bars
- Pressure media: all non-corrosive gases

EHT 1062 & EHT 1068

- Analog pressure sensor
- Constant current excitation
- Easy to use package
- Temperature compensated (0 to 50 °C)
- Analog output in mV
- Standard 19 mm stainless steel or aluminium housing with o-ring
- Low zero offset voltage
- High performance OEM applications
- Flex strips for interconnection
- Pressure ranges: 20 mbars to 7 bars
- Pressure media: all non-corrosive gases and liquids

EST 2211

- Digital pressure sensor
- Easy to use package
- Ratiometric analog output in volts
- Digital I2C output (pressure + temperature)
- Surface mount device (SMT)
- Compact and light weight
- High performance (stable silicon chip)
- Compensated from 0 to 60 °C
- High accuracy: 1% (all effects included) in compensated temperature range
- Gage and absolute configurations
- Pressure ranges: 50 mbar to 7 bars

EST 2222 & EST 2229

- Digital pressure sensor
- Temperature compensated (0 to 70 °C)
- Ratiometric analog output in volts
- Digital I2C output (pressure + temperature)
- High accuracy: 1% (all effects included) in compensated temperature range
- Standard 19mm stainless steel or aluminium housing with o-ring
- High performance OEM applications
- Pressure ranges: 10mbars to 7 bars
- Pressure media: all non-corrosive gases and liquids