



**The Role of Academies in Promoting  
Regional Cooperation in Science, Technology  
and Innovation in the Balkans**

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ABSTRACTS  
of presentations



# SYMPOSIUM I

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## Regional Cooperation and Networking in Information and Communication Technologies for Development

### ICT RESEARCH AND DEVELOPMENT IN KOSOVA: FACTS AND FUTURE TRENDS

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Information and Communication Technologies (ICTs) comprise the technological basis for information and knowledge based society. Following the European practice of fostering research and development (R&D) in ICT, the Government of Kosova has recognized ICT as a national priority, and the National Research Council has placed ICT among the *five plus one* national research priority fields for the next five years. Kosova thus has a chance to boost economic growth and improve the quality of life and work of its citizens through technology-enabled industries and services. Moreover, the results delivered by ICT R&D may well be of use for many other disciplines of science and technology. In addition, ICTs are the main driving force of innovation in a modern society, and as such require attention and support at a respectable level.

Kosova has improved its ICT performance (there has been considerable growth of GDP in the sector), and an increase in investments for providing the infrastructure and resources to support the R&D in ICT is planned.

Moreover, several activities are under way to contribute to the shaping of future research cooperation within the Western Balkan Countries (WBCs) region, and to further integrate the WBCs into the European Research Area in accordance with the actual needs of regional ICT domain.

The presentation will address the current ICT R&D environment in Kosova, including the local policy framework, fields of competencies in ICT research, the ICT sector trends, and the main socio-economic challenges that impact R&D in the ICT field. From the research perspective, (1) ICT in the context of the highest *five plus one* national research priorities for the next five years, as well as (2) the potential and the country's readiness for the future in terms of the R&D priority topics within ICT itself will be outlined.

Following are some of the main developments and decision-making facts in Kosova in relation to its capacities in ICT that will be addressed in the presentation: ICT is recognized among national priorities; the performance of the ICT sector in Kosova is steadily increasing; National Research Council proposed ICT among the *five plus one* national research priority fields for the next five years; increase in budget expenditure for ICT is planned; the strategy for development of e-Government has been adopted; digitalization of cultural heritage is under way; the health information system is being extended; advanced communication networks are in use; and a growing number of internet users has been reported.

## HEALTH NETWORKS AND TELEMEDICINE SYSTEMS FOR E-COOPERATION BETWEEN BALKAN COUNTRIES

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Health networks and telemedicine systems within and between European countries can promote new medical activities in the European regions through Information and Communication Technology (ICT) applications. ICTs permit the exchange of medical information and knowledge in order to support tele-diagnosis, tele-consulting and tele-monitoring processes and the linking of hospitals and health structures. The medical data exchanged can improve the care and treatment of patients. This electronic cooperation (e-cooperation) by means networks between institutions of EU and not EU countries (i.e. Balkan area) can improve e-health applications. Nowadays in Europe there are radical changes in healthcare: ICT can support better administrative processes and patient care activities in clinics and hospitals, in disease prevention and health promotion, in rehabilitation and even in tele-homecare (due to elderly population increasing with chronic diseases). Computer based patient records, health networks and telemedicine systems will be the most visible development in the years ahead. The creation of networks among the groups working in the area of telemedicine and medical informatics permits several advantages, including: (1) the possibility of exploiting the specific competencies of each one of the e-cooperation partners; (2) access to up-to-date information on state of the art of the research and its application; (3) cooperation between research and medical groups studying and developing this field of healthcare system.

The health/medical networks will undoubtedly add value to the European area and in particular benefit the academic, research and health institutions in countries in the pre-accession phase to the EU. Several cooperation projects in this field now exist between Italy and some European countries in the Balkan and Eastern European area, e.g., Albania, Bosnia-Herzegovina, Croatia, Greece, Hungary, Romania and Slovenia etc.

In these countries, the development of medical/health networks could establish interoperability between systems in the health market. The standardization of some care protocols could serve to provide relevant information for clinical and administrative decision making of regional and national health authorities, for example Adriatic and Balkan area countries.

## ESTABLISHING TELEMEDICINE PROGRAMME IN THE BALKANS INNOVATIVE STRATEGY: INITIATE–BUILD–OPERATE–TRANSFER

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*Introduction:* Establishing sustainable telemedicine has become a goal of many developing countries. The introduction of telemedicine and e-learning in the Republic of Kosova has been a pivotal step in advancing the quality and availability of medical services in that entire region, whose infrastructure and resources have been decimated by wars, neglect, lack of funding and poor management.

*Materials and Methods.* In this report, we highlight our retrospective analysis of the activities that led to initiating and establishing international telemedicine programmes in the Balkans.

*Results.* By implementing the four distinct phases (Initiate, Build, Operate and Transfer), we helped create a sustainable telemedicine programme in Kosova as well as Albania, while actively pursuing the establishment of telemedicine in Macedonia, Montenegro, Nigeria, Peru and other countries. The majority of the initial efforts of the telemedicine programme of Kosova (TPK) have oriented toward educational programmes for health-care workers. More than 100,000 students, doctors, nurses and information technology (IT) professionals have benefited from the programme. Currently, an integrated telemedicine programme is being implemented in Albania with 14 telemedicine centres.

*Programme Description:* As part of the Initiate phase, to date, we have successfully held three advanced, intensive telemedicine and e-health seminars: in Kosova (2002), Albania (2007) and Macedonia (2009). These seminars served as galvanizing events for the adoption of telemedicine in the Balkans, introducing the concepts and creating a large number of health professionals armed with new capabilities.

*Infrastructure:* The second phase (Build), based on the technical assessment and the goals of the country involved, has four main components: (1) building the network; (2) building the main telemedicine centre, including auditoriums and rooms for training, research, resources and/or education; (3) building an electronic medical library; and (4) building up the training, education and capacity of local leaders, so that they will be able to run the programme independently.

*Lessons Learned From Kosova:* Establishing telemedicine programmes in developing countries is complex, time-consuming and requires multiple partnerships. Clear vision for each step of the process is a must. Ensuring a complete transition from the initial project to a sustainable nationwide programme is essential, and should ideally be laid out in detail in advance.

*Conclusion:* In conclusion, we found that the ‘Initiate-Build-Operate-Transfer’ model has been effective in creating sustainable telemedicine and e-health integrated programmes in the Balkans and may be a good model for establishing such programmes in other developing countries.

### Reference

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## MONTENEGRO AND REGIONAL COOPERATION IN ICT

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Montenegro is a small country of about 650,000 inhabitants covering an area of about 13.8 thousand km<sup>2</sup>, situated on the Adriatic coast. Economic development in recent years has been mainly oriented toward the service sector in addition to several large metal industry plants that remain from the communist era. It appears that such development plans are failing and that an alternative, more robust strategy for sustainable development over the next 10-20 years is required. There is lot of discussion, mainly within government ministries and agencies, about the possibility of development in the ICT sector.

The state-of-the-art in the ICT sector in Montenegro is far from bright. Several large foreign companies dominate the communication market. Generally, 95% of development in these companies is performed outside Montenegro within mother companies. Smaller communication providers are even more dependent on the import of technology and they are not developing novel products and services. There is some development in small companies oriented to computer systems and computer software, but again leaders in the field are companies oriented to distribution and import of technology rather than companies developing products.

The Government of Montenegro has established the Ministry for Information Society. It is the main promoter of the ICT as potential “development chance for Montenegro”. There are some ideas financed by this Ministry but they are still at an early stage. The Ministry of Science and Education is also working in the same direction, supporting research projects and investigating the possibility of supporting directly some sort of business incubators, etc.

In contrast to the economic development, there is a relatively strong educational foundation for the ICT sector in Montenegro. The leading institution in the field is the Electrical Engineering Department, University of Montenegro, which has well-established groups for computer engineering, multimedia and signal processing, and communications systems. They have produced a large number of publications in major journals, with reviewers for major journals, editors in the IEEE journals etc. Also, they have well-established international collaboration projects. In addition, there is the Department for Mathematics and Computer Sciences and Information Processing Centre (quite active in international collaboration) within the state university and two recently established departments in related fields at private universities.

There is regional collaboration between West Balkan countries in the ICT field, mainly at the educational and research levels. Various EU programmes (mainly FP7, IPA etc) support such collaboration. Montenegro is engaged in several bilateral programmes, some active and another in the negotiation phase. These programmes have recently suffered from funding reduction on both sides.

We believe that there are important drawbacks in the current support to projects in the ICT area, and that better, more focused funding will produce significantly better outcomes. On the national (regional) level, support should be divided into three parts: 1. Supporting excellence in research; 2. Supporting some sort of business incubators; 3. Supporting projects with application of ICT in other fields. On the international level, FP7 and other calls related to the West Balkan Countries, there should be more emphasis on excellence in research and connections with SMEs and less to so-called capacity-building

only projects. On the regional and bilateral level, emphasis should be on a true form of collaboration, reducing meaningless meetings and visits and supporting only productive stays and visits.

## THE ATOMO PROJECT AND NETWORK

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Food safety and quality regulations in the EU are laying down the principles and requirements of traceability, which imposes the complete tracking and labelling of foods through the transmission and storage of information. Moreover, it establishes, in all phases of the production and distribution of food “from the farm to the fork”, the responsibilities for the transmission of information for all operators in the food chain. ICT-based traceability tools could help to organize and rationalize large amounts of data, making the information accessible and helping to use it for the transparency of all critical points and processes of the food supply chain.

[Ciani] Short introduction.

[Voros] *Local food systems, innovation and territorial marketing*. Concept and role (economic-social-environmental) of local food systems (LFS). The importance of the small and medium size enterprises (SMEs) in the short food supply chains (SFSC). The relevance to promote jointly production and territory.

*The need for innovation in agro-food SMEs*. Requirements of food quality and safety. The need for using information and communication technologies (ICT) for traceability, particularly of short food supply chains (SFSC).

[Ciani] *The state of art of traceability*. Traceability systems are mainly designed and used by the people directly involved in the food chain. The people at the end of the food chain – consumers – have little say in which attributes are traced and can rarely access the information stored in traceability systems because the law and traceability systems do not help consumers’ needs. Till now, the traceability process has mainly been linked through the structure of data management by bar code readers or radiofrequency tools. Such tools are able to trace and inform, during the different transfers from the field to the consumers’ table, about the origin, the transformers, the packagers, the transporters, the quality and the health characteristics of any agro-food. But with these systems, there is no opportunity to create a strong consumer loyalty based on product quality and certification, nor are there any links to targeting the product and territorial marketing.

*An innovative idea for a more useful traceability process*. To assure consumers concerning the quality, safety and particularly the origin of agro-foods, it is indispensable to create a true and attractive image of the producer. In this way we can create a synergy between a certification of quality, healthiness and traceability and agro-food and territorial marketing. For this, we need to reorganize the technologies that are produced and used in the traceability process. The idea is to introduce into traceability system management, as well

as the numerical data, also images (movies) for each different step of chain using smart cards or QR code.

*A joint Hungarian-Italian R&D project (ATOMO - Agrofood Traceability Organization Movie Oriented). Prospects of a proposed international S&T cooperation project. Technical contents of the proposal. Expected results and creation of ATOMO Balkan and CEE network. Potential beneficiaries of the joint scientific cooperation and dissemination of the R&D project results in Hungary, in Central and Eastern Europe (CEE) and in all the Balkan area. Conclusions.*

## **REGIONAL COOPERATION AND NETWORKING IN INFORMATION AND COMMUNICATION TECHNOLOGIES FOR DEVELOPMENT: A CASE STUDY IN LANGUAGE TECHNOLOGIES**

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The development of language technologies is an essential part of the integration of the national language into the trends of the modern information/communication society, as the resulting software tools support communication in a natural language which is, and presumably will remain, the most widely used communication means in a country.

The development of such technologies is a difficult and demanding task requiring in-depth expertise as well as vast resources, the amount of which remain essentially the same irrespectively of the size of the prospective market, which in some cases results in the under-development of such technologies for 'small' languages (i.e. languages spoken by small communities).

On the other hand, even though details of such technologies are generally language-particular, cooperation on the large scale is generally possible among scientists/engineers working on languages which are typologically similar, since a similar (or even common) language structure allows for the application of similar ideas and procedures. In the Balkans, this might in particular be the case for languages of the South Slavic group (Bulgarian, Croatian, Macedonian, Serbian, Slovene), as has been proved, as a matter of fact, on an even more general scale, by the cooperation on a project of a grammar-checker for Bulgarian language between the Bulgarian Academy of Sciences and the Academy of Sciences of the Czech Republic (ASCR).

The issue is that the ASCR developed a grammar-checker using an entirely new technology, diverging profoundly from the approaches developed before for (i.a.) English, German and French, and marketed it successfully to Microsoft, which resulted in the product being an integral part of the MSOffice software package. Bulgarian, being, like Czech, a Slavic language typologically much different from English, was then among the natural candidates for adjusting this technology to a new language. Hence the know-how, including the necessary software development support, was passed to Bulgarian partners in the framework of inter-academic cooperation. Even though the project has not yet reached maturity, mainly for financial problems on the Bulgarian side, its current stage has brought promising results, resulting in a tentative agreement of the Bulgarian branch of Microsoft to take over the resulting system once finished.

Obviously, both the original system and the expertise collected during the development of its Bulgarian clone is (or will be) available to other interested partners such as academies (or other R&D institutions) in the region.

## SYMPOSIUM 2

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### Regional Cooperation and Networking in Biotechnology for Development

#### **PROPOSAL FOR THE CREATION OF A NETWORK FOR INNOVATION IN ADVANCED AGRO-BIOTECHNOLOGIES IN THE ADRIATIC AND IONIAN REGION**

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Biotechnology is a set of enabling technologies that finds applications in all major industrial sectors (e.g., process industries, energy, environment, health and agro-food industries). Its importance in sustainable development has been widely recognised, and nations have identified biotechnology and biosafety as strategic objectives and have pledged to generate a critical mass of technological expertise in targeted areas that offer high growth potential. Given the fact that countries in the region have economies strongly based on agriculture, this proposal aims at creating a biotechnology development and transfer network that focuses on *Crop Production Systems* that will bring significant economic benefits specifically to farming communities and the overall economies of the countries as a whole.

*The problem.* One of the major impediments affecting productivity in the agro-industrial sector in the Adriatic and Ionian region is the lack of interaction between innovation systems developed by academia and the private sector. In fact, the latter has little awareness of the numerous opportunities offered by RTD in agro-biotechnology. Furthermore, there is little capacity in managing intellectual property assets and this manifest lack is considered to be a major impediment for investment and technology transfer. The establishment of a network of technology groups and private enterprises, in particular SMEs, can constitute an important mechanism that addresses the above deficits.

*The proposal.* A capacity building initiative involving the establishment of an Agro-Biotech Business Development Network with the mission of facilitating the commercialization of research results for the public good and to be a catalyst for economic growth. Innovations made by local research institutes can be the starting point for the development of novel crop varieties, food/feed products and quality control systems. The primary objective of the network will be to bring innovations developed by public research institutions to industry with the ultimate goal of delivering novel food production systems and products into the market place. The network will also engage in income-generating activities with a view to fostering research at the regional and national level as well as raising awareness and catalyzing collaboration between academic research and training programmes and industry.

This can be achieved by a process involving the following steps: (1) pro-active identification of innovations with high commercial potential; (2) ensuring the transfer and management of intellectual assets through equitable partnership arrangements; (3) fostering entrepreneurial initiatives by negotiating and executing agreements with companies and the establishment of start-up enterprises.

Indicative specific activities would involve: (a) training in intellectual property management; (b) training in trade and biosafety regulations as well as eco-accreditation; (c) establishment of an information resource to facilitate bio-business brokering; (d) development of model material transfer agreements, technology licensing etc.

The network could provide intensive training in intellectual property management and technology transfer best practices and act as an information resource to facilitate bio-business brokering, as well as playing a key role for investment and technology promotion in the broader Mediterranean basin.

## **THE ICGEB IN THE BALKAN AREA**

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The ICGEB is very active in the Balkan area, with Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia and Serbia, all being ICGEB Member States. The Centre contributes to strengthening the research capacity of these countries through training, funding programmes and advisory services.

In the past, extremely wide interactions have taken place with the aim of training young scientists and promoting biotechnology development. Since 1987, ICGEB has granted 177 fellowships, 58 research grants and sponsored 8 courses held in the various countries, and 462 participants attended our meetings. The global investment in these activities is around EUR7,700,000. Currently, 1 principal investigator from Macedonia runs the ICGEB Outstation in Monterotondo (near Rome), 2 scientists are members of the staff, 6 students are enrolled for a PhD degree, and 6 post-docs are working in ICGEB.

The excellent networks of scientists established in the Balkans are documented by the numerous joint publications of local and ICGEB researchers in subjects ranging from basic biology, biomedicine and plant biotechnology.

The Balkan area is contributing to ICGEB scientific policy-making through its Governors and members in the Council of Scientific Advisers: Prof. Radovan Komel (University of Ljubljana, Slovenia) and Prof. Vladimir Glisin (Institute of Molecular Genetics and Genetic Engineering in Belgrade, Serbia). Some of the Liaison Officers have presented biotech industries interested in acquiring available ICGEB technologies for transfer (Croatia, Macedonia, Slovenia) thus demonstrating an additional interest in the potentiality of our international collaborations.

The academic relations with the area have been enriched since 2006 by the joint ICGEB-University of Nova Gorica (Slovenia) PhD programme in Molecular Genetics

and Biotechnology that counts 13 registered students distributed over a three-year programme.

## **THE 'ADRIANO BUZZATI-TRAVERSO' SCIENTIFIC CAMPUS AT MONTEROTONDO, ROME**

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The 'A. Buzzati-Traverso' Campus at Monterotondo (near Rome, Italy) was established by the Consiglio Nazionale delle Ricerche (CNR) in 1996, aiming at the international development of Italian biomedical research and its integration in the European and world-wide scenario.

Several, top-level research institutions are located at the Monterotondo Campus. For example, there is the CNR Institute of Cell Biology (IBC), which operates in close collaboration with the local international institutions on several advanced areas of functional genomics, systems biology and molecular medicine.

CNR scientists at the campus participate as founding members in the Human Frontier Science Programme Organization (HFSP/O) and in the Human Genome Organization (HUGO). They are also delegates of the Italian Government to the European Molecular Biology Conference (EMBC), to the European Strategy Forum on Research Infrastructures (ESFRI) and to several research plan and themes of the European Framework Programmes.

The campus hosts the IBC unit for international research activities which coordinates the European Mouse Mutant Archive (EMMA) infrastructure and database ([www.emmanet.org](http://www.emmanet.org)), whose partnership comprises all the primary European biomedical research Institutions. The EMMA partners are founding members of the Federation of International Mouse Resources (FIMRe).

EMMA has already archived and organizes the world-wide distribution of more than 1,600 mutant strains, which represent ad hoc models of human multi-factorial and genetic diseases, and their collection is steadily increasing, with 400-500 novel strains each year.

The Mouse Biology Unit of the 'European Molecular Biology Laboratory' (EMBL) has also been established at the campus, with several new groups and dedicated service facilities, and further expansion is planned for the coming years.

Also the International Centre for Genetic Engineering and Biotechnology (ICGEB) is a campus partner, with a new research unit devoted to molecular biology and biotechnology, focusing on the scientific advancement and technology transfer to developing countries.

CNR has also established federated research and technology nodes of the Jackson Laboratory, of the University of California at Davis, the Harvard Medical School at Boston and the University of Manitoba at Winnipeg.

In collaboration with the above international partners, plans have been defined for the expansion of CNR's Monterotondo Mouse Clinic, with the development of new functional modules and related databases, as essential components of the INFRAFRON-

TIER project of the executive Roadmap of the European Strategy Forum on Research Infrastructures (ESFRI).

This planned extension will be crucial for the advancement of the current and future participation of CNR in international large-scale projects, research networks and consortia, with support through dedicated funding from European Framework Programmes and integrated national funds for large-scale research infrastructures.

The campus hosts more than 180 scientists, engineers and technicians and has been named in honour of Prof. Adriano Buzzati-Traverso, the eminent CNR scientist, who pioneered the development of modern molecular biology in Italy.

## **BIOTECHNOLOGY AND ITS ROLE FOR SUSTAINABLE AGRICULTURE**

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Developing an efficient sustainable agriculture in the current context of major global challenges (climate change, soil degradation and erosion, water scarcity, reduction of biodiversity), coupled with a continual population increase, represents an imperative for conceiving a strategy that should integrate conventional and biotechnological approaches, aiming to optimize productivity and contribute to food, feed, fibre and fuel security.

The successful development and implementation of this strategy depends largely on the establishment of regional cooperation and networks that address the similar agricultural needs, priorities and practices, based on science and regulations that should be able to protect public health and the environment and able to stimulate economic development, regional and global trade, modern agricultural practices, and an advanced food and feed production industry.

The germs of such a regional cooperation and networking are developed by the Black Sea Biotechnology Association (BSBA), established in June 2004, as a public non-profit organization that has proved to be a very promising example of cooperative achievements. This example deserves to be followed and extended on a large scale inside all Europe and even outside the continental limits. Valuable information has been accumulated during 14 years of the cultivation of genetic modified organisms (GMOs) (since 1996). GMOs are now grown in 25 countries on different continents, under the dedicated management of International Service for the Acquisition of Agri-Biotech Application (ISAAA), led by remarkable specialist Dr. Clive James. The global impact of GMO cultivation consists in higher level of productivity and economic benefits, as well as a considerable reduction of pesticide use, a decreasing of CO<sub>2</sub> emission and soil, water and biodiversity preservation.

The up-to-date evaluation of GMO cultivation and use has not registered any negative effect on human or animal health, biodiversity, or had consequences on the gene-flow to conventional crops or other environmental resources.

There are some strong reasons to join our efforts for promoting the adoption of GMOs in agricultural systems without any further delay and to improve public perception of biotechnology achievements.

## **INTEREST OF BIOTECHNOLOGIES IN THE BALKAN AREA**

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In the past few years, biotechnology, as well as being an important field of research, has established itself as a business opportunity with huge promise for the 21st century.

However, biotechnology differs from other modern high-technology businesses because biotechnology research requires large amounts of laboratory space, costly equipment, and huge efforts of teams of experienced scientists to develop their initial ideas. On the other hand, more than almost any other high-technology business, biotechnology depends on close ties with leading academic institutions. It is well known that academic clusters provide the staff and the main ideas for the development of most biotechnology companies.

Biotechnology is a multidisciplinary science and therefore, any biotechnologist, apart from having a good knowledge of basic molecular biology, requires knowledge of bioinformatics, information technology, engineering, statistics, genetic epidemiology, business management, product development and legal issues.

Especially in the last few years, many governments of Balkan countries have shown a keen interest and genuine desire to develop this technology for their economic development. Obviously, most of the above elements could form a good base of a well-organized framework to provide a more effective regional cooperation, not just in the building of capacity but also in the creation of effective cooperative schemes, information and staff exchange, and the establishment of good technical standards.

## SYMPOSIUM 3

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Mitigation and Adaptation to Climate Change, Geo-environmental Risks and Natural Hazards in the Balkan Region

### **GEOHAZARD EVALUATION IN URBAN AREAS FOR CIVIL PROTECTION PURPOSES: THE CASE OF THE URBSIT PROJECT**

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Public institutions are continuously involved in the managing of geohazards and in the planning of future development of urban areas, which both require in-depth knowledge of the geo-environmental settings. The management of these areas has been even more complicated in the last decades because of the increasing worldwide urbanization trend (UN-Habitat 2008). The quantitative assessment of geohazards is therefore one of the main challenges for suitable development and the risk management of large urban areas and megacities. This assessment activity is promoted worldwide by international agencies that support research activities designed to reduce the impact of natural disasters on populations.

For its part, during the past three years, the Institute of Environmental Geology and Geoengineering (IGAG) of Italy's National Research Council (CNR) has coordinated a multidisciplinary research group working on the UrbiSIT Project, financed by the Italian Civil Protection National Service (DPC) and carried out in cooperation with top level universities and research institutes, with the aim of using GIS technologies to define geohazards and preventing their adverse effects in urban areas.

For the purpose of the project, contributions and methodologies from earth science, engineering, physics, archaeology and informatics are included in a three-stage process that comprises: (i) a preliminary construction of the geographic database, followed by (ii) the production of intermediate key-products useful for (iii) the final geohazard assessment. Tautly, surface and subsurface information acquired both from public and private datasets is firstly archived in an open source database. Geomodelling is then performed with commercial software integrating all the information retrieved from the database, and geohazard evaluation is achieved by applying dedicated algorithms, following DPC guidelines when available. Finally, archived information and final products are made available to DPC through both desktop and WebGIS applications.

Geohazard evaluations proposed within the project necessarily provide for a multi-level scheme of application, i.e., from large to local-scale. Each level envisages the above mentioned three-stage elaboration process for geohazards potentially affecting urban ar-

eas, including differential settlement, landslides, river floods, earthquakes, cavity collapses, just to mention the main ones.

Rome was selected as one of the prototypical areas for the project because of the high level of risk affecting the city and, not least, because of the very large amount of available data. A part of the study was focused on the geological and geotechnical characterization of the recent River Tiber alluvial deposits, which are locally affected by subsidence and differential settlement. At present, an attempt to define a settlement susceptibility index,  $I\delta$ , is carried out based on a large geotechnical dataset and a three-dimensional geological model of the alluvial deposits. The comparison between  $I\delta$  distribution and deformation velocity maps from InSAR interferometry shows a good correlation, encouraging in pursuing research activity.

IGAG has also been involved in the emergency and post-emergency operations of DPC following the L'Aquila earthquake of 6 April 2009. In cities and villages affected by the earthquake, DPC guidelines (ICMS 2008, downloadable from [www.urbisit.it](http://www.urbisit.it)) and new tools for seismic microzonation were applied in the aftermath of the catastrophic event. Results of this application brought DPC to review and update the ICMS 2008 guidelines, and this activity will be part of the UrbiSIT Project in the months to come.

Activities headed by IGAG on behalf of DPC also involve the preservation of cultural heritage. IGAG, in cooperation with CNR research institutes and the Sapienza University of Rome, is currently involved in a detailed geohazard assessment and seismic microzonation of the main archaeological area of Rome, including the Palatine hill, Roman Forum, and Coliseum.

The desire to compare and share acquired knowledge and achieved results in defining geohazards makes cooperation with international institutions highly desirable for IGAG. Balkan and East-Central Mediterranean Countries would probably be the most suitable partner for such a scientific cooperation, bearing in mind that these areas suffer similar geohazards as Italy and have a comparable anthropic pressure. As a matter of fact, Italy shares a thousand-year history of cultural and social advance with these countries, which has induced an impressive concentration of people and World Heritage sites in a few crowded areas.

## **DETECTING, MONITORING AND FORECASTING OF GROUND DEFORMATIONS FOR LANDSLIDE HAZARD ASSESSMENT**

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Landslides represent a serious problem in many areas of the world, causing frequent loss of life and damage to infrastructure. They often represent a hindrance to the development of mountain communities, especially in less developed countries. Nevertheless, the hazard of landslides is generally neglected, more emphasis being given to other types of hazards such as seismic and volcanic hazards. This is even more unfortunate, since slope movements are usually more easily predictable and manageable than earthquakes, volcanic eruptions or hurricanes.

In order to assess landslide hazards correctly, it is necessary to carry out in-depth investigations on the spatial and temporal occurrence of ground deformations to determine the changes in superficial morphology. Several methods and tools are generally available to reach this goal, ranging from the economical to the very expensive. Monitoring systems help to forecast the evolution of an area, analyse the kinematics and geometry of failures and define the history of a failed slope. Conventional monitoring techniques, such as inclinometers, extensometers or GPS networks provide data on accessible points throughout landslide areas but they cannot give detailed, spatially extensive information and cannot be employed for those landslide sectors that are at high risk or not accessible. Therefore, even if single-point data are accurate and reliable, they cannot be considered inferable to the whole landslide area especially in case of huge landslides. To avoid such disadvantages, some remote sensing techniques have been developed and extensively used in monitoring and modelling in recent years.

Space-borne or ground-based synthetic aperture radar (SAR) interferometry as well as laser imaging detection and ranging (LiDar) have been shown to be effective complementary tools for landslide monitoring and hazard assessment at local and regional scale.

The data provided by such instrumentation are then used to model the investigated phenomena in order to forecast the field of deformations and possible evolutionary scenarios for landslide hazard assessment. In this case, different types of model can be applied in relation to different types of landslide: mathematical and physical-based models are extensively used. However, the effectiveness of the results provided by such models are strictly related to the quality of input data and therefore great attention must be paid to the significance of data captured and to the reliability of the adopted monitoring tools and methods.

For all these reasons, it is of paramount importance to plan a monitoring system correctly in order to get reliable data when the alarm to the population, the risk definition, slope modelling and stabilisation can be predicted.

## **INNOVATIVE SEISMIC HAZARD ASSESSMENT AT REGIONAL AND LOCAL SCALE: FROM ZONATION TO MICROZONATION**

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When estimates of seismic hazard obtained using the neodeterministic approach (NDSHA) and the probabilistic approach (PSHA) are compared, the NDSHA provides values larger than those given by the PSHA in areas where large earthquakes are observed and in areas identified as prone to large earthquakes, but lower values in low-seismicity areas. These differences suggest the adoption of the flexible, robust and physically sound NDSHA approach to overcome the proven shortcomings of PSHA, especially for those areas characterized by a prolonged quiescence, i.e. in tectonically active sites where events of only moderate size have occurred in historical times.

An integrated neodeterministic approach has been developed, in the framework of the ASI - Pilot Project, 'SISMA: SISMA- Information System for Monitoring and Alert',

that combines different pattern recognition techniques, designed for the space-time identification of impending strong earthquakes, with algorithms for the realistic modelling of seismic ground motion (modal summation and finite differences).

The approach allows for a time-dependent definition of the seismic input. The scenarios of expected ground motion are defined by means of full waveform modelling. A set of neodeterministic scenarios of ground motion is defined at regional and local scales, thus providing a prioritization tool for timely preparedness and mitigation actions. Constraints about the space and time of occurrence of the impending strong earthquakes are provided by three formally defined and globally tested algorithms developed according to a pattern recognition scheme. Examples of neo-deterministic scenarios are provided for several cities (e.g., Bucharest, Debrecen, Russe, Sofia, Thessaloniki) where the knowledge of the local geological conditions permits a detailed evaluation of the expected ground motion, including potential ground failures. Ground motion has been computed for the 6 April 2009 earthquake ( $M_w=6.3$ ) along a geological section crossing L'Aquila. Sources have been simulated both as point and extended. Spectral amplifications of about 10, found in correspondence of the Aterno river alluvial deposits, span a wide range of frequencies, that is various typologies of structures.

The modelling evidences that for the same set of synthetic seismograms the H/V spectral ratios are not able to evidence the spectral amplifications obtained with the response spectra ratios, and this poses a severe limitation on the validity of the procedure currently used for empirical seismic microzonation. Possible nonlinear soil effects have been evaluated for PGA values higher than 0.1- 0.2g. All these and more comprehensive preventive actions, consistent with the sustainable development of the area, can rely on the strengthening and broadening of the documented activity of existing networks.

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## PERSPECTIVE COLLABORATION IN THE BALKANS AND USE OF GEODETIC TOOLS IN SEISMIC HAZARD ASSESSMENT

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Statistics for natural disasters, including *devastating earthquakes*, demonstrate that since 1950, there has been a dramatic increase of the loss burden, even after correcting for inflation. Material damage caused by large natural disasters increased from US\$2 billion to US\$80 billion over the past fifty years. This increase is driven by a concentration of populations in urban areas, as well as the complexity of modern societies and technologies. This process will continue unless *preventive measures* are taken. Managing the risk from *earthquake disasters* starts with the identification of the hazardous seismic source areas. The next step is the evaluation of the prognostic methodologies that is necessary for seismic hazard assessment, where risk is a function of hazard, exposed values or human lives and the vulnerability of the exposed objects. Consequently the state of art of seismic *observation network in the Balkan area will be discussed in some detail, separately for the case of broad-band and short-period stations and accelerometers.*

The second and main goal of the presentation is to describe an independent (from recently used deterministic and probabilistic approaches) estimate of return periods for large- and medium-sized earthquakes. The main techniques of seismic hazard assessment – PSHA (probabilistic seismic hazard assessment) and DSHA (deterministic seismic hazard assessment) – are constrained by limited knowledge of seismological prehistory. Furthermore PSHA suffers due to the homogeneity requirement of seismic activity within seismic zones. An additional problem is that the traditional PSHA and DSHA procedures are developed for the currently active seismic zones and consequently they can be used in areas of medium or low activity with reduced efficiency. The concept is to use together geodetic strain rate values and the list of seismic moment data determined for past seismic events of a given seismic source. In this way, an independent new possibility of estimating future seismic activity can be accomplished to estimate the average time-interval between two successive characteristic earthquakes in an earthquake source region. For this purpose, with the use of a modified version of Kostrov's equation (1974) and of the catalogue of seismic moments, the minimum time interval of the return period of the maximal observed earthquake of a source area is estimated and can readily be introduced into the NDSHA (neodeterministic seismic hazard assessment) procedure.

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## **SLOPES STABILITY INVESTIGATION AND LANDSLIDE MONITORING IN THE FRAMEWORK OF THE EMERGENCY SITUATION IN ALBANIA**

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Albania is a mountainous country and its geological structures represent an environment with possibilities of unstable slopes and landslide developments. Based on the geological formations and landslide body mass, the following landslide classification in Albania can be presented: (a) unstable slopes and intensive landslides developed in weathered bedrocks and in overburdened beds at the lakeshores of hydropower plants; (b) unstable slopes and intensive landslides developed in Oligocene flysch formation; (c) unstable slopes and landslides developed in the Neogene's molasses formations; (d) landslides developed in loose Quaternary deposits; and (e) downfalls in the weathered rocks.

The development of new landslides or the re-activation of the old ones is mainly due to human activities. Events that have contributed to landslide development include special constructions, such as hydrotechnical works, civil, industrial, and urban and rural infrastructure constructions, particularly during last decade, as well as the destruction of the equilibrium of ecological systems through deforestation etc. Landslides are located in the deluvial deposits, and in the altered-bedrocks. The slipping bodies of some landslides have a very large volume, sometimes more than 40 million cubic metres. The largest ones are observed at lakeshores near hydropower plants, which present a great geological hazard. Actually, is very important to avoid natural risks related to the slope instability and landslide development. Periodical multidisciplinary integrated engineering geophysical-geological-geodesic methods of innovative technologies in the investigation of slope stability and landslide monitoring have been included in survey systems. In-situ multidisciplinary geophysical-geological-geodesic investigation and monitoring have been realized in three phases: (a) surface integrated geological-geophysical survey and installation of geodesic markers; (b) drilling of shallow boreholes; (c) study of the landslide body structure and soil of the landslide area; (d) evaluation of in-situ physical-mechanical properties of soils and rocks; (e) hydrogeological surveys; and (f) in-situ monitoring of landslide phenomena.

The basic method has been to use seismic tomography and high frequency refraction seismic profiling. The natural seismic-acoustic activity within and outside the slipping body have been observed. Through such surveys, the velocity of P-waves ( $V_p$ ) and S-waves ( $V_s$ ) have been studied in the slipping body structure to determine the physical-mechanical properties of the soil and rocks. Electrical soundings have been performed by

the Schlumberger array, with survey depth of 120-150 m. Together with the geophysical methods mentioned above, micro-magnetic and micro-gravity surveys have been part of the integrated investigation of landslide areas. Micro-magnetic mapping presented important information for landslide activity prognosis. A major future goal of the programme is to set up, for the first time, innovative observation systems of multidisciplinary integrated remote sensing-geophysical-geological-geodesic technologies for slope stability investigation and landslide monitoring near hydropower plants and cities. The transferring of the new technologies for the investigation and monitoring of the landslides will allow the necessary technical engineering measures to be undertaken for the elimination or reduction of the negative environmental effects of landslides. Already programmed is the development of technology and establishment of two innovative observation stations for multidisciplinary monitoring of two of the largest and most dangerous landslide areas in Albania.

## SYMPOSIUM 4

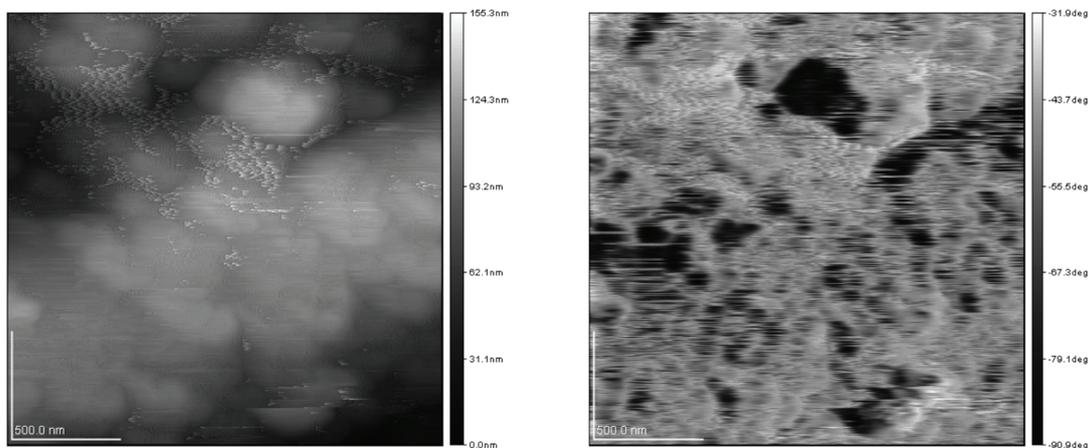
Regional Cooperation and Networking in Nanotechnology for Development

### EXPERIENCE OF USING ATOMIC FORCE MICROSCOPY AND MAGNETIC FORCE MICROSCOPY IN MATERIALS AND TISSUE CHARACTERIZATIONS

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In our 25 years experience in nanoscience and nanotechnology at the University of Belgrade, we have been doing research in many fields of materials and tissue characterization. One of them is application of scanning probe microscopy techniques in evaluating processes. We conducted a surface characterization and comparison of topographical and magnetic features of three steel plate samples that were processed with the same milling parameters (Fig. 1) The topographical features presented an interesting discourse with magnetic features, leading us to propose the magnetic fingerprint of matter on the nanometre level as a possible guideline in early crack detection and process parameter optimization.



*Fig.1: Comparative AFM (left) and MFM (right) image of same surface area ( $2 \times 2 \mu\text{m}$ ). Black area in right image indicates absence of magnetism (iron presence), indicating that non-magnetic material is concentrated in that place (hill on left image and hole on right image are on the same place).*

We characterized PbMnTe alloys with different percentages of components, both copper and alumina, and examined the paramagnetic and diamagnetic range. Concerning biological tissues, we have characterized human skin, bones, hair, contact lenses and others.

In general, atomic force microscopy (AFM) and magnetic force microscopy (MFM) offer new possibilities for qualitative and quantitative surface characterization in the range of several nanometres to a millimetre. The relationship between morphology and magnetism yields a new perspective for the investigation of material synthesis and analysis.

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### **THE ICS-UNIDO PROGRAMME ON NANOTECHNOLOGY: COOPERATION AND NETWORKING WITH DEVELOPING COUNTRIES AND COUNTRIES IN ECONOMIC TRANSITION WITH FOCUS ON THE BALKAN REGION**

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The mandate of the International Centre for Science and High Technology (ICS) of United Nations Industrial Development Organization (UNIDO) is to develop and strengthen the scientific and technological capability of developing countries and countries in economic transition in the creation and application of scientific knowledge to support their efforts toward social and economic development through the transfer of appropriate, sustainable and environmentally friendly technology.

ICS has three operational areas: Chemistry, Environment and High Technology and New Materials (HTNM). According to the guidance provided by the ICS International Scientific Committee during a meeting held in Trieste on November 2008, the HTNM Area has the mandate to promote the transfer of knowledge to developing countries and countries in economic transition in the field of nanotechnology. As matter of fact, the field of nanotechnology represents the core programme of this area.

In order to respond in time and in a holistic way to this objective and to the requests from developing countries, all activities are conceived and implemented taking into consideration the impact on the local economic and industrial sectors, as final users in the technology transfer process.

Since 2004, the ICS High Technology and New Materials Area recognized the enormous potential that nanotechnologies could have for industrial growth in developing countries and countries in economic transition. In fact, nanoscience and its derivative technologies have the potential to improve the economic conditions of developing world if the applications are designed and tailored to best fit the needs of their people. Nanotechnologies, unlike other technologies, will have a significant impact on almost all industries and all areas of society, offering better built, longer lasting, cleaner, safer and smarter products for home, communication, medicine, transportation, agriculture and industry in general. However, a favourable terrain for their growth needs to be prepared. As far as the

Balkan region is concerned, the most appropriate sectors of application may be in nano-materials and nano-intermediates for manufacturing, electronics and IT.

At the same time, it is worth underlining that there are also several risks in connection with this technology. For instance, the risks of today's nano-scale technologies (nanoparticle toxicity, etc.) must be taken into consideration, with a special focus on their use especially in developing countries and countries in economic transition.

Last but not least, it is necessary that local institutions promote the commitment of regional and international financial institutions in actively encouraging innovation by sharing the financial risk through favourable financial means such as grants or soft loans. Particularly, they should participate in the early-stage risk capital in developing countries and countries in economic transition for new technologies, when there is a potential for international markets or the use of new technologies is meant to address major social needs.

Furthermore, in the case of nanotechnology, more than other technical and scientific fields, the knowledge acquisition issue represents an important and sensitive challenge due to the fact that nanotechnology represents a convergence of several different sciences and topics (i.e. physics, engineering, mathematics, chemistry, biology, etc.). Therefore, in view of the above, the promotion of the use of nanotechnology in developing countries in general and in Balkan region in particular, to improve and implement social and economic development, implies that the following aspects become crucial: a) partnerships between academia and industry to advance and implement nanotechnology for economic development; b) support and promotion of the cooperation and networking between scientific and technological research centres and industry located both in industrialized and emerging countries; c) promotion and support of projects dealing with the creation of innovative products developing, using and adapting nanotechnology to address local needs and/or for international markets; and d) the extensive use of *ad hoc* financial instruments.

Within the above-mentioned strategy, and pending the final approval of new ICS Management, the following projects could be carried out in order to respond to the request of Balkan region at national, institutional and enterprise levels:

*Nanotechnology for Balkans.* Promotion, diffusion and application of nanotechnologies to improve and implement social and economic development. Main sectors of application: nano-materials and nano-intermediates for materials, manufacturing, electronics and IT applications.

*Nanotechnology regional networking - to provide better access to knowledge and technology.* Partnerships and networking among Balkan and European R&D institutions, industries, public research institutes, technology centres and universities, dealing with nanotechnologies.

*Establishment of an ICS research and training network.* Enhancing the presence of scientists, experts and researchers from Balkans in research programmes/projects within outstanding nanotechnology institutions. In particular, the 'training/research programme' may include the organization of specific 'fellowship activities' at ICS and/or at partner Universities/R&D institutions in Italy and/or in Europe.

*Nano-Project Award.* Capacity to create innovative products developing, using and adapting nanotechnologies to address local needs and/or for international markets.

## INTERNATIONAL ACCESS TO LARGE-SCALE FACILITIES: THE CASE OF THE ELETTRA LABORATORY

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Ultrabright, third-generation synchrotron radiation facilities cater to thousands of scientists and engineers worldwide for applications ranging from the spectromicroscopy of new materials to structural biology, nanolithography and medicine. Elettra, one of the first third-generation light sources to come into operation, was recently upgraded with a new full-energy injector that improved the stability and the reliability of the source and made the previous linac injector available to become the core of a new, fourth-generation light source, FERMI@Elettra. The future of the Elettra source following the recent switch to the top-up operation mode will now involve upgrading the existing 25 beamlines to take full advantage of the enhanced source performance. Every year, international peer-review committees evaluate some 800 research proposals from 39 countries. Specific access programmes enhance participation from the developing world, central European countries and India.

Based on the free electron laser (FEL) concept, the FERMI@Elettra project aimed to provide an ultrabright extended ultraviolet radiation source for spectroscopy and microscopy applications and complement the Elettra source. The uniqueness of the project in comparison to the projects under way in Germany (XFEL) and the USA (LCLS) resides in the use, right from the start, of *seeding*, i.e., of an optical laser signal to obtain the initial stimulated emission from the electron bunches, and thereby achieve better control of the shape and intensity of the output FEL pulses as compared to the *self-amplified spontaneous emission* utilized by both XFEL and LCLS.

The FERMI@Elettra original design goal of a maximum photon energy of about 120 eV has recently been revised upward as it became apparent that technical breakthroughs were possible. The revised targets are now to provide FEL-1 radiation in the 100 to 20 nm range by the end of 2010 and FEL-2 radiation in the 20 to 4 nm range with usable third harmonic intensity at 1.3 nm by the end of 2011. This will allow us to perform experiments on biomaterials at the water window as well as probe the core levels of transition metals such as Fe, Co and Ni. In turn, this will open the way to time-resolved FEL microscopy and spectroscopy studies of materials ranging from biological samples to magnetic clusters and nanostructures.

The expanded capabilities of FERMI@Elettra will be exploited by three initial scientific programmes/beamlines/experimental stations: Diffraction and Projection Imaging (DIPROI), Elastic and Inelastic Scattering (EIS), and Low Density Matter (LDM). To date, some 30 international institutions participate in the three programmes. Participation from the developing world, central European countries and the Balkans is actively pursued through the establishment of Regional Partner Facilities, where the research infrastructure required for exploratory experiments would be concentrated in experimental laboratories to be shared by researchers from the border region and beyond. Proposed Regional Partner Facilities focus on the field of nanostructured materials and technologies for medical and environmental applications.

## NETWORKING PERSPECTIVES IN NEW MICRO-NANOTECHNOLOGY APPROACHES AND RELATED MATERIALS AND DEVICES FOR EMERGING APPLICATIONS

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Solid state sensing devices and micro/nanosystems in general constitute a research and development area characterized by an extremely high scientific interest as well as by many potential emerging applications. Currently, interesting developments are under way in the field of materials and micro/nanosystems technologies where size reduction is often accompanied by the emergence of new functionalities. As such functionalities can only be realized on very small scales, the development of devices needs to take advantage of the new performances obtained by controlling the physical, chemical and biological properties of the materials. This can be achieved by exploiting the potential of the emerging nanotechnologies.

In this area a lot still needs to be done. Determined efforts need to be devoted towards increasing the performances of such micro/nano devices. Previous research results indicate that improved performance can be achieved by considering new concepts concerning: (a) *The sensing material*: by tailoring the structure of materials and by controlling the surface characteristics of the nanostructured materials it is possible to improve the sensing materials characteristics. This offers a lot of possibilities for surface engineering in all application areas of sensing devices. (b) *The implementation of new sensing principles*: in addition to micromechanical structures, sensing devices based on new detection mechanisms offer very promising alternatives to traditional ones. (c) *New materials preparation technologies*: new deposition techniques and optimised deposition processes to achieve better control of the material characteristics and consequently to improve the sensor performances need to be investigated. (d) *Compatibility with silicon micro/nanomachining technologies* to achieve really low levels of power consumption which are a stringent requirement for opening up the new field of applications for sensor technology. (e) *Integration into multifunctional microsystems* in order to be applied to many applications, mainly to emerging applications related to 'problem solving' and 'social needs' applications.

This work reports some results and strategies, coming also from networking activities performed in Europe, which show the contribution of micro/nanotechnologies in solving problems related to applications in areas like, food, environment, energy, 'ambient assisted living' and tele-care, with the perspective to be also integrated under an 'ambient intelligence' approach that will allow full interconnectivity and communication of multi-device systems.

## **THE PROJECT 'TRIL FOR BALKANS'**

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The project 'TRIL for Balkans' is addressed to the western Balkan Countries that are not members of the European Union (i.e., Albania, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro and Serbia). These countries represent a sub-region of particular interest to the Central European Initiative (CEI), which in its plenary meeting of 6 February 2009 gave its patronage to the project.

The project fits in the successful and long-experienced ICTP programme of Training and Research in Italian Laboratories (TRIL). Its aim is to facilitate the scientific and technological relations between experts of these Balkan countries with their Italian colleagues by offering opportunities of training and research periods in high level Italian laboratories with strictly related ongoing research activities.

Specifically the main issues addressed by the project concern: (1) The efficient use of energy and the development of renewable energy sources, while taking into account the territorial and the regional context. (2) Applied and basic research in physics, chemistry and medical physics.

## SYMPOSIUM 5

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Regional Cooperation and Networking in Fundamental Physics and Astrophysics

### **PROMOTING COLLABORATION IN PHYSICS AND MATHEMATICS IN THE BALKANS: THE ROLE OF ICTP**

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Since 1970, ICTP has hosted more than 6,000 visitors from the Balkans, and has organized nearly 100 scientific meetings in the region. This presentation will give an overview of the various activities that ICTP has developed over the years in the Balkans, including some prospects for the future.

### **NEW TRENDS IN NUCLEAR ASTROPHYSICS**

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New developments in computational physics, including those in quantum Monte Carlo methods now used in several branches of the physical sciences, have been made to address fundamental problems in nuclear physics and nuclear astrophysics. The quantum Monte Carlo techniques developed in the past few years have allowed the prediction of the structure and the reaction rates of light nuclei up to 12 nucleons. New quantum Monte Carlo methods have been devised to simulate nucleonic systems of more than a hundred nucleons either in a periodical box or in confined geometry. From these calculations we learn about structural and dynamical properties of heavy nuclei and of the matter composing compact stars. We also learn about nuclear forces, or at least on some important aspects of them. We will present some of these recent developments, together with the results obtained on the equation of the state of nucleonic matter and on the structure of neutron stars.

## **TWAS, ICRANET AND THE BALKAN COUNTRIES**

### **Remo Ruffini**

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Recent years have seen tremendous progress in the field of relativistic astrophysics. This field is, by its own nature, strongly international and has seen significant progress originating in Italy and in all the Balkan region extending all the way to Armenia. The opening of an ICRANet Centre in Armenia as well as the existing centres in Nice and Pescara promises to be of great importance in promoting further growth in the area of relativistic astrophysics in the entire Balkan region as well as in Near East countries. The recent progress has been rooted in the recent developments of many international research facilities in space, on the ground and in underground laboratories that have led to important discoveries both in the microphysical and macroscopic world. In parallel, a powerful theoretical framework has been developed based on Einstein relativistic field theories and general relativity. The future is open to reach a deeper understanding of these two conceptually different sectors of research and promises to lead to fruitful discoveries through the application of subnuclear physics concepts to astrophysical systems. The best example we are considering these days is the interpretation of dark matter composed of semi-degenerate fermions to the understanding of galactic structures.

## **NETWORKING IN MATHEMATICAL AND THEORETICAL PHYSICS**

### **Boyka Aneva**

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I will present the main points in the activity of the Southeastern European Network in Mathematical and Theoretical Physics (SEENET MTP Network). It was established in 2003 with the aim of strengthening the close relations and cooperation among faculties of science, research institutions and individual scientists across the region of southeastern Europe. This is achieved through joint scientific and research activities in the region and the improvement of the inter-regional collaboration through networking, the organization of scientific events and mobility programmes. We work together with the University of Sofia and the academies and the universities in the Balkan region. It is a challenge to work for the motivation of talented young people to choose mathematical and physical sciences as their professional field. An important step in this direction is the renewing of the traditional type of school with a focus on the education of young people through lecture courses and discussion seminars on specialized topics covering the latest developments and states of research in modern mathematical and theoretical physics.

Our Network is supported and sponsored by UNESCO-BRESCE and ICTP. In our activities, we are strongly supported by local organizations and authorities.

Scientific integration and collaboration on both the regional and inter-regional level has very a positive effect on the development of society as a whole in the Balkan region.

## FROM NEUTRON PHYSICS VIA CROATEA AND MAGIC TO ASPERA

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The R. Bosković Institute was one of the prominent centres of neutron physics where the first measurement of neutron-neutron interaction was done, and it was the cradle of some particle research wherefrom sprang a series of conferences, from Brela 1967 to Santos 2006 and Bonn 2009. Today, we are involved in ASPERA, the astrophysics and particle physics ERAnet that started in 2006 and includes most EU member states and Croatia. Through CROATEA and MAGIC, aimed at gamma astronomy, several southeast European countries are planned to be included.

## SYMPOSIUM 6

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### Role of Academies in the Balkans in Providing Evidence-based Advice to Governments

#### **IMPORTANCE OF SCIENCE ACADEMIES IN IMPROVING QUALITY OF LIFE**

##### **Slobodan Loga**

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Quality of life (QOL) indicators will enable the Academy of Sciences and Arts of Bosnia and Herzegovina to enhance the processes of gaining insight into trends in our economy, society and environment.

QOL helps identify why any country has succeeded or fallen short in achieving its stated policy goals in each area, especially in the domain of health.

The existing evidence also highlights some of the areas where policymakers need to focus their efforts to increase citizens' life satisfaction: income growth, health, quality of work etc.

Over the past few years, one might recognize a gradual but ever increasingly interest of experts to identify and take into account the opinion of service users about all aspects of the healthcare provision process. One of the ways this is done is through assessing quality of life.

In the domain of mental health, increasing the quality of treatment can be demonstrated through improvements of quality of life of those using the services.

On the other hand, assessing the quality of life of patients can also be used as a source of feedback that will guide specific attempts to improve healthcare provision and its planning.

In the domain of health, quality of life is often approached as a measure of negative effects of the burden of disease, i.e. in what ways and how much a disease damages or diminishes the quality of life.

#### **ENERGY: EVIDENCE-BASED ADVICE TO THE GOVERNMENT**

##### **Loucas G. Christophorou**

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In 2005 the Academy of Athens established the Academy's Energy Committee, comprised of academicians and Greek experts on energy. The principal purpose of the Energy Committee is to provide sound knowledge and information on energy issues and to disseminate it broadly, to serve as a catalyst for enhancing and coordinating existing efforts

in the area of energy, and to offer independent advice to the Government and the political leadership of the country on energy matters.

One of the mechanisms via which the committee is pursuing its goal, is the organization of symposia and working groups on key energy issues. So far, the academy's Energy Committee has organized three symposia (on 'Energy Conservation', 'Energy and the Environment', and 'Materials for Energy Applications') and two working groups on ('Nuclear Power and Energy Needs of Greece', and 'Electricity Generation in Greece: Fossil Fuels, Renewable Energy Sources and Perspective of Energy Supply').

The product of each of these efforts has been: (i) a comprehensive report; (ii) a press release by the academy (on the 'Findings, Suggestions and Recommendations'); (iii) broad dissemination of the report (recipients included Government officials, political leaders, members of the press, university professors, industrial leaders and students); and (iv) follow-up lectures and comments.

Recommendations of symposia and working groups:

1. *Energy conservation*: (a) Make energy conservation an important component of the national policy on energy. (b) Focus on areas of potentially large and immediate energy-savings such as buildings, lighting, appliances and transportation. (c) Effectively use existing scientific/technical resources.

2. *Energy and the environment*: (a) Optimize the energy mix and promote energy conservation and renewable energy sources. (b) Invest broadly in energy infrastructure. (c) Implement promptly European initiatives on energy and the environment. (d) Couple government policy on energy with that on the environment.

3. *Materials for energy applications*: (a) Strengthen materials science and technology. (b) Effectively use new materials and material technologies to optimize energy efficiency.

4. *Nuclear power and energy needs of Greece*: (a) Start a national dialogue about the introduction or not of the nuclear option in Greece. (b) Assess the possible role of nuclear power in the energy mix of Greece. (c) Prepare relevant infrastructure. (d) Consider inclusion of the nuclear power option in the long range energy plan of Greece.

5. *Electricity generation in Greece: Fossil fuels, renewable energy sources, and perspective of energy supply*: Recommendations pending.

## **THE ROLE OF ACADEMIES IN PROMOTING REGIONAL COOPERATION IN STI IN THE BALKANS**

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In 2001, under the patronage of the European Commission, the national academies of southeast Europe signed a Declaration which calls for more cooperation between national academies of countries in southeast Europe. This Declaration included the national academies of the former Yugoslavia, too. Since then different activities have taken place. The presidency of this organization, the 'Inter academy Council for South East Europe' has been allocated to the Montenegrin Academy of Sciences and Arts first and later, in alphabetic order, to other academies in the region.

Appropriate activities have been performed by this institution. Different committees were established, the web site was placed on the internet and many more other activities have been performed.

The major objective has been to encourage scientific cooperation among member countries. The list of favourable projects which are of interest at least for three countries was established. Beyond this, intensive bilateral cooperation has been established. The organization of joint conferences and wide participation of scientists from the region in the different events organized by the national academies have been widely practiced.

The cooperation have been influenced by lack of finances and scientific infrastructure which is present in particular in the academies of the former Yugoslavia and Albania, as well as by shortage of common centres of excellence.

The cooperation among national academies of southeast Europe has also been encouraged by the Central and Eastern European Networking Association.

## **ACADEMY AS ADVISOR TO THE GOVERNMENT**

### **Ljubisav Rakić**

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The topic of the academy as the advisor to the Government comprehends a complex, universal and significant notion which involves the analysis of the academy's structure and functioning, as well as its role in the integrity of society. Stability and independence of the academy's advisory role have been important prerequisites of a stability of social strength in general. This has insured its superior position in social communities in all social systems up to date. It should not be changed in the future.

Among other expert institutions, academies play an important pivotal role in public advisory systems due to concentration of top scientific and professional experts who can provide the most qualified and independent opinions.

Academies advise governments in science and technology, science education at all levels (primary and secondary school, university), strengthen national programmes to promote economy and social development, including long term strategy.

Following the Kyoto Statement (STS Forum 2008), it was stressed that there should be more direct dialogue between political leaders and scientists, and that scientists should be involved in policy formulation. Policymakers should bring the needs of society to the attention of scientists and properly reflect accumulated scientific knowledge in their policies. Scientists should actively propose policy recommendations based on their scientific knowledge.

Some recent experiences of the Serbian Academy of Sciences and Arts will be presented.

## ROLE OF ACADEMIES IN THE BALKANS IN PROVIDING EVIDENCE-BASED ADVICE TO GOVERNMENTS: THE TURKISH ACADEMY OF SCIENCES

**Dinçer Ülkü**

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The Turkish Academy of Sciences provides scientific advice to governmental authorities as well as to the public in different ways. One option is that the academy is asked for advice. Then the procedure is straight forward. The second option is that the academy is not approached for any advice, but the issue is important enough to be understood correctly by the public as well as policy-making bodies. In this case, the academy makes a public statement prepared by experts to enlighten the public. Otherwise, silence allows disinformation to seep into the public. Some issues that the Turkish Academy of Sciences dealt with in recent years are:

*Science, evolution, and creationism.* The most famous early controversy between science and religion was the trial of Galileo in 1633. Years later, when Charles Darwin published the 'Origin of the Species', the controversy sharpened and still continues. Conflicts between science and religion will not end any time soon. In the future, conflicts between science and religion can be expected over theories such as 'The Big Bang', which also undermines fundamentalist beliefs about creation. TUBA's approach is that 'intelligent design' is not science; therefore, it has no place in the science classroom. The scientific approach favours testability.

*Stem cell research.* With the present state of technology, the status of the human embryo and human embryonic stem cell research is controversial because the creation of a human embryonic stem cell line requires the destruction of a human embryo. Research involving human pluripotent stem cells promises new treatments and possible cures for many diseases and injuries, including Parkinson's disease, diabetes, heart disease, multiple sclerosis, burns and spinal cord injuries. In 2005, the Turkish Academy of Sciences established a Stem Cell Research Working Group. The working group recognizes the potential medical benefits of human pluripotent stem cell technology. Research in this field should be in accordance with appropriate ethical standards.

*Genetically modified food.* The production of genetically-modified foods is another controversial issue. In recent years more than 250 million acres of transgenic crops were planted in 22 countries by 10 million farmers. Genetically-modified foods have the potential to solve many of the world's hunger and malnutrition problems and to help protect and preserve the environment by increasing yield and reducing reliance upon chemical pesticides and herbicides. Yet there are many challenges ahead for governments, especially in the areas of safety testing, regulation, international policy and food labelling. Many people feel that genetic engineering is the hope of the future and that we cannot ignore a technology that has such benefits. However, we must be careful and do our best to avoid unintended harm to human health and the environment as a result of our enthusiasm for this powerful technology.

*Science ethics.* The Turkish Academy of Sciences' Ethics of Science and Technology Programme aims to build and reinforce linkages among scientists and policymakers on ethical issues in science and technology. Science ethics is an integral part of the definition of what scientific research and development is. On the other hand, it encompasses the

professional ethics of scientists and the wide range of rules and regulations that they have to uphold in practicing their professional duties. Ethics and, in particular science ethics, are areas of thought and action which are under continual evolution with the diversification of social activities.

## **CEEN: A TOOL TO PROMOTE REGIONAL INTEGRATION IN CENTRAL AND SOUTHEAST EUROPE**

### **Gilbert Fayl**

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The Central and Eastern European Network (CEEN) is a platform for dialogue among the presidents of national academies of sciences of central-east and southeast European countries.

CEEN was initiated by the European Academy of Sciences and Arts in 2003 in connection with the then upcoming EU enlargement. CEEN addresses broad issues that are essential to: (a) the optimal integration of central-east and southeast European scientific communities (viz. individual scientists, national science academies, universities, research institutions, etc.) into the European scientific establishment, while maintaining academic freedom and independence in the process; and (b) these countries' full integration into- / enhanced cooperation with the EU, while maintaining the necessary democratic accountability during the progression of the transition and beyond.

So far, CEEN has held 14 semi-annual meetings. These demonstrated the value of CEEN as an efficient early warning mechanism between the EU and academy presidents, as well as among the Presidents themselves.

CEEN works in a collegial manner. Its selected membership helps ensure efficient operation.

When appropriate, CEEN (a) comments and provides advice on current issues with significance for the scientific community or society at large. These documents, normally in form of a memorandum or declaration, draw on the broad interdisciplinary experience and holistic approach of CEEN members. Targets are EU and national political leaders influencing S&T policies and, as appropriate, relevant leaders of civil society; (b) invites outside experts to its meetings. So far, these have included: European Commissioners Jan Potocnik (research) and Jan Figel (education); Jerzy Buzek, MEP and reporter for FP7 in the European Parliament (former Polish Prime Minister); Andrei Marga, president of the Babeş-Bolyai University Academic Council (former Romanian Minister of Education); Mohamed H.A. Hassan, executive director, TWAS; Howard Alper, co-chair, Inter Academy Panel (IAP); Hido Bišćević, secretary general of the Regional Cooperation Council in Balkans, as well as senior EU and national experts.

In October 2008, CEEN received the 'Cross Border Award 2008' of the Association of European Border Regions.

## ON THE ROLE OF AN ACADEMY IN CONTEMPORARY SOCIETY: A SLOVENIAN PERSPECTIVE

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The position and function of academies in their nations and beyond have been discussed on several occasions. This presentation will briefly refer to some experiences of the Slovenian Academy of Sciences and Arts over the past few years. An academy of our type is relatively free from some important and often complex conflicts of interest, and this puts it in a unique position in society. Thus we are increasingly invited to participate in debates as an independent authority whose voice is appreciated.

Advancing globalization is taking away piece after piece of our independence and autonomy, both as nations and individuals, and has in many ways exposed each of us to increasing influences, economical, social and cultural, both good and bad. Among them is the global economic crisis. The academy was invited by the Prime Minister to participate in a group charged with the task of looking forward in order to illuminate the possible ways along which our society might best move in the future. The resulting document, which presents a vision rather than a real strategic plan, has been open to public discussion during the past seven months.

The main goal has been to seek ways to increase human welfare while respecting the principles of sustainable development. Development in terms of increasing GDP has been shown to reach a point beyond which further increase is associated with decreasing salaries, growing unemployment, and a drop in overall quality of life. Parameters of non-material welfare have been found to correlate well with happiness, while GDP and wealth have not. Before the global financial crisis, Slovenia had already passed that point. It is well established that in rich societies the poor have shorter lives and suffer more from almost every social problem. A single common factor has recently been identified that accounts for the differences in health and happiness among developed nations: the degree of economic inequality among their members. Societies that are more unequal are bad for almost every member – the poor, the middle class and the rich. There is a striking contradiction between material success and social failure in today's world. An obvious conclusion is that the system should no longer support and encourage the accumulation of personal wealth beyond all real needs and at the expense of others. This should be reflected in a change in mentality. Replacing the desire *to have* with a goal *to be*, to quote the advice of the philosopher Erich Fromm, should be the orientation of the future society, assuring more mental and physical health, more satisfaction and more happiness. Indeed, the long-term survival of our civilization may depend on our ability to achieve this change.

Apart from the classical functions, a contemporary academy has to take on board new tasks and responsibilities vis-à-vis society. This includes increased attention to the natural and social environment, to ethics- and value-oriented school education, to fostering responsible use of new knowledge, means and technologies. The limited number of both membership and fields of their specialized expertise asks for new approaches. Two of these include a new form of partnership with experts outside the academy and international collaboration. The Slovenian Academy of Sciences and Arts supports inter-academy projects aiming at the goals mentioned, such as improving the programmes of natural sciences in elementary and high schools, and the teaching of ethics from pre-school to postgraduate levels.

## ADVISORY ROLE OF THE ACCADEMIA NAZIONALE DEI LINCEI

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Government's handling of scientific advice, risk and evidence in policy making is a complex procedure which usually involves the office of the scientific adviser and that of science and innovation. However, an adequate scientific advisory system, which represents a major goal for a Government, must also involve national science academies. In a globalized society, the role of academies must indeed be renovated with new strategies to catch up with the modern rate of information and progress. Academies are composed of scientists, often nationally and internationally recognized as major experts in their specific fields, basically independent from the economic and political interests of governments. This allows academies to objectively evaluate the great challenges of humanity and to consider possible solutions to be offered to the society. In addition, academic networks, such as IAP and IAMP, have the specific aim to build scientific capacity for developing countries' communities of researchers, as well as the capacity to provide evidence-based advice. The *Accademia Nazionale dei Lincei*, the oldest scientific academy, is officially in charge of providing scientific advice to the Presidency of the Italian Republic. To fulfil this challenging task, an *ad hoc commission system* has been developed, which will be presented.

## THE ACADEMY-GOVERNMENT INTERFACE: THE CASE OF ROMANIA

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The role of the national academies as potential advisors to governments is discussed, with illustration from the Romanian Academy. The Romanian Academy can play its role at the request of national authorities (presidency, government, parliament) or at its own initiative.

At the invitation of the government, the Romanian Academy was involved in the preparation of the '*National Research, Development and Innovation Strategy 2007-2013*' and of the '*National Sustainable Development Strategy of Romania 2013-2020-2030*'. Recently, the parliament established a financial council within the academy, with the role of advising the government in fiscal matters.

The Romanian Academy hosted the activities of the Institute of Projects for Innovation and Development (composed of several members of the academy among other specialists) and produced a series of three reports under the general title '*The Reprofessionalization of Romania*'. The two most recent volumes are entitled '*The Chance of Romania – The People*' and '*Romania – after Crisis*'. The documents were subjected to public debate in the Aula Magna of the academy.

At its own initiative, the academy produced three successive statements (declarations) about a controversial gold mining project in the Western Carpathians, expressing its concern and opposition.

