MINISTRY OF SCIENCE,
EDUCATION AND SPORTS

UNITY THROUGH
KNOWLEDGE FUND

Contents

Ladies and Gentlemen,

In behalf of the Government of the Republic of Croatia, we hereby present the Unity through Knowledge Fund, founded by the Ministry of Science, Education and Sport in 2007 as part of the Science and Technology Project (STP) financed by a loan of the World Bank.
Through the tendency of initiating new ideas and introducing advanced technological solutions, science is the foundation of building a competitive economy and maintaining sustainable development. The Fund presented herewith financed 80 scientific-research projects in four years that were chosen according to criteria of scientific excellence through public call for proposals, and have undergone an unbiased and competitive selection process.
The transfer of knowledge and technology important for the further development of Croatian innovative potential has been enabled trough these projects, thus fulfilling one of the prerequisites for a stronger economy, which is visible and recognizable according to international standards.
During implementation of these projects, we actively worked on the development of competence and knowledge necessary for competition in the international community, which is proven by 7 million EUR received from the Seventh Framework Program of the European Union for research and technological development.

In accordance with the goals of the Lisbon Strategy and the strategy Europe 2020, the Fund has especially stimulated projects that included investments of the private sector in research and development and assumed the role of one of the key actors that directs the Croatian science system in accordance with principles of good practice on an international level. Today, when economical development depends on knowledge, infrastructure development, high-technology and innovations, mutual efforts of the scientific community and the economy are necessary in order to achieve one common goal – a more competitive Croatia.
Conforming to the above-mentioned, our mission is to direct ourselves toward integrating our scientific potential, to strategically direct research toward the economy and protect intellectual property created in publicly financed scientific research systems. Our final goal, enabled by a new legal framework, is to increase the competitiveness level internationally and to even more promptly integrate the Croatian scientific system into the European Research Area.

Radovan Fuchs Ph.D.
Minister of Science, Education and Sports

ABOUT THE FUND

The Unity through Knowledge Fund

The Unity through Knowledge Fund (UKF) was established in 2007 by the Ministry of Science, Education and Sports on behalf of the government of the Republic of Croatia.
The Fund operates within the Science and Technology Project, which is financed by a loan of the World Bank.
From its establishment until March 2011, the Fund financed 80 scientific and technological projects, 30 of which are currently in progress. A total of 7.7 million EUR has been invested in the activities of the Fund. The Ministry of Science, Education and Sports, acting as holder of the project, ensured nearly 5.3 million EUR, i.e. 68% of the total necessary value for the implementation of the project, while the remaining funds have been ensured by international scientific-research institutions (1.07 million EUR), the private sector (648 thousand EUR) and Croatian public scientific-research institutions (770 thousand EUR)*. All of the above have recognized the key role in such a financing method and strengthening of scientific-research activities in ensuring the visibility of the Croatian scientific community and competitiveness of the Croatian economy on an international level.

*Data are not final as some of the projects are currently in progress.

International Labour Ogranization

EREF European Regional Economic Forum

In May 2009, the European Regional Economic Forum (EREF), whose activities are directed toward raising awareness of the strategic significance of the use of the Lisbon Agenda, chose the Fund as an example of the best practice on the topic "Developing human capital and managing migration for more competitive European regions". In the same year, the International Labor Organization (ILO) chose the Fund as an example of good practice on the topic "Promoting the linkages between migration and development".

Accomplishment of the Mission "Connectivity – Cooperation – Creativity" through three Programs

Within the Fund' activities three programs are implemented, which are designed for the realization of different, complementary goals within the scientific system:

1 Cooperability – the program supports joint research projects of Croatian scientists in and outside of Croatia with the goal of attracting prospective scientific research in Croatian companies and institutions.

2. Connectivity– the program encourages the international mobility of professionals and scientists in order to enhance the flow of knowledge and skills in Croatia.

3. Young Researchers and Professionals – the program encourages professional advancement of Young Researchers , with an emphasis on establishing cooperation with international institutions and the economic sector, in order to enable them to lead scientific research autonomously.

These are unique programs that directly enabled the transfer of knowledge and technology from leading international scientific institutions to Croatian universities, institutes, and to small and medium-sized businesses in the Republic of Croatia.

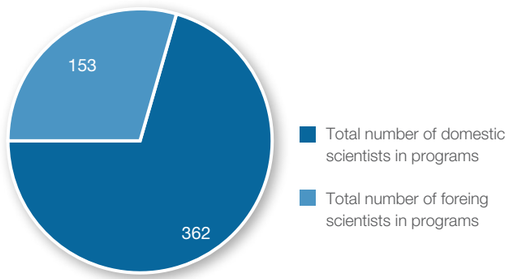
The programs contributed to the transfer of knowledge and the development of careers of young researchers, who will once in the future take leading roles in the Croatian and international scientific community as well as in the economy. In particular this contribution to the development of human capital is among the most significant accomplishments of the program implemented within the Fund.

In the era of global competition and the necessity for multidisciplinary approaches and solutions, mobility is of utmost importance in order to give scientists the possibility to get insight into good European and international research practice and consequentially, contribute to the creation of a more competitive position of Croatian science. With the implementation of the program, the Fund encouraged the international mobility of scientists in order to maximally take advantage of the possibility of knowledge and technology transfer through the establishment of cooperation. Also, the activities have been taken to enhance intersectoral mobility between the scientific community and the industry by engagement of scientists from public sector by private sector and vice versa, to enable all of the sectors the use of complementary advantages of the other.

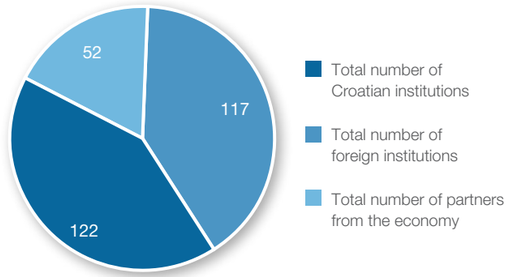
Goals

- Supporting internationally competitive research
- Supporting projects that create new values in the Croatian economy
- Supporting projects that help the development of scientific infrastructure in Croatia

The Fund connected domestic and foreign Scientists



Cooperation between domestic and foreign Institutions with the participation of Partners from private Sector



The Availability of Knowledge and Technology of internationally - recognized world Institutions for the Croatian scientific Community and Economy

515 Croatian and international scientists are participating in the programs of the Fund, where mutual work on the projects contributes to the development of research capacities of the Croatian scientific community and create new values in the Croatian economy.

A significant transfer of knowledge and technology into the Croatian scientific-research and economic sectors has been made possible due to cooperation with leading international scientific-research institutions. The transferred knowledge and technology are of vital importance for the further development of Croatian innovative potential, and with this, of a more competitive economy.
Institutions with which cooperation has been created represent research and scientific centers of excellence in the relevant fields, and among the included institutions being Yale University, Harvard Medical School and Stanford University; Mack-Planck-Institute for Molecular Cell Biology and Genetics, Institute of Biochemistry II Goethe University Medical School; Swiss Federal Institute of Technology Lausanne (EPFL), Swiss Federal Institute of Technology Zurich (ETH); Fred Hutchinson Cancer Research Center, KTH Royal Institute of Technology and Johns Hopkins University, USA, Laval University, Canada, Academy of Fine Art, Austria, Norwegian University of Science and Technology, etc.

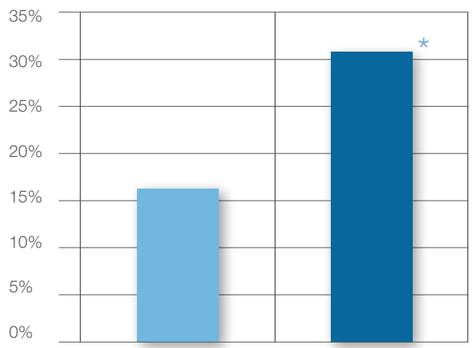
From the total of 5.3 million EUR, the amount invested by the Ministry of Science, Education and Sports into the projects of the Fund, 2.7 million EUR i.e. 56% has been directed into the projects oriented toward industry, with which the brace of science and commerce is strengthened.

Within the 28 completed projects (Research Cooperability and Young Researchers programs), 32 new technologies have been transferred to Croatian institutes, and an additional 26 new technologies have been developed. Those technologies brought direct benefits to the Croatian science and economy, from the areas of industrial robotics to mariculture.

Significant Results in attracting Resources from EU Funds

Thanks to the use of systematic and transparent selection methodology, the Unity through Knowledge Fund supported high-quality scientific-research groups that have been additionally strengthened with the support of the Fund by receiving the necessary competence and knowledge to enable participation in very competitive call for proposals of the European and international scientific communities.

Newly acquired skills and knowledge, as well as networking with excellent world scientific-research institutions, enabled scientist groups a far more competitive approach and herewith a favorable capacity for attracting European and other international financial sources, especially within the Seventh Framework Program of the European Union (FP7) for research and technological development.



Success of the Fund's Project in attracting Resources from the FP7 Program for Research and Technological Development

- Period from 2007-2010
  Republic of Croatia – accepted projects
- Period from 2008-2010
  The Fund – accepted projects

* Projects finished until March 2011.

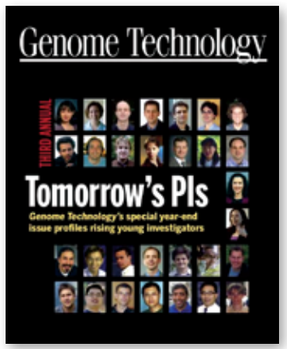
Proportion of accepted applications of completed projects of the Fund, financed within the first two tender Research Cooperability and Young Researchers and Professionals Programs – 28 projects, in relation to the total number of accepted applications from the Republic of Croatia of FP7.

The projects financed within the Fund realized great success among the applications for call for proposals in the FP7 program for research and technological development – success thereof is in the 30% range. The Fund invested 3.87 million EUR in the acceptance of projects, and an additional 51.3 million was extracted from the FP7 program, entitled to Croatian partners. In addition to the financing, success of the Fund's projects within FP7 provided Croatian research groups with international recognition, visibility and competitiveness in a worldwide scope.

Thanks to the Fund's high-quality selection process, further financing of the best research groups in the Republic of Croatia has been enabled.

Recognition and Publication in prestigious scientific Journals

Within the Research Cooperability and Young Researchers and Professionals Programs, 28 projects have been completed from which 179 scientific articles and 26 book chapters have arisen and been published. Other than the significant number of published works, the success of the projects is additionally confirmed by the publication of scientific articles in the most prestigious international scientific journals such as Nature, Proceedings of the National Academy of Sciences (USA) and Journal of the American Chemical Society, while a commentary was published in Science. Publication in relevant scientific journals is one of the most important indicators of excellence in the scientific system and represents a large recognition for all involved authors.



One of the users of the Fund's program, Bojan Žagrović Ph.D., was elected as one of the world's 30 rising young scientists in his field of work according to the American journal Genome Technology in 2008.

Cover page of Nature dedicated to the work of Tomislav Domazet Lošo Ph.D., resulted from Fund's project "Phylostratigraphic analysis of disease genes expression in the context of life cycle".

80 PROJECTS

Projects realized within the Framework of the Unity through Knowledge Fund

Since the establishment of the Fund in 2007, 80 scientific and technological projects have been financed. The projects were chosen trough public call for proposals in an unbiased and competitive selection process, which is operatively managed by the Secretariat of the Fund in cooperation with two independent bodies – the Steering Committee and the Approval Committee. The stated Committees gather distinguished members of the Croatian academic community and of the economy. The chosen projects are stated hereinafter:

COOPERABILITY

Professor Babić, Emil, Ph.D.
Enhancement of electromagnetic properties of MgB2 superconductor by magnetic nanoparticle doping (project co-leader Horvat, Josip, Ph.D.)

Professor Banfić, Hrvoje, Ph.D.
Chemical genetic approach to identifying inhibitors of nuclear lipid signaling (project co-leader Bedalov, Antonio, Ph.D.)

Professor Crnković, Ivica, Ph.D.
DICES - Distributed Component-based Embedded Software Systems (project co-leader Professor Žagar, Mario, Ph.D.)

Professor Gajski, Daniel, Ph.D.
Application-oriented Embedded System technology (project co-leader Professor Sruk, Vlado, Ph.D.)

Professor Kaštelan-Macan, Marija, Ph.D.
Reduction of environmental risks posed by pharmaceuticals and their degradation products in process wastewaters, through RO/NF membrane treatment (REPHAD) (project co-leader Petrović, Mira, Ph.D.)

Professor Kostović, Ivica, Ph.D.
Neuroimaging, neurogenomics and pharmacogenomics of the frontal lobe connectivity: normal development and abnormalities in developmental cognitive disorders (project co-leader Professor Rakić, Paško, Ph.D.)

Kuljača, Ognjen, Ph.D.
Applied neuro-fuzzy control of turbine governors and ship rudder systems (project co-leader Horvat, Krunoslav, Ph.D.)

Trgovcich, Joanne, Ph.D.
Transcriptomic Approach to Viral Disease Research (project co-leader Professor Jonjić, Stipan, Ph.D.)

Weber, Igor, Ph.D.
Biophotonics approach to regulation of the actin cytoskeleton dynamics by small GTPase proteins (project co-leader Tolić-Norrelykke, Iva Marija, Ph.D.)

Professor Weygand-Đurašević, Ivana, Ph.D.
Macromolecular complexes of amino-acyl-tRNA synthetases and their role in translational quality control and non-ribosomal peptide synthesis (project co-leader Professor Ban, Nenad, Ph.D.)

Žagrović, Bojan, Ph.D.
Worldwide distributed computing in molecular biology: from dynamic activation of enzymes to the problem of conformational averaging in structure determination (project co-leader Žitković, Gordan, Ph.D.)

Desnica, Vladan, Ph.D.
Research, development and construction of portable micro X-Ray Fluorescence device

Professor Dujić, Željko, Ph.D.
Physiology of SCUBA diving (project co-leader Denoble, Petar, Ph.D.)

Professor Gajović, Srećko, Ph.D.
Regeneration and plasticity after ischemic brain damage studied on innovative transgenic mouse models (project co-leader Professor Križ, Jasna, Ph.D.)

Kirin, Srećko, Ph.D.
Organometallic and inorganic bioconjugates as potential enantioselective catalysts

Professor Kragić, Danica, Ph.D.
Improving GRAsping Movements by predictions based on Observation (project co-leader Professor Jerbić, Bojan, Ph.D.)

Professor Volarević, Siniša, Ph.D.
Regulation of the p53 tumor suppressor by ribosomal proteins in physiological and pathological conditions (project co-leader Professor Dembić, Zlatko, Ph.D.)

Professor Bašić, Josipa, Ph.D.
Implementation of evidence-based prevention program of socio-emotional learning through science evaluation and its application into Croatian kindergartens and primary schools (PATHS-RASTEM) (project co-leader Domitrovich, Celene, Ph.D.)

Ciglenečki-Jušić, Irena, Ph.D.
Nanoparticles in aqueous environment: electrochemical, nanogravimetric, STM and AFM studies (project co-leader Professor Batina, Nikola, Ph.D.)

Professor Deletis, Vedran, Ph.D.
Neurophysiologic markers generated by electrical and magnetic stimulation of motor speech related cortical areas (project co-leader Professor Tadin, Duje, Ph.D.)

Gracin, Davor, Ph.D.
Nano-structural materials for thin film solar cells (project co-leader Professor Balzar, Davor, Ph.D.)

Maksić, Mirjana, Ph.D.
Mechanochemistry for the clean and

efficient metal-catalysed synthesis of pharmaceutical targets and the study of their molecular recognition (project co-leader Friščić, Tomislav, Ph.D.)

Professor Šalković-Petrišić, Melita, Ph.D.
Cytopathological characterization of the brain in a rat model of sporadic Alzheimer's disease (project co-leader Professor Kuljiš, Rodrigo O., Ph.D.)

Tutiš, Eduard, Ph.D.
New electronic states driven by frustration in layered materials (project co-leaders Professor Forro, Laszlo, Ph.D.; Barišić, Neven, Ph.D.; Smontara, Ana, Ph.D.)

Valla, Tonica, Ph.D.
Photolithographic synthesis and electronic properties of graphene-based devices and related structures (project co-leader Kralj, Marko, Ph.D.)

Professor Vukičević, Slobodan, Ph.D.
Bone morphogenetic protein-1 isoforms in bone regeneration (project co-leader Dropulić, Boro, Ph.D.)

CONNECTIVITY

Alfirević, Nikša, Ph.D.
Toward the knowledge-based development of the Alps-Adriatic region

Barišić, Lidija, Ph.D.
Antibiotic plusbacin A3: total solid-phase synthesis and structure-activity relationship study

Barišić, Matko, B.Sc.
A Distributed Navigation System for Coordinated Control of a Fleet of Autonomous Submersibles

Professor Bažok, Renata, Ph.D.
The landscape genetics of the invasive western corn rootworm in Croatia

Fuchs, Željka, Ph.D.
International Atmospheric Research over the Adriatic

Hojšak, Iva, Ph.D.
Visit to Schneider Children's medical center of Israel

Lorincz, Josip, Ph.D.
Doctoral research visit on "Green networking" project

Ljubković, Marko, Ph.D.
Animal Model for Studying the Effects of Exercise on Cardiac Function

Marinović Terzić, Ivana, assist. prof., M.D.
Gaining experience in two dimensional gel electrophoresis technique

Marinović, Jasna, Ph.D.
Induction of Chronic Heart Failure in Rats by Coronary Artery Ligation

Matanović, Ivana, Ph.D.
Full-dimensional quantum translation-rotation dynamics of methane in clathrate hydrates

Nikolić, Nela, B. Sc.
Adaptation of the metabolic pathways to diverse environmental conditions

Pirc, Andreja, B. Sc.
Innovation in the U.S. furniture industry

Rogić, Maja, Ph.D.
A new insight to the neurophysiology of speech production

Ručević, Marijana, Ph.D.
Endemic Nephropathy: proteomics approach for biomarkers discovery and etiology study

Rudić, Milan, M. Sc.
Research of the (patho) physiology of the middle and inner ear

Smolčić, Vernesa, Ph.D.
Caltech - Zagreb collaboration

Šimić, Anita, Ph.D.
Monitoring dynamics of Croatian olive fields and vineyards using remote sensing applications

Vinković Vrček, Ivana, Ph.D.
Nanosilver particles versus ionic silver - development of a method for differentiation and quantification

Šilović, Tina, Ph.D.
Uncovering composition and diversity of marine picophytoplankton in northern Adriatic coastal waters

Lončar, Nina, B. Sc.
Gaining experience in radiometric and stable isotope measurements

Baković Kramarić, Darija, Ph.D.
The application of latest advances in Doppler echocardiography in clinical and experimental echocardiology

Šamec, Dunja, Ph.D.
Identification of bioactive metabolites in medicinal plants and there In vitro propagation

Serdar, Marijana, B. Sc.
The composition of corrosion products on corrosion resistant concrete reinforcement

Majhen, Dragomira, Ph.D.
Deciphering entry pathway of NGR-retargeted adenovirus vectors by confocal microscopy

Svoboda, Petra, B. Sc.
Rickettsia spp. and tick-borne encephalitis virus in small rodents

Boraska, Vesna, Ph.D.
Establishing novel genetic loci for eating disorder-related traits, brachial circumference and sex

Turalija, Marina, Ph.D.
Antimicrobial functionalisation of PLA polymer

Kostić, Sandra, M. Sc.
Neuropathic pain treatment: Gene transfer to nociceptive neuron

Zibar, Karin, Ph.D.
Gaining knowledge on newborn screening using tandem mass spectrometry

Lukić, Aleksandar, assist. prof., Ph.D.
Planning, policies and measures for integrated rural development in Croatia

Karanović, Sandra, Ph.D.
Molecular profiling of the urothelial cancers in endemic nephropathy patients

YOUNG RESEARCHERS AND PROFESSIONALS

Borovečki, Fran, assist. prof., Ph.D.
Location analysis of alpha-synuclein promoter binding in Parkinson's disease

Horvath, Kristian, Ph.D.
Wind resources and forecasting in complex terrain of Croatia (WINDEX)

Jerković, Igor, Ph.D.
Evaluation of Unifloral Honeys - Chemical Fingerprinting and Nutritional Properties

Klanjšček, Tin, Ph.D.
Finfish mariculture dynamic energy budget model (FiMDEB)

Marković, Goran, Ph.D.
Evaluation of the muscular system function: external loading and mechanical output

Mladineo, Ivona, Ph.D.
Development of a Health Genomic Profile for the captive Atlantic bluefin tuna (Thunnus thynnus)

Nagy, Vanja, Ph.D.
Regulation of Neurotrophin Receptor Signaling and Endocytosis during Neuronal Development and Plasticity

Professor Paar, Nils, Ph.D.
Spin-Isospin Excitations in Exotic Nuclei and Astrophysically Relevant Weak Interaction Rates

Šimić, Petra, Ph.D.
Bone morphogenetic protein-6 in osteoporosis

Vianello, Robert, Ph.D.
Computational prediction of structure and catalytic activity of new organic superacids

Vuletić, Tomislav, Ph.D.
Protein Assisted DNA Monolayer Assembly

Capan, Ivana, Ph.D.
Silicon nanocrystals solar cells... Properties and characterization

Domazet-Lošo, Tomislav, Ph.D.
Phylostratigraphic analysis of disease genes expression in the context of life cycle

Ljubković, Marko, Ph.D.
Exercise-induced improvement of chronic heart failure: the role of KATP channels and mitochondria

Majerić, Elenkov Maja, Ph.D.
Biocatalytic application of halohydrin dehalogenases for production of chiral building blocks

Peharda Uljević, Melita, Ph.D.
Bivalve feeding, competition and predation – what is at play?

Radić, Tomislav, Ph.D.
Indigenous arbuscular mycorrhizal fungi in the grapevines from karstic soils

Skorin-Kapov, Nina, Ph.D.
A Security Planning Framework for Optical Networks (SAFE)

Živković, Ivica, Ph.D.
Magnetization of quantum magnets at ultra low temperatures

Budimir, Marko, Ph.D.
Study and development of ultrasonic non-destructive examination systems

Jelavić, Mate, Ph.D.
Advanced wind turbine control system

Knežević, Ana, Ph.D.
High throughput contract analysis of plasma glycans

REPRESENTATIVE PROJECTS OVERVIEW

Professor Marija Kaštelan-Macan Ph.D.

Reduction of environmental Risks posed by Pharmaceuticals and their degradation Products in process Wastewaters, through RO/NF membrane Treatment (REPHAD)

Project leader: **Professor Marija Kaštelan-Macan Ph.D.**
Co-leader: **Mira Petrović Ph.D.**

Unprocessed industrial and agricultural waste water in Croatia in most cases is released into watercourses. This is why it is important to protect surface waters with an effective processing of waste water, which will ultimately result in an increase in the quality of potable water supply.

In the project, the ecological problem of the so-called new pollutants is processed, namely human and veterinary pharmaceuticals in waters. The presence of such has been researched with modern chromatographic methods in industrial and agricultural waste, while the removal thereof was executed with advanced membrane technology based on reverse osmosis and nanofiltration. The largest source of contamination of these compounds into the environment is the incomplete removal of inappropriate water processing devices. Therefore, the scientific and technological goals of the project are directed to the testing of advanced water processing methods in laboratory and pilot attempts.

Ognjen Kuljača Ph.D.

Applied neuro-fuzzy Control of Turbine governors and ship Rudder Systems

Project leader: **Ognjen Kuljača Ph.D.**
Co-leader: **Krunoslav Horvat Ph.D.**

The goals of the project were the establishment of laboratories for advanced industrial regulation systems in the Brodarski Institute, the transfer of knowledge from the field of advanced regulation systems to Croatia and the development of regulation algorithms with neuron networks and fuzzy control algorithms for turbine governor and ship rudder systems.

The laboratory has been established and is being used regularly, for scientific research and for commercial projects where precision measurement in real-time or hardware testing is necessary. Thus far it has been used in management and regulation projects in HE Lešće and HE Čakovec, which was created by the Brodarski Institute, with the desire for model testing to expand to other activities. The project likewise flourished with the development of a new real-time water turbine model.

The knowledge gained with the use of the laboratory equipment has been used in the development and activation of the wave generator regulator, a device that creates waves in test pools for testing ship models for sailing conditions in wavy waters or for testing port profiles in wavy waters. All tests must be executed with waves of various strengths and frequencies, and the regulator automatically guides the wave generator to achieve such waves.

Joanne Trgovcich Ph.D.

Transcriptomic Approach to Viral Disease Research

Project leader: **Joanne Trgovcich Ph.D.**
Co-leader: **Professor Stipan Jonjić Ph.D.**

The project is envisioned to use new technology and to develop tools for the study of viral diseases through research of global expression programs, i.e. transcriptome. The stated techniques have been used in the research of cytomegalovirus (CMV) infections, which can cause serious infections in newborns and adults with weak immune systems. Focusing on studying the human cytomegalovirus, the infection of mouse cytomegalovirus (MCMV) served as an exceptional model.
During the project, an encompassing analysis of virus gene expressions has been carried out, which revealed an unexpected complexity of the MCMV genome and lead to the discovery of new viral genes, whose further characterization will certainly dramatically influence the understanding of viral replication and the development of disease. These discoveries opened a pathway to the research of interrelations between viral disease and virus expression programs. Likewise, a key region in the CMV genome has been identified, which has a unique ability to stimulate the expression and thus has the potential to become extremely important to researchers, as well as the academic sector, and to the biotechnological and pharmaceutical industries.
The Fund's initiative designated access to the most modern technologies for the project's participants, as well as support for the creation of an international team of scientists that included virologists, immunologists, bioinformational professionals and professionals in the field of IT and programming. The effort of these scientists enabled the creation of a more complete view on the viral genome and gene as well as setting the foundation for efficient immunological control of these viruses.

Vladan Desnica Ph.D.

Research, Development and Construction of portable micro X-Ray Fluorescence Device

Project leader: **Vladan Desnica Ph.D.**

The goal of the project was the development and construction of a prototype of a portable instrument for the microanalysis of x-ray fluorescence (micro-XRF), which in many aspects would be superior to similar high-quality devices currently available on the market. This method is considered one of the most suitable non-destructive techniques for the elemental analysis of materials, and in its portable version, this device enables in situ analysis of samples/objects regardless of their size, shape or location or exhibition (e.g. in a museum or archeological site, in the event of use with an object of cultural heritage).
Likewise, this is the first hand-held XRF-device of its kind on the market, which enables milli and micro XRF applications, with switching from one operation mode into another with a simple click of a button. The potential use of such a versatile instrument covers a wide field of use in archaeometry, museology, the chemical industry, environmental research (land pollution, air and water quality, ash content in air and other), forensics, metallurgy, etc.
The original design developed within the project was a transfer of a combination of scientific and technological knowledge, which was acquired by the team leader abroad, and the mutual efforts of the team of Croatian professionals, who are prepared to transform their theoretical and practical knowledge into a unique, high-technology product. The mentioned prototype of the micro-XRF device is proof that one high-technology device, a hand-held micro-XRF device, can be developed and constructed in Croatia, using one's own knowledge and be offered on the Croatian and international markets at a very competitive cost.

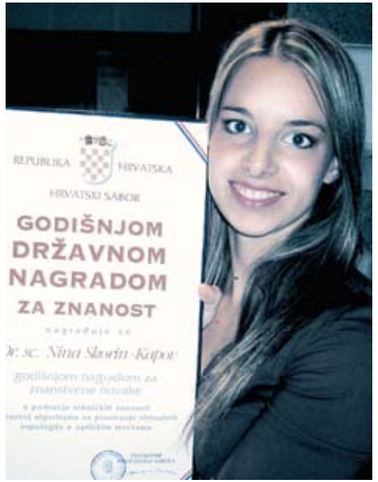
Bojan Žagrović Ph.D.

Worldwide distributed computing in molecular Biology: from dynamic Activation of Enzymes to the Problem of conformational averaging in structure Determination

Project leader: **Bojan Žagrović Ph.D.**
Co-leader: **Gordan Žitković Ph.D.**

The focus of this project was the study of the structure and dynamics of a biomolecule, namely a protein, with the assistance of advanced computing and theoretical methods. The role of proteins is immeasurable – as one of the most important molecules in cells, it protects the mechanism from harmful aggressors such as viruses and bacteria, aids in the development of tissue and organs and participates in all significant biochemical processes. This is why understanding the protein's structure and dynamics is important not only because of its fundamental significance, but for its possible use in the areas of biomedicine, biotechnology or nanoscience.

From the coordination of more than twenty scientists from four domestic and four foreign institutions to the establishment of significant infrastructure, the project was logistically extremely demanding. Regardless, a large number of anticipated goals were fulfilled, which are expected to be used in the fields of biomedicine and pharmacology. Likewise, six scientific works have been published in relevant journals thus far.



Nina Skorin-Kapov Ph.D.

A Security Planning Framework for Optical Networks (SAFE)

Project leader: **Nina Skorin-Kapov Ph.D.**

The SAFE project deals with the security planning framework for optical networks in the event of vilification of the physical layer or in the event of component failure. The suggested security approach, instead of improving the technical equipment or the mechanisms of a reaction, offers diligent network planning that decreases the consequences of attack and malfunction and hereby facilitates the detection and reaction process, while simultaneously decreasing costs of realization of designated safety levels. The most important results of the project are emphasized as being the development of the model and algorithm for security planning, which significantly lowers the possibility of expansion of various malicious physical attacks, and simultaneously do not influence other activities, the cost and efficiency of the network.

The project is currently working on the integration of the developed models with the protection methods as well as the reaction and detection mechanisms in cooperation with the Athens Information Technology (AIT) Institute in Greece.
The Fund enabled the project's participants to execute focused operations on a defined scientific theme, as well as intense cooperation with partner institutions abroad, in addition to participation in important world conferences. Likewise, within the SAFE project, intense cooperation with partner institutions (The Polytechnic University of Cartagena in Spain, The Royal Institute of Technology, KTH, in Sweden and Athens Information Technology, AIT, in Greece) throughout the duration of the project resulted in new mutual challenges, from collective project suggestions and mutual training to the co-organization of conferences.

Tin Klanjšček Ph.D.

Finfish Mariculture dynamic Energy Budget Model (FiMDEB)

Project leader: **Tin Klanjšček Ph.D.**

Fish funds in nature have drastically dropped, with a tendency toward further decreases and a realistic possibility of a final drought. As an alternative source of seafood, the emergence of mariculture occurred – the breeding of sea organisms in a controlled environment. World trends show that mariculture is surging quickly, and the development of mariculture is included among the strategic goals of Croatia's development program.

The goal of this project was the creation of a model that links feeding with the growth of the fish and seeking effective feeding strategies with the assistance of the new model, based on which production costs and environmental strain can be decreased.

The success of the project is significant. Other than the fact that this is the first model in the world of such a sort for breeding, the ideas developed by the project are already in use in production. The most significant concept introduced is the distribution of fish in structure and energy reserves, which represents a shift from current thought of weight being the most important determinant of potential fish growth. Determining weight and length upon biometrics enables a more favorable future adaptation of the model.

Ultimately, the experiences of the project are very positive: other than the establishment international and domestic cooperation, an exceptional scientific advancement has been achieved, which will be useful for the economy. However, this is not the end of the project – some parts of the research have been included in suggestions of the FP7 projects.

Ivona Mladineo Ph.D.

Development of a Health Genomic Profile for the captive Atlantic bluefin tuna (Thunnus thynnus)

Project leader: **Ivona Mladineo Ph.D.**

Tuna has been recognized as the most valuable product of aquaculture and fishing, and more than half of the world's production is concentrated in the Mediterranean. Expanding production of the bluefin tuna through aquaculture directly depends on maintaining the population of bluefin tuna for breeding, reproduction and growth of young through an extended period. The final goal of the project was the drafting of a preliminary microarray, specific for the Atlantic bluefin tuna that would include only a few indicative genes, which would assist in a more extensive monitoring of the tuna's health in breeding conditions.

The advantage of the project is firstly the above average amount of available resources that enabled the execution of high-quality and competitive research, and thus a later publication of results in journals with higher reputations. An important fact is that for the first time, autonomy in the execution of the project by young scientists was enabled in respect to daily laboratory actions as well as with financial planning of the project.

This Unity through Knowledge project represents the peak itself of new research fields in aquaculture, which has been recognized by other funds, where the continuation of work will enable development within a new field of caged tuna physiology through gene expression, which has a great potential for use in the economy.

Professor Bojan Jerbić Ph.D.

Improving GRAsping Movements by predictions based on Observation

Project leader: **Professor Danica Kragić Ph.D.**
Co-leader: **Professor Bojan Jerbić Ph.D.**

The mentioned project deals with the design and development of an autonomous robot system for handling objects. Specifically, a robotic agent learns how to manipulate with various objects by observing humans during their handling of the same set of objects. Grasping and handling objects is one of the most difficult tasks to automatize and execute with a robotic system. Consequently, many procedures based on the multi-agent bottom -up concept have been developed and implemented within the project, as well as new control paradigms established on the concepts of multi-agent systems (MAS) for the coordination of robotic arms with multi-finger grasps for handling objects. Furthermore, for the improvement of efficiency and security of the multi-agent system with two robots that move in overlapping operational areas, an optimization control framework based on a co-evolutionary approach has been suggested.
The correct combination of approaches from the field of service robotics developed at the Royal Institute of Technology (Sweden) with approaches developed at the Faculty of Mechanical Engineering and Naval Architecture in Zagreb resulted in a synergetic effect, where benefits are primarily realized in the field of industrial robotics. The executed project is closely connected with industrial partners in the manner that industrial conditions are loyally implemented, whereby the possible research of real use of research accomplishments is executed. Likewise, it has been proven that the “smart” behavior of robots is a type of universal quality that will assist robots to participate in daily life more significantly in the future.

Professor Ivana Weygand-Đurašević Ph.D.

Macromolecular Complexes of aminoacyl-tRNA Synthetases and their Role in translational Quality Control and non-ribosomal peptide Synthesis

Project leader: **Professor Ivana Weygand-Đurašević Ph.D.**
Co-leader: **Professor Nenad Ban Ph.D.**

Within this cooperation project, the structure and function of macromolecules important for protein biosynthesis have been researched. Many organisms are comprised of proteins related to aminoacyl-tRNA synthetases, key enzymes that participate in the transfer of genetic information. The identified related proteins execute different functions, among them likely being the non-ribosomal synthesis of biologically significant peptide compounds, perhaps an antibiotic. All scientific results explain the macromolecular interactions that occur upon the emergence of the protein within the cell. We were able to explain many biochemical and structural properties of these macromolecules with interdisciplinary research. The results thereof were described in approximately ten scientific articles published in renowned journals, basically with a high impact factor.
Financial resources enabled the intensification of earlier established cooperation of several research groups from the country and abroad, which is extremely important for achieving scientific results. Direct financing of consumables and laboratory equipment is a significant advancement in domestic research capabilities, while eminent scientists from international institutions received greater insight in the manner of organization of scientific research and of the functionality of the educational system in Croatia.
The economical sector has been interested in the project from the very beginning, and foreign pharmaceutical companies co-financed the same. Further scientific cooperation with existing research partners and intensifying cooperation with pharmaceutical companies is expected in the future.

Advantages in participating in the Fund's project are the actual financing that can cover costs anticipated in the project and the possibility of connecting scientists from Croatia and abroad, which initiated an entire series of activities related with scientific works and instruction.

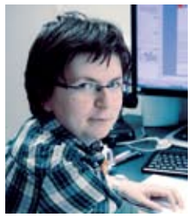
Professor Mario Žagar Ph.D.

As an advantage of participating in the Fund's project, I would like to state the possibility of financing research activities on the level of Western groups and institutions, the possibility of equipping laboratories for Diaspora, the manner of monitoring the project by foreign financing agencies and the advertence and professionalism of administrative personnel.

Marko Ljubković Ph.D.

Based on the achieved results, I would like to emphasize that the Unity through Knowledge Fund should be an example of a respectable and professional allocation of funds for financing scientific projects and following the implementation thereof.

Professor Siniša Volarević Ph.D.



With its participation in the project, the Fund ensured recognition and the expansion of cooperation as well as the possibility of presenting results to the public domestically and internationally. Presented results nevertheless create numerous further possibilities.

Ivana Capan Ph.D.

As a fund that finances scientific projects in accordance with international practices, the Unity through Knowledge Fund significantly contributed to the development of science in Croatia through this project.

Tomislav Domazet-Lošo Ph.D.

New and high-quality scientific ideas must be imposed on industrial subjects, but recognizing our best scientists, who can create those ideas, must also be known. The Unity through Knowledge Fund, with its mission, is on the best road to accomplishing this.

Robert Vianello Ph.D.

Personnel of the Fund were available in all situations throughout the entire project. With the continued directing of research according to planned activities and terms, the Fund is largely responsible for the success of the project.

Igor Jerković Ph.D.

Because of the Fund's important role in the transition of young researchers into independent managers of research groups, it would be crucial to further continue activities in financing projects of young researchers.

Fran Borovečki Ph.D.

Support such as this Unity through Knowledge Fund is very significant, as scientists from Diaspora start from the beginning when establishing research groups and infrastructure upon arrival in Croatia, which requires financial resources. Croatia needs as many as possible financing prospects for the establishment of new research groups, especially oriented to younger generation scientists.

Professor Nils Paar Ph.D.

A large advantage of participating in the Fund's project is a type of freedom and autonomy in making decisions, which enabled creative, more risky and flexible thinking.

Marko Budimir Ph.D.

For the necessity of the Fund's activities, the Ministry of Science, Education and Sports has appointed two committees with strictly detached functions: the Steering Committee and the Approval Committee.

The Steering Committee is responsible for the management, coordination and successful implementation of all programs and activities, management of the evaluation process and suggesting which projects to finance.

MEMBERS

Professor Mile Dželalija Ph.D.
Faculty of Science, University of Split
President

Professor Stjepan Car Ph.D.
Končar – Electrotechnical Institute d.d., Zagreb

Krunoslav Kovačević Ph.D.
Galapagos Research Center Zagreb d.o.o.

Professor Astrid Krmpotić Ph.D.
Faculty of Medicine, University of Rijeka

Hrvoje Meštrić Ph.D.
Ministry of Science, Education and Sports

Professor Kristian Vlahoviček Ph.D.
Faculty of Science, University of Zagreb

The Approval Committee is an independent body responsible for final evaluation and approvals. This Committee approves projects proposed by the Steering Committee.

MEMBERS

Radovan Fuchs Ph.D.
Minister of Science, Education and Sports
President

Professor Željko Bošnjak Ph.D.
Medical College of Wisconsin, Milwaukee, USA

Ivica Mudrinić, B.Sc. in Electrical Engineering
T-Hrvatski telekom d.d.

Professor Ivan Pavić Ph.D.
University of Split

Professor Mladen Žinić Ph.D.
Institute "Ruđer Bošković", Zagreb

Secretariat of the Fund is the executive office responsible for the operative activities in relation to the program.

MEMBERS

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Program Manager

Dijana Juroš, B.Sc. in Biology
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