

## SCOPES 2005-2008: List of supported Joint Research Projects and Institutional Partnerships arranged according to *scientific disciplines*

The SNSF supports Joint Research Projects (JRP) and Institutional Partnerships (IP) in the following disciplines.

In the list the JRP and IP are arranged alphabetically according to the names of the project co-ordinators. Abstracts are arranged numerically.

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No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Agronomy, Forestry</b>				
IB73A0-111010	Boller Beat	Agroscope Reckenholz Eidg. Forschungsanstalt für Agrarökologie und Landbau CH-8046 Zürich	Characterization of natural populations of <i>Festuca</i> spp. ( <i>Festuca pratensis</i> Huds. and <i>Festuca arundinacea</i> Shreber) from diverse habitats in Bulgaria	Bulgaria
IB74A0-111087	Commarmot Brigitte	Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL CH-8903 Birmensdorf ZH	Strengthening research in virgin and managed forests as basis for biodiversity conservation and sustainable use of forest resources in the Ukrainian Carpathians	Bulgaria
IB73A0-110772	Hinz Harriet	CABI Bioscience Swiss Centre CH-2800 Delémont	Restoring biodiversity of degraded Romanian pastures through the development of sustainable management practices for invasive weeds using <i>Lepidium draba</i> as a model system	Ukraine
IB74A0-110950	Hoffmann Christian W.	Eidg. Forschungsanstalt Abt. Landschaftsdynamik und Raumentwicklung CH-8903 Birmensdorf ZH	Promotion of forest and wood sciences in the Ural, in Siberia and in the Carpathians to mitigate the effects of climate changes on long-term forest development	Romania
IB73A0-111150	Kenis Marc	CABI Bioscience Swiss Centre CH-2800 Delémont	Non-indigenous insects and their threat to biodiversity and economy in the Balkans	Russia / Ukraine
IB73A0-111089	Rigling Daniel	Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL CH-8903 Birmensdorf ZH	Epidemiology and population structure of <i>Cryphonectria parasitica</i> and associated <i>Cryphonectria hypoviruses</i> in the Balkans	Albania / Bulgaria / Macedonia
IB7310-110724	Rossier Ruth	Agroscope FAT Tänikon Eidgenössische Forschungsanstalt für Agrarwirtschaft und Landtechnik CH-8356 Ettenhausen TG	Farm Transfer Research - developing a rationale for structural policy in Romanian agriculture (Farmtrans)	Romania

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB73A0-110978	Samietz Jörg	Eidg. Forschungsanstalt für Obst-, Wein- und Gartenbau, FAW CH-8820 Wädenswil	Transition to sustainable pest management in Eastern European horticulture: implementation, adaptation and validation of novel methods for forecasting, monitoring and control by example of the key pest in apple, the codling moth	Croatia / Macedonia
IB73A0-110826	Schaffner Urs	CABI Bioscience Swiss Centre CH-2800 Delémont	Weeds in the East, weeds in the West: what makes Russian knapweed a weedy species in the native and in the exotic range?	Bulgaria
IB73A0-110809	Scheeder Martin	Institut für Nutztierwissenschaften ETH-Zentrum CH-8092 Zürich	Assessment of natural pasture resources (essential nutrients) in endemic mountain regions with respect to nutritional balance and quality of sheep milk and dairy products (white brine cheese, yellow cheese, yogurt)	Usbekistan
IB7320-110817	Sorg Jean-Pierre	Departement Umweltwissenschaften ETH-Zentrum HG FO 22.4 CH-8092 Zürich	Biodiversity and sustainable management of Kyrgyzstan's walnut-fruit forests: development of new silvicultural concepts (ORECH-LES)	Kyrgyzstan
IB73A0-110865	Studer Christoph	Schweizerische Hochschule für Landwirtschaft (SHL) CH-3052 Zollikofen	Sustainability of agricultural production in Armenia - analysis of the current situation and improvements through farm advice and facilitation of policy action to adapt framework conditions using the RISE	Armenia

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<b>Anthropology, Ethnology</b>				
IB7310-111124	de Jong Willemijn	Ethnologisches Seminar Universität Zürich CH-8050 Zürich	New reproductive technologies and the making of bodies, persons and families in Russia and Switzerland	Russia
IB7310-110827	Giordano Christian	Ethnologisches Seminar Universität Fribourg CH-1700 Fribourg	Trust, co-operation and integration in agrarian society in Bulgaria	Bulgaria
IB7310-110767	Rüegg François	Département d'Anthropologie Sociale Université de Fribourg CH-1700 Fribourg	Nomads and parliamentarians. The influence of mobility and religious affiliation on identity building and on the development of integration social policies. Roma people in Northern, Eastern Romania, and the Republic of Moldova. 1989-2005. (NOMAPARLIA)	Moldova / Romania
IB73A0-110895	Zollikofer Christoph P. E.	Anthropologisches Institut Universität Zürich-Irchel CH-8057 Zürich	Comparative analysis of the hominin fossils from Dmanisi (Republic of Georgia)	Georgia

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<b>Archaeology</b>				
IB7410-111065	Aubert Jean-Jacques	Institut des Sciences de l'Antiquité Faculté des Lettres et Sciences Humaines Université de Neuchâtel CH-2000 Neuchâtel	Development and implementation of master studies in didactics of classical languages	Macedonia
IB7410-111136	Fuchs Michel	Institut d'Archéologie et des Sciences de l'Antiquité IASA Université de Lausanne, BFSH2 CH-1015 Lausanne	Sauvetage et gestion d'un patrimoine menacé: la peinture antique de Kertch (Crimée, Ukraine)	Russia / Ukraine
IB7310-110991	Luginbühl Thierry	Inst. d'archéologie et d'histoire ancienne Université de Lausanne, BFSH2 CH-1015 Lausanne	Nokalakevi (West Georgia) in the first millenium B.C. and earlier, cultural and environmental context	Georgia
IB7310-110982	Piérart Marcel	Commission de recherche de l'Univ. de Fribourg, Séminaire d'histoire ancienne Université de Fribourg CH-1700 Fribourg	Epigraphy in the context of the renovation of historical studies in Russia: the new corpus of Greek and Roman inscriptions of the Black Sea region and the development of the Russian Epigraphic School	Russia
IB7310-110808	Zehnder Konrad	Schweizerische Geotechnische Kommission ETH-Zentrum 8092 Zürich	A comprehensive study of Dodo-Rka monastery (6th-18th cc) and of Gansashori skete (founded in ca. 6th-9th). Against the background of Byzantine and Eastern christendom.	Georgia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Astronomy, Astrophysics and Space Research</b>				
IB7420-111020	Courvoisier Thierry J.L.	INTEGRAL Science Data Centre CH-1290 Versoix	Creation and maintenance of a computing astroparticle centre	Ukraine
IB7420-110748	Dach Rolf	Astronomisches Institut Universität Bern CH-3012 Bern	Renewal and expansion of high academic teaching and advanced infrastructure for analysis of satellite geodetic data in Romania	Romania
IB7320-110996	Thielemann Friedrich K.	Institut für Physik Universität Basel CH-4056 Basel	The role of neutrons and neutrinos in supernovae and their nucleosynthesis	Russia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Biology</b>				
IB73A0-110774	Apel Klaus	Institut für Pflanzenwissenschaften Departement Biologie ETH Zentrum, LFW CH-8092 Zürich	Identification of genes involved in regulation and execution of programmed cell death in <i>Arabidopsis thaliana</i> : a functional genomics approach	Bulgaria
IB73A0-110878	Ban Nenad	Institut für Molekularbiologie und Biophysik ETH-Zürich CH-8093 Zürich	Structural studies of atypical seryl-tRNA synthetase from methanogenic archaea	Croatia
IB73A0-111142	Feller Urs	Institut für Pflanzenwissenschaften Universität Bern CH-3013 Bern	Drought induced leaf protein alterations in wheat (DILPA)	Bulgaria
IB73A0-110988	Hofmann-Lehmann Regina	Veterinärmedizinisches Labor Departement für Nutztiere Vetsuisse-Fakultät der Universität Zürich CH-8057 Zürich	Elaboration of a low-cost microtest for identification, rapid cultivation and antibiotic susceptibility testing of <i>Helicobacter pylori</i> in clinical samples	Moldova
IB73A0-110965	Kohli Jürg	Institut für Zellbiologie Universität Bern CH-3012 Bern	DNA repair and recombination in meiosis of <i>S. pombe</i>	Russia
IB73A0-110990	König Barbara	Verhaltensbiologie Universität Zürich-Irchel CH-8057 Zürich	Ecology, behaviour and population genetics of the forest living Bechstein's bat ( <i>Myotis bechsteinii</i> ) in two glacial refuges: South-Eastern Europe and the Caucasus	Bulgaria/ Georgia/ Russia/ Serbia
IB73A0-110670	Körner Christian	Botanisches Institut Universität Basel CH-4056 Basel	Towards sustainable use of mountain pastures in the Central Caucasus: effects of recent land use changes on plant diversity and soil stability	Georgia
IB73A0-110830	Müller-Schärer Heinz	Unité d'écologie et évolution Département de biologie Université de Fribourg CH-1700 Fribourg	Checklist of alien and invasive plants of Georgia	Georgia

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IB73A0-111064	Pawlowski Jan Wojciech	Département de Zoologie et Biologie Animale Université de Genève CH-1211 Genève 4	Molecular systematics of amoeboid protists	Bulgaria / Russia / Ukraine
IB73A0-110842	Plückthun Andreas	Institut für Biochemie Universität Zürich Irchel CH-8057 Zürich	Mono- and multivalent single-chain-antibody-enzyme fusions as immunotoxins and bifunctional antibody constructs	Russia
IB73A0-111137	Scheidegger Christoph	Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL CH-8903 Birmensdorf ZH	Genetic diversity, ecotype differentiation and population biology of an endangered primeval-forest lichen, <i>Lobardia pulmonaria</i> in a suture zone in the Ural Mountains	Russia



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<b>Chemistry</b>				
IB7420-111017	Buchegger Franz	Service de Médecine Nucléaire CHUV CH-1011 Lausanne	Development of radiotracers based on the radionuclide Y-86 (DRBRY)	Serbia
IB7320-110794	Dyson Paul	Lab. de chimie organométal. et médicinale Inst. des sciences et ingénierie chimique EPFL - SB - ISIC - LCOM CH-1015 Lausanne	Experimental and theoretical investigations of low viscosity ionic liquids	Russia
IB7320-110854	Figgemeier Egbert	Departement Chemie Institut für Anorganische Chemie Universität Basel CH-4004 Basel	Synthesis of doped-nano-structured semi-conductor libraries for high-throughput testing of photocatalytic oxidation processes	Romania
IB7320-110901	Kiwi-Minsker Liubov	Lab. de génie de la réaction chimique Inst. des sciences et ingénierie chimiques EPFL -SB - ISIC -LGRC, Station 6 CH-1015 Lausanne	Innovative reactor combining plasma and structured catalyst for the destruction of industrial pollutants	Romania
IB7320-111072	Kündig Ernst Peter	Département de chimie organique Sciences II Université de Genève CH-1211 Genève 4	Design of multifunctional organic compounds for asymmetric catalysis and new materials	Bulgaria
IB7320-110823	Stoekli-Evans Helen	Institut de Chimie Faculté des Sciences Université de Neuchâtel CH-2007 Neuchâtel 7	Design, synthesis and study of co-ordination compounds of 3d- and 4f-metals using functionalised macro- and heterocyclic ligands for possible medicinal and therapeutic applications	Moldova
IB7320-110961	Wirz Jakob	Departement Chemie Physikalische Chemie Universität Basel CH-4056 Basel	Tautocrowns - new aza crown ethers with active sidearms	Bulgaria

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Climatology, Atmospheric Physics, Aeronomy</b>				
IB7320-110935	Ohmura Atsumu	Institut für Atmosphäre und Klima ETH Zentrum, CHN CH-8092 Zürich	Investigation of the variability of aerosol optical thickness and solar irradiance in an urban environment in Kishinev	Moldova
IB73A0-111134	Saurer Matthias	Bereich Allgemeine Energieforschung Paul Scherrer Institut CH-5232 Villigen PSI	Climatic changes, tree-ring growth and C- and O-isotope variations along longitudinal transects in Siberia and in the Urals	Russia
IB7320-110884	Schmutz Werner	Physikalisch-Meteorologisches Observatorium Davos und Weltstrahlungszentrum CH-7260 Davos Dorf	Modelling of the global ozone and climate evolution in the first half of the XXI century	Russia
IB7320-110831	Staehelin Johannes	Institut für Atmosphäre und Klima ETH Zentrum, CHN CH-8092 Zürich	Variability and long-term trends of tropospheric ozone: Comparison and interpretation of measurements of Caucasian and Central European mountain sites using a Lagrangian approach	Russia / Ukraine

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<b>Communication and Media Sciences</b>				
IB73B0-110932	Cattin Philippe C.	Institut für Bildverarbeitung Dept. Informationstechnologie und Elektrotechnik, ETH Zentrum, ETF Sternwartstrasse 7 CH-8092 Zürich	Non-rigid registration of multi-modal medical images	Bosnia- Herzegovina
IB7310-111027	Hribal Lucie	IPMZ- Inst. für Publizistikwissenschaft und Medienforschung, Universität Zürich CH-8050 Zürich	The role of the mass media for political participation in Kyrgyzstan	Kyrgyzstan
IB7420-111091	Neubauer Wolfram	ETH-Bibliothek CH-8092 Zürich	Launching a central publication platform for grey literature for Romanian universities	Romania

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Earth Sciences</b>				
IB7420-110673	Armbruster Thomas	Laboratorium für chemische und mineralogische Kristallographie Universität Bern CH-3012 Bern	Minerals as advanced materials : reformulating an old discipline	Russia
IB7320-110675	Armbruster Thomas	Laboratorium für chemische und mineralogische Kristallographie Universität Bern CH-3012 Bern	Microporous and nanotubular mineral phases as perspective materials for adsorption and ion exchange applications	Russia
IB7320-111032	Bachofen Reinhard	Institut für Pflanzenbiologie Universität Zürich CH-8008 Zürich	Limnologic and hydrologic assessment of the Buvilla basin (Albania) and its watershed, focused on drinking water use	Albania
IB7320-110694	Burg Jean-Pierre	Geologisches Institut Departement Erdwissenschaften ETH-Zentrum, CHN CH-8092 Zürich	Digital geological and natural hazard maps of the inner Tien-Shan (Kyrgyzstan)	Kyrgyzstan
IB7420-110916	Dominik Janusz	Institut F.-A. Forel Université de Genève CH-1290 Versoix	Network for environmental assessment and remediation in the aquatic systems: environmental curriculum and training at the postgraduate level (NEAR 3)	Bulgaria / Croatia/ Georgia / Romania / Ukraine
IB7320-111130	Heinrich Christoph A.	Institut für Isotopengeologie und mineralische Rohstoffe, ETH-Zentrum Departement Erdwissenschaften CH-8092 Zürich	Metal transport and ore deposition: the geology, geochemistry and geodynamic setting of mineral resources in Bulgaria, Serbia and Romania	Bulgaria / Romania / Serbia
IB7320-110723	Hirt Ann M.	Institut für Geophysik ETH-Hönggerberg CH-8093 Zürich	Environmental applications of soil magnetism for sustainable land use	Bulgaria

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB7320-111046	Moritz Robert	Département de minéralogie Section des Sciences de la Terre Université de Genève CH-1205 Genève	Tectonic and magmatic controls on Cretaceous and Tertiary gold and copper deposits in the Rhodope Massif, the Srednogorie belt and the Caucasus, Bulgaria and Georgia	Bulgaria / Georgia
IB7320-110973	Mosar Jon	Departement für Geowissenschaften Universität Freiburg CH-1700 Fribourg	The Eastern Great Caucasus: geodynamics of an active mountain belt at the cross-road of Europe, Middle-East and Asia	Azerbaijan
IB7320-110885	Spangenberg Jorge	Institut de Minéralogie et de Géochimie Université de Lausanne Bâtiment Humense CH-1015 Lausanne	Permian-Triassic mass extinction in an ancestor of the Adriatic carbonate platform, Croatia	Croatia
IB7320-110693	Strasser Andreas	Département de Géosciences Géologie et Paléontologie Université de Fribourg CH-1700 Fribourg	Sequence stratigraphy and palaeogeography: tools to investigate potential oil and gas resources in Georgia (Caucasus)	Georgia
IB7320-110712	Waber Niklaus	Mineralogisch-petrographisches Institut der Universität Bern CH-3012 Bern	Helium migration from water into natural quartz crystals - a new dating technique for very old pore- and groundwaters	Russia
IB7320-111096	Wehrli Bernhard	Abteilung Oberflächengewässer Forschungszentrum für Limnologie EAWAG Kastanienbaum CH-6047 Kastanienbaum	Assessing the impact of environmental change on aquatic ecosystems in the Danube delta (ECAQUDAN)	Romania / Ukraine
IB7320-111082	Wüest Alfred	Angewandte Gewässerökologie Forschungszentrum für Limnologie EAWAG Kastanienbaum CH-6047 Kastanienbaum	Subaquatic springs in ancient Lake Ohrid - assessment of ecological importance and anthropogenic change	Macedonia

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<b>Economics</b>				
IB7310-111074	Bösch Martin	Forschungsst. für Wirtschaftsgeographie und Raumordnungspolitik (FWR-HSG) Universität St. Gallen CH-9011 St. Gallen	Development of a certification system for sustainable tourism and its application to practical conditions of pilot destinations of Bulgaria	Bulgaria / Croatia / Moldova
IB7310-110891	Gern Jean-Pierre	Centre de recherches sur le développement Université de Neuchâtel CH-2000 Neuchâtel	Conforming to EU standards and efficiency requirements in the SME of Bulgaria: social and economic effects in the food and textile industries	Bulgaria
IB7310-111114	Quade Michael	Fachhochschule beider Basel Institut für angewandte Betriebsökonomie CH-4002 Basel	Research and competency e-government and e-business lab development - REGEBlab	Bulgaria
IB7310-110917	Saner Raymond	Centre for Socio-Eco-Nomic Development, C.P. 1498 CH-1211 Genève 1	Inter-ministerial coordination of trade policy in Macedonia and Kyrgystan	Kyrgyzstan / Macedonia
IB7410-111005	Sturm Jan-Egbert	Konjunkturforschungsstelle ETH Zentrum CH-8092 Zürich	Improving business tendency survey in industry and expanding sectors covered by BTS as a first step of introduction of the nation-wide business tendency surveys in Ukraine	Ukraine

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Engineering Sciences</b>				
IB7320-110942	Avellan François	Lab. de Machines Hydrauliques - LMH Institut des sciences de l'énergie - ISE EPF - Lausanne CH-1007 Lausanne	Turbomachinery swirling flow optimisation and control with technology of magnetorheological fluid systems	Croatia
IB7320-110691	Balemi Silvano	Scuola Universitaria della Svizzera italiana (SUPSI) CH-6928 Manno	A stronger Europe with micro- and nanotechnologies (SEMINA)	Bulgaria / Moldova / Romania
IB7420-110981	de Rooij Nicolaas	Institut de Microtechnique Université de Neuchâtel CH-2007 Neuchâtel 7	Southern Nanoengineering Network (SONNET)	Moldova
IB7320-110902	Gheorghe Adrian	ETH - KOVERS CH-8001 Zürich	Conversion of renewable kinetic energy of water: synthesis, theoretical modelling and experimental evaluation	Romania
IB7320-110974	Hora Pavel	Institut für virtuelle Produktion ETH Zentrum CH-8092 Zürich	Improvement of performances of formability models for sheet metals using new constitutive laws	Romania
IB7420-110931	Kunz Andreas	Institut für Werkzeugmaschinenbau und Fertigungstechnik ETH-Zentrum CH-8092 Zürich	Implementing new collaboration scenarios in education, research and industry	Romania
IB7320-110971	Lacroix Christophe	Labor für Lebensmittelmikrobiologie Institut für Lebensmittel- und Ernährungswissenschaften, ETH-Zentrum CH-8092 Zürich	Bioencapsulation for protection and development of new probiotic bacteria in food and health products	Serbia
IB7320-110997	Lanza Michele	Facoltà di scienze informatiche Università della Svizzera Italiana CH-6900 Lugano	Network of reengineering expertise (NOREX)	Romania

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB7420-111104	Morari Manfred	Institut für Automatik ETH-Zentrum CH-8092 Zürich	Advanced process engineering for Master and joint PhD education	Romania
IB7320-111146	Moser Eva Maria	École d'ingénieurs de Genève Université de Genève CH-1202 Genève	Surface engineering of nanostructural coatings on aluminium for environmentally friendly anticorrosion protection	Ukraine



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<b>Environmental Sciences</b>				
IB73A0-111034	Clot Bernard	MeteoSuisse Station Aérologique CH-1530 Payerne	Monitoring and forecasting airborne ragweed pollen concentrations in the south-eastern part of its European distribution	Albania / Bulgaria / Macedonia / Serbia
IB7310-110915	Maignan Michel	Inst. de Minéralogie et Géochimie Faculté des Géosciences et de l'Environnem. Univ. de Lausanne, Bâtiment Humense 4141 Quartier UNIL-Dorigny CH-1015 Lausanne	Creation of GIS for health risk assessment of the population of Bishkek city	Kyrgyzstan
IB7320-110933	Slaveykova-Startcheva Vera	Institut des sciences et technologies de l'environnement ISTE - ENAC - EPFL Bâtiment GR, Station 2 CH-1015 Lausanne	Black Sea Ecotoxicity Assessment (BSEA)	Bulgaria

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>History</b>				
IB7310-110815	Berelowitch Wladimir	Unité Russe Département MESLO Université de Genève CH-1205 Genève	Education and internal divisions of elites in modern Eastern Europe	Bulgaria / Romania / Russia / Serbia
IB7410-111133	Hauser Martin	Institut interdisciplinaire d'éthique et des droits de l'homme, Université de Fribourg CH-1700 Fribourg	Are there essential differences between East and West? South East and Western Europe in a comparative framework	Moldova
IB7410-111056	Weichlein Siegfried	Seminar für Zeitgeschichte Universität Fribourg CH-1700 Fribourg	Institutionalisation of scientific networks and scholarly activities for the promotion of cross-cultural and inter-disciplinary approaches on nationalism in the Europe of small nations	Bulgaria

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Law</b>				
IB7410-110980	Kälin Walter	Seminar für öffentliches Recht Universität Bern CH-3012 Bern	Swiss-Georgian International co-operation in legal education	Georgia
IB7310-111055	Killias Martin	Ecole des Sciences Criminelles ESC Institut de criminologie et de droit pénal Bâtiment de Chimie, Université de Lausanne CH-1015 Lausanne	International self-reported delinquency study in Russia and Armenia	Armenia / Russia

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<b>Linguistics</b>				
IB7410-111065	Aubert Jean-Jacques	Institut des Sciences de l'Antiquité Faculté des Lettres et Sciences Humaines Université de Neuchâtel CH-2000 Neuchâtel	Development and implementation of master studies in didactics of classical languages	Macedonia
IB7310-110968	Bearth Thomas	Seminar für Allgemeine Sprachwissenschaft Universität Zürich CH-8032 Zürich	Exploring an African terra incognita: lexicology and reconstruction in South Mande languages	Russia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Materials Sciences</b>				
IB7320-110976	Decurtins Silvio	Departement für Chemie und Biochemie Universität Bern CH-3012 Bern	New approaches for building potential magnetic materials: from isolated metal clusters to molecule-based magnets	Moldova
IB7320-111015	Günter Peter	Laboratorium für Nichtlineare Optik Institut für Quantenelektronik ETH-Hönggerberg CH-8093 Zürich	Chalcogenide crystals for all-optical photonics devices in the near infrared	Ukraine
IB7320-110977	Hafner Christian	Inst. für Feldtheorie und Höchstfrequenztechnik ETH-Zentrum CH-8092 Zürich	Simulation and synthesis of metamaterials for electromagnetics and optics	Georgia
IB7320-111101	Klotz Ulrich	Eidg. Materialprüfungs- und Forschungsanstalt (EMPA) CH-8600 Dübendorf	Influence of atomic arrangement changes on phase equilibria near the liquidus curve in Cu-Sn-based alloys	Ukraine
IB7320-110726	Meier Wolfgang	Departement Chemie Physikalische Chemie Universität Basel CH-4056 Basel	Strengthening and expert knowledge accumulation and dissemination through high quality research on self-assembled polymeric nanotubes (POLYTUBE)	Bulgaria
IB7320-111151	Wandrey Jutta Christine	Laboratoire de médecine régénérative et de pharmacobiologie 2 EPFL - SB - ISIC - LMRP2 AAB, Station 15 CH-1015 Lausanne	Stimuli-responsive and self-organizing polymers: Molecular and functionality design for medical, pharmaceutical and biotechnological applications	Bulgaria
IB7320-110681	Yvon Klaus	Laboratoire de Cristallographie Université de Genève CH-1211 Genève 4	Refractory metal hydrides by self-propagating high-temperature synthesis	Armenia

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<b>Mathematics</b>				
IB7320-111079	Gander Walter	CSE-Colab ETHZ CH-8001 Zürich	New methods for quadrature	Bulgaria / Serbia
IB7320-110720	Giordano Silvia	Scuola Universitaria della Svizzera italiana (SUPSI) CH-6928 Manno	New priority disciplines and algorithms in queueing analysis	Moldova
IB7420-111041	Jeltsch Rolf	Seminar für Angewandte Mathematik ETH-Zentrum CH-8092 Zürich	Supporting the Bologna process in applied mathematics and computer science at the Tbilisi State University in Georgia	Georgia
IB7320-110721	Ratiu Tudor	Chaire d'analyse géométrique EPFL - SB - IMB - CAG Bâtiment MA, Station 8 CH-1015 Lausanne	Applied symplectic geometry and modelling of materials	Romania

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Medicine</b>				
IB74B0-111076	Danuser-Nideröst Brigitta	Institut Universitaire Romand de Santé au Travail Université de Lausanne CH-1005 Lausanne	Development of core curriculum in occupational health	Croatia / Macedonia / Serbia
IB74B0-110928	Deplazes Peter	Institut für Parasitologie Universität Zürich CH-8057 Zürich	Development of educational and research tools for the study of parasitic zoonoses in Kyrgyzstan	Kyrgyzstan
IB74B0-110998	Exner Gerhard U.	Orthopädische Klinik Balgrist Universität Zürich CH-8008 Zürich	Enhancing the teaching and training in paediatric and tumor orthopaedics in Armenia	Armenia
IB73B0-110957	Friis Robert Reaney	Departement Klinische Forschung Medizinische Fakultät Universität Bern CH-3004 Bern	The control of TWIST and other effectors of epithelium-mesenchymal transition in breast cancer	Bosnia-Herzegovina
IB73B0-110719	Izui Shozo	Département de Pathologie et Immunologie Faculté de Médecine, Université de Genève Centre Médical Universitaire CH-1211 Genève 4	Selective silencing of auto-aggressive B cells in animal models of autoimmune diseases	Bulgaria
IB74B0-111111	Krähenbühl Lukas	Chirurgische Klinik Kantonsspital Freiburg CH-1708 Fribourg	Transforming Pius Brnzeu Center of Laparoscopic Surgery and Microsurgery (PBCLSM) Timisoara into Eastern European Zonal Center of Development and Research in Laparoscopic Surgery	Romania
IB73B0-110892	Larkum Matthew Evan	Physiologisches Institut Universität Bern CH-3012 Bern	Pattern-forming roles of heterogeneous dendritic geometry and synaptic input in electrical activity of neocortical pyramidal neurons	Ukraine

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB74B0-110911	Leuenberger Hans	Institut für pharmazeutische Technologie Departement Pharmazie, Universität Basel CH-4056 Basel	New concepts in training industrial pharmacists and pharmaceutical engineers to be developed and implemented at the Russian-Swiss scientific and educational centre in MUCTR	Russia
IB74B0-110992	Leumann Ernst Pieter	Kinderspital Zürich Universitäts-Kinderklinik CH-8032 Zürich	Implementation of a new teaching concept in Lviv and Chisinau via Yerevan for selected paediatric disciplines	Armenia / Moldova / Ukraine
IB74B0-111081	Lipp Hans-Peter	Anatomisches Institut Universität Zürich CH-8057 Zürich	Anchoring European integration of behavioural brain research at Moscow State University	Russia
IB73B0-111016	Martin Ivan	Institut für Chirurgische Forschung und Spitalmanagement Universitätsspital Basel CH-4031 Basel	Development, validation and modelling of a novel bioreactor system for cartilage tissue engineering	Serbia
IB73B0-110939	Michel Patrik	Service de Neurologie CHUV CH-1011 Lausanne	Stroke survival, recurrence and mortality in Tbilisi, Georgia: a population-based follow-up study	Georgia
IB74B0-110810	Oberholzer Martin	Institut für Pathologie Universitätsspital Basel CH-4031 Basel	Clinical and educational telemedicine network between Uzbekistan and Switzerland	Uzbekistan
IB74A0-110940	Rüegg Urs T.	Laboratoire de pharmacie galénique Section des Sciences pharmaceutiques Université de Genève CH-1211 Genève 4	Calcium dysregulation as a trigger of apoptosis in muscular dystrophy	Russia
IB74B0-111086	Seeck Margitta	Unité d'éval. préchirurgicale de l'épilepsie Dépt. Neurosciences cliniques et dermatol. Hôpital Cantonal Universitaire CH-1211 Genève 14	Transition to modern epilepsy care in Moldova	Moldova



No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Philosophy</b>				
IB7310-110912	Calzolari Bouvier Valentina	Faculté des Lettres Unité d'Arménien Université de Genève CH-1205 Genève	The work of David the Invincible: the diffusion of neoplatonic thought and the spread of neoplatonic texts in Ancient and Medieval Armenia	Armenia
IB7310-110962	Graeser Andreas	Institut für Philosophie Universität Bern, Unitobler CH-3000 Bern 9	Recognition and intersubjectivity. Towards a foundation of democratic society	Georgia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Physics</b>				
IB7320-110859	Allenspach Peter	Laboratorium für Neutronenstreuung Paul Scherrer Institut CH-5232 Villigen PSI	Magnetic and electronic properties of cobalt-based perovskites under extreme conditions (external magnetic field, pressure and temperature). COPEC	Russia
IB7320-110869	Ansermet Jean-Philippe	Lab. de physique des mat. nanostructurés EPFL - SB - IPN -LPMN CH-1015 Lausanne	Mn and Cu doped nanowires prepared by electrodeposition in ion track templates	Romania
IB7320-110918	Blondel Alain	Département de physique nucléaire et corpusculaire, Université de Genève CH-1211 Genève 4	Joint Swiss-Bulgarian project in neutrino physics (BUCHNEU)	Bulgaria
IB7420-110914	Blondel Alain	Département de physique nucléaire et corpusculaire, Université de Genève CH-1211 Genève 4	Modernization of education in nuclear and particle physics - Swiss-Bulgarian partnership (BUCHEDU)	Bulgaria
IB7320-111050	Chergui Majed	Lab. de spectroscopie ultrarapide Inst. des sciences et ingénierie chimiques EPFL- SB - ISIC - LSU CH-1015 Lausanne	Experimental and theoretical investigation of the shape effects on the optical and dynamical properties of metallic nanoparticles	Armenia
IB7320-111135	Dissertori Günther	Institut für Teilchenphysik ETH - Höggerberg CH-8093 Zürich	Preparation and exploitation of the first data taking at the Large Hadron Collider	Serbia
IB7420-110873	Feurer Thomas	Institut für angewandte Physik Universität Bern CH-3012 Bern	Crystals and optical fibres for novel diode-pumped femtosecond laser systems and applications in nanoprocessing of advanced materials	Russia
IB7320-111044	Forro Laszlo	Laboratoire de nanostructures et nouveaux matériaux électroniques LNNME - IPMC - EPF - Lausanne Bâtiment PH, Station 3 CH-1015 Lausanne	Thermal-transport and magnetic properties of highly frustrated magnets	Croatia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB7320-111073	Hoffmann Patrick	Laboratoire d'optique appliquée Institut d'imagerie et optique appliquée EPFL - STI - IOA - LOA Bâtiment BM, Station 17 CH-1015 Lausanne	Deposition - characterization - irradiation of chalcogenide films for lithography (DECHIR-CHAFLI)	Romania / Russia
IB7320-110986	Kapon Eli	Laboratoire de physique des nanostructures LPN - IPEQ - SB - EPFL Bâtiment PH, Station 3 CH-1015 Lausanne	Confined excitons: interaction and localisation effects	Russia
IB7420-110784	Keller Hugo	Physik-Institut Universität Zürich-Irchel CH-8057 Zürich	Nanoscale properties of high-temperature superconducting cuprates and related compounds probed by the magnetic resonance techniques	Georgia / Russia
IB7420-110849	Mesot Joël	Laboratorium für Neutronenstreuung Paul Scherrer Institut CH-5232 Villigen PSI	Research and education using neutron scattering experiments (RENSE)	Russia / Usbekistan
IB7420-111116	Pescia Danilo	Laboratorium für Festkörperphysik ETH-Hönggerberg, HPF CH-8093 Zürich	Improvement of teaching methods and development of new curricula of the course of general physics and of physics at schools	Russia
IB7320-110923	Popovic Radivoje	Lab. de microsystemes 3 Inst. de microélectronique et microsystem EPFL -STI - IMM - LMIS3 Bâtiment BM, Station 17 CH-1015 Lausanne	Micro-nano cantilever based detection of small electromagnetic forces	Serbia
IB7320-110921	Shklover Valery	Laboratorium für Kristallographie ETH-Hönggerberg CH-8093 Zürich	Development of physical principles of new type of sensitive "continuous" focal plane arrays for Terahertz radiation detection	Moldova / Russia
IB7420-110666	Sigg Hans	Labor für Mikro- und Nanostrukturen Paul Scherrer Institut CH-5232 Villigen PSI	Development of scientific and technical cooperation for investigations of Si-Ge-C nanostructures	Russia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
IB7320-110970	Sukhorukov Euguene	Département de Physique Théorique Université de Genève CH-1211 Genève	Spin-dependent transport in silicon gate-controlled rings	Russia
IB7420-111038	Tiwari Ayodhya Nath	Gruppe Dünnschichtphysik Laboratorium für Festkörperphysik ETHZ-Technopark CH-8005 Zürich	Development of stable and high efficiency CdTe solar cells and mini-modules	Moldova / Ukraine
IB7320-111004	Tregenna-Piggott Philip Louis	Laboratorium für Neutronenstreuung Paul Scherrer Institut CH-5232 Villigen PSI	Experimental and theoretical study of exchange and vibronic interactions in compounds containing orbitally degenerate or quasi-degenerate metal ions: Prospects for practical applications	Moldova
IB7420-110851	Tröster Gerhard	Institut für Elektronik ETH-Zentrum CH-8092 Zürich	Swiss-Bulgarian network in education and research in packaging in micro-electronics	Bulgaria
IB7320-110684	Weis Antoine	Département de physique Université de Fribourg CH-1700 Fribourg	Tunable frequency locking of a diode laser to atomic resonance lines using atomic vapor nanolayers	Armenia
IB7320-110848	Wiese Uwe-Jens	Institut für theoretische Physik Universität Bern CH-3012 Bern	Nonperturbative dynamics in planar condensed matter systems	Ukraine
IB7320-111057	Witzigmann Bernd	Institut für Integrierte Systeme ETH - Zentrum CH-8092 Zürich	Correct wavelength-scale computer simulation of resonant-cavity light emitting diodes by an advanced method of single expression	Armenia
IB7320-111105	Zaharko Oksana	Laboratorium für Neutronenstreuung Paul Scherrer Institut CH-5232 Villigen PSI	Sparsely connected antiferromagnets: ground states, clusters and domains	Croatia
IB7320-110987	Zogg Hans	Lab. für Festkörperphysik Technopark Zürich, ETHZ CH-8005 Zürich	Lead chalcogenide infrared optoelectronic devices	Russia

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Political and Social Sciences</b>				
IB7310-110958	Hayoz Nicolas	Dept. Gesellschaftswissenschaften Universität Freiburg CH-1700 Fribourg	Civil society, trust and democratisation in Russia	Russia
IB7410-115187	Hayoz Nicolas	Dept. Gesellschaftswissenschaften Universität Freiburg CH-1700 Fribourg	Social Sciences in changing contexts: the Georgian case	Georgia
IB7310-110898	Kübler Daniel	Institut für Politikwissenschaft Universität Zürich CH-8001 Zürich	Bosnia and Herzegovina: territorial organisation and inter-regional co-operation. Challenging ideologies with strategic planning	Bosnia-Herzegovina
IB7310-111103	Meessen Heino	Centre for Development and Environment Institute of Geography University of Berne CH-3008 Bern	Sustainable development of mountain regions for countries in transition (SMD-T): an appraisal of options for sustainable development with case studies in Caucasus mountain villages	Russia
IB7310-110881	Spini Dario	Centre lémanique d'étude des parcours et modes de vie (PaVie), Université de Lausanne et de Genève, Bâtiment Provence CH-1015 Lausanne	Transition to adulthood and collective experiences in former Yugoslavia (TRACES)	Croatia / Serbia
IB7410-110880	Zürcher Dieter	NADEL ETH-Zentrum CH-8092 Zürich	Capacity building through research partnership: A case study on decentralisation and governance in Northern Albania	Albania

No.	Co-ordinator	Institution	Title of JRP / IP	Partner countries
<b>Religious Sciences, Theology</b>				
IB7410-110708	Dietrich Walter	Christkatholische und Evangelische Theologische Fakultät Universität Bern, Unitobler CH-3000 Bern 9	Christianity and society	Romania
IB7410-111026	Dubied Pierre-Luigi	Faculté de théologie Université de Neuchâtel CH-2000 Neuchâtel	Consolidation of hermeneutical knowledge and competences and study of religious culture at the state universities of Omsk and Kurga (Russia).	Russia
IB7410-110837	Gisel Pierre	Faculté de théologie Université de Lausanne, BFSH 2 CH-1015 Lausanne	The status of religion in Romania in regard to European society: religion, state of law, social and cultural data	Romania



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## **SCOPES 2005-2008: Abstracts of supported Joint Research Projects and Institutional Partnerships**

The abstracts of the JRP and IP are arranged numerically.

May 2007

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110666 – Sigg Hans (formerly Grützmacher)

**Title: Development of scientific and technical cooperation for investigations of Si-Ge-C nanostructures**

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**Keywords:**

semiconductor heterostructures and superlattices, nanotechnology, solid state films, semiconductor nanotubes

**Abstract:**

The present IP is a follow up of a previous IP which aimed to strengthen and to develop long-term scientific and technical co-operation in the field of semiconductor nanotechnology and mesoscopic physics with the Academy of Sciences in Novosibirsk and in Minsk. This very successful collaboration, which already led also to common research proposals, will be expanded by adding the University of Nizhny Novgorod to the team. To continue the co-operation with the Belarussian Academy of Sciences in Minsk, it will be included as a subcontractor in this project. Within the IP special emphasis is put on the exchange of experiences in Si based materials, like SiGe and SiGeC alloys. Semiconductor superlattices, nanotubes and other 3-dimensional nano-objects will be taken as scientific vehicle to intensify the already existing scientific collaboration between the partners. The goal is to improve the research infrastructure of the partners by means of modernization of experimental equipment and to transfer know-how of technological fabrication processes and characterisation techniques for semiconductor nanostructures and compare obtained results with model calculations. Thus one goal of the proposed project is to initiate ties between experimental and theoretical physicists working in similar fields. The results of the IP are expected to serve as a basis for following joint research initiatives.

The scientific background of the institutional partnership is given by the rapidly evolving field of silicon based nanoelectronics, which demands close collaborations among research institutes on an international level as well as with industrial laboratories. Si semiconductor technology is the main driving force in nanotechnology. However, next to microelectronics, also micromechanics and molecular sensors make use of advances in the Si nanotechnology. The decrease in device size and the increase in the packaging density in all these areas, demands the development of sophisticated technologies and instruments in Si nanotechnology. In addition new concepts for devices, fabrication and modelling are required.



The development of nanotechnology offers new possibilities and routes to address the demands of future Si device technology.

The experimental verification of new concepts and ideas in semiconductor nanotechnology often requires large investments in the technology, which is an increasing problem in many eastern European countries and the States formerly forming the Soviet Union. On the one hand this lack of instrumentation inspired physicists in these countries to develop non-conventional methods, on the other hand it led to a lack of knowledge in handling new technology and about its possibilities for modern nanotechnology. The second impact caused by the lack of expensive instrumentation, is that many Eastern universities focussed strong efforts on theoretical physics. However, due to the lack of technology these theories often suffer from experimental verification. At the same time Western laboratories are typically well equipped, but they may experience two problems. First, the number of students in physics has decreased substantially in the last years, also driven by the economic weakness leading to a lower demand in manpower, in particular in the semiconductor industry. Second, the semiconductor science was driven by mainstream technology leaving little room for innovative concepts. These circumstances will lead to the foreseeable problem that in the case of economic recovery there will be a lack of highly educated personnel in innovative Si technology. Thus the proposed project has the purpose to join these different backgrounds to evaluate the possibilities to integrate innovative concepts, sophisticated technology and high level model calculations. This will require the introduction of modern technology to the physicists of Eastern countries and the teaching of their new ideas and concepts to the Western scientists and also allows to verify and further develop theoretical concepts. Thus the present IP aims to strengthen and to develop long-term scientific and technical cooperation in the field of semiconductor nanotechnology using group IV alloys. In this context it should be noted that a collaboration among the LMN/PSI and the Laboratory of Three-Dimensional Nanostructures (LTDN)/ISP in Novosibirsk started in autumn of 2000 by a visit of Dr. V. Prinz at the PSI. He suggested a new technique for the preparation of nanotubes using strained semiconductor heterostructures /1,2/. Within the past IP it was successfully shown that the concept of integrating novel paths in nanotechnology and state of the art processing equipment leads to remarkable progress. Within several visits young scientists from Novosibirsk could be trained in clean room processing. At the same time young scientists from PSI learned about new ideas and concepts in producing nanostructures. This an excellent example how transfer of know how can be of mutual interest for all partners. Several joint publication have been published /3-7/ and the results were presented at several workshops and international conferences. For better understanding of the observed phenomena as well as to integrate theoretical physics with advanced nanotechnology we added in the proposed IP the group in Nizhny Novgorod. Within this new IP we wish to continue and expand this collaboration. It is anticipated that this institutional partnership will lead also to intense scientific collaboration manifested in additional research-oriented projects. In particular since these new structures of semiconductor nanostructures have not been explored in terms of there mechanical, electrical and optical properties. In order to achieve a base line for present and future scientific collaboration the present IP is needed as the backbone.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110670 – Körner Christian

**Title: Towards sustainable use of mountain pastures in the Central Caucasus: effects of recent landuse changes on plant diversity and soil stability**

**Co-ordinator:**

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**Partners:**

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**Keywords:**

landuse, agriculture, erosion, biodiversity, Caucasus, mountain ecology, water, productivity, cattle

**Abstract:**

The Caucasus region is one of the biologically richest parts of the world, is inhabited by a dense rural population that practiced sustainable pasturing with sheep for as long as we know. In the region around Kasbegi in the Republic of Georgia, ca. 4 hours north of Tbilisi, it was custom to overwinter herds in the northern foothills of the main divide, an area now inaccessible for political reasons. In addition, market conditions changed, and as a consequence strictly shepherded herds of sheep were replaced by small breeds of cattle, with loose or no shepherding at all during the day. This leads to visible deterioration of steep slopes, with erosion not only devaluating pastures but also endangering settlements and traffic routes. This project, locally conducted by our partners of the Georgian Academy of Sciences under the leadership of Prof. Gia Nakhutsrishvili and his senior researchers Dr. Otar Abdaladze and Dr. Maia Akhalkatsi, explores the significance of land use and biodiversity on productivity and erodability of steep slopes using a replicated fencing trial. Much of the work is conducted by two Georgian doctoral students, who will start their work in Sno Valley at 1700 m during the 2006 growing season.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110673– Armbruster Thomas

**Title: Minerals as Advanced Materials: Reformulating an Old Discipline**

**Co-ordinator:**

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**Keywords:**

mineralogy, teaching initiative, material science, nanotechnology, biotechnology

**Abstract:**

The project involves collaboration between two organization units, Laboratory of Chemical and Mineralogical Crystallography, University of Bern, and Department of Crystallography, Faculty of Geology, St.Petersburg State University, in establishing a new interdisciplinary teaching initiative “Minerals as Advanced Materials”. Its idea is to introduce a new applied-oriented mineralogical research with direct relevance to the current needs of modern industry and technology. The current trends in material science are closely related with such directions as microporous and mesoporous materials, nanostructures and nanomaterials for nanotechnology applications, biomimetic and bioinspired materials for biotechnology applications. These directions can be associated with corresponding mineralogical research directions: porous mineral structures, nanostructures in minerals and biomineralogy. The introduction of the new material-science mineralogical direction with special attention to nano- and biotechnology will support strong modernization of geological and crystallographic education and can potentially induce revolutionary changes in our thinking about mineral world and its structural organization. The project includes the following activities: elaboration of a new course in mineralogical material science and publication of lecture notes by the St.Petersburg University Press, invitation of Prof. T. Armbruster (University of Bern) to St.Petersburg University to give lectures on natural zeolites as perspective industrial materials, and modular mineralogy as a theoretical model and as a tool in engineering design of new materials, organization of a two-days education-oriented workshop “Minerals as Advanced Materials: a New Look at Old Discipline” in St.Petersburg in 2007. The project will represent an important step towards modernization of Russian education system in order to make it more efficient and attractive in the today world of high technologies. It will introduce a strong applied-oriented character to the mineralogy teaching with emphasis on high-technology-related research. By doing so, it will make scientific carrier in mineralogy and crystallography more exciting and therefore more attractive to young Russian population. It is expected that the project will make its own contribution to the improvement of Russian economic development towards a modern economy system which involves combination of advanced technologies and intelligent population.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110675 – Armbruster Thomas

**Title: Microporous and Nanotubular Mineral Phases as Perspective Materials for Adsorption and Ion Exchange Applications**

**Co-ordinator:**

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**Keywords:**

microporous frameworks, nanostructures, minerals, crystal structure, Kola peninsula

**Abstract:**

The project is directed towards investigation of mineral phases based upon microporous frameworks and nanotubular structures as perspective materials for ion-exchange and adsorption applications, in particular, for removal of radionuclides Cs-137 and Sr-90 from nuclear waste solutions. The project involves: investigations of chemical variabilities and occurrences of microporous framework and nanotubular mineral phases of natural origin found in alkaline massifs of the Kola peninsula; ion-exchange and adsorption experiments using Cs- and Sr-rich solutions; structural investigations of 'fresh' and ion-exchanged crystals using modern diffraction techniques of X-ray crystal structure analysis such as CCD area diffractometers and third-generation synchrotron X-ray radiation. Major attention will be focused on minerals of the labuntsovite group, vinogradovite-related minerals, zorite and chivruaiite-related minerals, microporous manganese silicates with pillared structures, double layer titanosilicate heterophyllosilicates, yuksporite-related phases and charoite. Identification of phases with potential technological applications will be based upon relevant structural features such as size of windows, presence of channels/cavities, their dimensions and connectivity, flexibility of frameworks and success of ion-exchange experiments on 'fresh' and thermally treated mineral samples verified by chemical analyses and structure refinements of exchanged phases. The project is based upon active participation of three research groups: Prof. T. Armbruster structural mineralogy and zeolites group at the Laboratory of chemical and mineralogical crystallography, University of Berne, equipped with modern CCD area detector diffractometer, Prof. S.V. Krivovichev's group at the Department of Crystallography, St.Petersburg State University, and Dr. V.N. Yakovenchuk's mineralogy group at the Kola Science center of the Russian Academy of Sciences, Apatity, Russia. The project involves active interaction of the teams based upon complementary experience and available resources and techniques. The research results will be used for identification of new mineral-like high-selective radiation-resistant ion-exchangers for nuclear wastewater cleaning technologies.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110681 – Yvon Klaus

**Title: Refractory Metal Hydrides by Self-Propagating High-Temperature Synthesis**

**Co-ordinator:**

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**Partner:**

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**Keywords:**

refractory metals, SHS synthesis, metal hydrides

**Abstract:**

Refractory metal compounds and their hydrides are of major interest in science and technology. In view of their unique physical and chemical properties, the spectrum of possible applications is very wide, in particular in the fields of hydrogen storage for the transportation sector, hydrogen power engineering, powder metallurgy, chemical industry, nuclear engineering etc. However, an aspect that currently limits a more widespread application of these materials is their relatively laborious method of synthesis. Current methods consist essentially of a two-step procedure that starts with the preparation of the alloys, for example by melting of the constituents at high temperature, and then proceeds with hydrogenation, also at elevated temperature. This way of doing so is relatively time and energy consuming, and thus expensive. A more efficient and less expensive way of synthesizing such materials is currently explored at the Institute of Chemical Physics of the National Academy of Sciences of Armenia. Based on a systematic investigation of the combustion processes of metals and alloys in hydrogen atmosphere it appears that refractory metal hydrides can be obtained in a single step. This so-called "Self-Propagating High-Temperature Synthesis" (SHS) technique has various advantages over existing methods of hydride synthesis, in particular regarding costs and yields. The newly developed method has so far no analogue in the world and has the potential of providing inexpensive metal hydrides in large quantities and thus a safe and volume efficient way of storing hydrogen (energy). During our past collaboration we have explored a few refractory metal hydride systems. Some titanium and zirconium based carbo-hydrides have been synthesized in relatively small quantities (~100g) by the SHS technique and examined with respect to thermodynamic and structural properties. The results were encouraging in the sense that the quality of the materials and their properties were similar to, and occasionally better than those of, similar materials synthesized by conventional methods. In this Joint Research Project we shall explore the possibility of obtaining larger quantities of such materials, including such in other promising systems. In particular, we shall investigate new refractory metal hydride systems based on 4-th and 5-th group metals (Ti, Zr, V), carbon and nitrogen that can be charged to high hydrogen contents. In case of favorable properties for applications their synthesis by the SHS technique will be upscaled to the kilogram region. The expected results are likely to be applicable to industry since they will provide a cheaper, more energy and time consuming, and a cleaner and safer production of refractory metal hydrides of high quality.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110684 – Weis Antoine

**Title: Tunable locking of diode laser radiation frequency to atomic resonance lines using atomic vapor nanolayers**

**Co-ordinator:**

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**Partner:**

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**Keywords:**

high resolution spectroscopy, selective reflection, frequency stabilization, nano-cells

**Abstract:**

Goals of the project

Investigations of physical processes in 2-dimensional atomic vapours with a layer thickness in the nm range (atomic nanolayers) with the purpose of stabilizing (in a tuneable way) the frequency of a laser. The Fribourg atomic physics group led by Prof. Antoine Weis and a team of scientists from the Institute for Physical Research, Ashtarak, led by Dr. Sc. David Sarkisyan join their common and complementary expertise for realizing these goals. We will use the Zeeman effect in nanometric Rb and Cs cells and selective reflection spectroscopy from Cs or Rb cells with windows of tuneable thickness for the active feedback control of the injection current of diode lasers. We will study the reliability, stability, and tuning range of the frequency locking scheme based on both processes and implement the locking scheme in specific set-ups, e.g. in atomic magnetometers.

Context and relevance of the project

The topics are of interest in the field of high resolution laser spectroscopy of atomic media and for practical applications. Most of past frequency stabilization methods provide a small frequency jitter and good long-term stability, but do not offer the possibility of tuning the locked frequency. For many applications this tuning may be quite important. The merits of the novel tuneable locking schemes to be developed in this project will be demonstrated by implementing them in an optical magnetometer setup in which they may prove useful for realizing lightweight portable devices.

Scientific frame and methodology

Based on preliminary experimental results from the atomic spectroscopy of sub-micron thick vapour layers of the Armenian team, the present proposal will investigate novel optical schemes, which have the potential to be competitive with the known schemes. We will collect quantitative data in the linear and nonlinear regimes of the Zeeman effect of various hyperfine transitions in sub-micron thick Rb and Cs vapour cells; gain a better understanding of the SR response of atomic medium using a temperature-controllable reflection coefficient of the cell window. We will further realize the continuous tuning of the locked diode laser frequency over 100 MHz around the centres of individual hyperfine components of the D lines of 85Rb, 87Rb, and 133Cs.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110691 – Balemi Silvano

**Title: A Stronger Europe with MIcro- and Nanotechnologies (SEMINA)**

**Co-ordinator:**

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**Keywords:**

ultra-high precision compliant mechanisms, hinges optimization

**Abstract:**

The proposed joint research project of a Swiss and a Eastern European (Croatian) academic institution will not only allow to meet a marked need for high and ultra-high precision compliant positioning mechanisms and the resulting mechatronic devices for applications in precision engineering and in the micro- and nanotechnologies, but also to enhance the capacities of both project partners in carrying out successfully interdisciplinary network research projects. The developed theoretical and experimental procedures will broaden the fundamental knowledge in the cited fields, while, concurrently, the obtained integrated mechatronic devices will constitute an important step towards a systematic approach of designing high and ultra-high precision equipment and instrumentation. This all will, in turn, allow immediate positive impacts on the small and medium-size enterprises in the emerging fields of handling and assembly of microstructures, of production of micro-electro-mechanical systems (MEMS), of measuring and scientific (AFM, STM) equipment, of IT peripheral devices, of precision machine tools. From the methodological point of view, new analytical and numerical structural calculation methods will be developed and coupled with optimisation and control design issues. A broad usage of numerical and algebraic manipulators as well as of computational technologies is foreseen. The obtained hinges shapes will then be validated experimentally. For this purpose monolithic compliant devices will be produced in metallic alloys and photoelastic materials via wire electro-discharge machining (EDM) and/or high precision milling. The experimental data will be collected via an automated data acquisition system. Photoelastic measurement benches and interferometric measurement techniques will also be used.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110693 – Strasser Andreas

**Title: Sequence stratigraphy and palaeogeography: tools to investigate potential oil and gas resources in Georgia (Caucasus)**

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### Keywords:

Geology; sequence stratigraphy; palaeogeography; natural resources; Georgia; Caucasus

### Abstract:

Sedimentary sequences contain a sensitive record of the geological and geographical history of the region where they have been deposited. Marginal-marine basins are particularly sensitive to environmental changes: the sequences there record timing and amplitude of these changes and provide information on the mechanisms triggering them. This information can be extracted using techniques such as sequence stratigraphy, which in turn is based on detailed sedimentological and (micro-)palaeontological analyses. The goal is to trace the distribution of sedimentary facies and depositional sequences in time and space. The interest is not only academic to reach a better understanding of past environmental changes, but also economic because certain facies and certain parts of the sequences may contain natural resources (oil, gas, minerals).

The proposed research aims to investigate Sarmatian (Middle-Late Miocene) deposits in Georgia, which palaeogeographically belonged to the eastern Paratethys realm. Sedimentological, biostratigraphical, and sequence stratigraphical methods will be employed.

Expected results are:

- identification and dating of the depositional sequences;
- tracing their geometry and facies in space and time;
- developing a palaeogeographical model of the region during the Middle-Late Miocene.

By using a sequence-stratigraphic approach rather than standard biostratigraphic subdivisions, the resulting palaeogeographic maps will be much more precise than the existing ones and will better reveal the environmental changes within the Miocene basins of Georgia.



This approach will also provide the framework to interpret the relative sea-level changes that affected the study area during the Middle-Late Miocene and will allow their correlation with over-regionally recognized eustatic changes. Sequence correlation between several basins in Georgia will reveal if there is a causal link between sequence boundaries and global sea-level fluctuations, if sequence boundaries are related to regional tectonic movements, or if they are caused by the interaction of both phenomena.

The proposed multidisciplinary investigation of Sarmatian deposits in Georgia will also provide the framework for the improved exploration of mineral deposits and the identification of potential new oil and gas fields. It is hoped that this research will contribute to the socio-economic development of Georgia in spinning-off hydrocarbon research. This research is presently in the hands of British oil companies, where Georgians have only a marginal role to play. Therefore, enhancing the professional qualifications of Georgian scientists contributes to improving their employment opportunities in this field.

The confrontation with new techniques and state-of-the-art interpretation of geological data as well as the contacts with colleagues from western Europe will allow the Georgian partners involved in this project to improve their knowledge and to train a new generation of young scientists in Georgian universities. As a final goal, this project will contribute to bridge the present gap in communication and co-operation with western countries.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110694 – Burg Jean-Pierre

**Title: Digital Geological and Natural Hazard Maps of the Inner Tien-Shan(Kyrgyzstan)**

**Co-ordinator:**

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**Keywords:**

Kyrgyzstan, seismic hazards, Tien-Shan, geology

**Abstract:**

This project will produce a digital geological map at the scale 1: 200 000 and the associated explanatory notes on the western Tien-Shan. The western segment of “the major Tien-Shan structural line” (the “Nikolaev Line”) is reputedly separating the Hercynides and the Caledonides of the Tien-Shan Mountains. The international literature on regional and global reconstructions of the Paleozoic systems is flawed and often erroneous because the information about this zone remains concealed. Perhaps more than the scientific aspects, we are particularly alarmed by the highly sensitive societal issues that this region raises. The Suusamyр earthquake (1992, M=7.3) was unexpected both by inhabitants and by the world scientists because the Inner Tien Shan was considered to be almost inactive in terms of neotectonic deformation and seismicity. Several international research teams have visited the earthquake center zone during the 2-4 years following the earthquake. However, competition between these teams prevented the systematic description of active faults and seismogenic dislocations in the Suusamyр earthquake zone. Accordingly, the seismicity of the Inner Tien-Shan has yet to be specified because the risks remain today under-evaluated. We will produce the necessary documentation to improve this knowledge. This information will be extremely important to another point of high apprehension: is the need of detailed geological description of territories that will be flooded after the construction of two hydroelectric power stations on the Naryn River. The flooded area is salt-rich, and the water table will be irremediably polluted. The 100000 inhabitants living in the Ketmen-Tube Basin, downstream the Naryn River, will lose their water resource. The detailed geological map we may produce will emphasise how insufficiently planned and somewhat senseless are both hydrotechnical projects. The map will take advantage of all archives and focused fieldwork to control crucial geological relationships. The digital form of the geological map will allow access from the Internet to a wide range of users.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110708 - Dietrich Walter

**Title: Christianity and Society**

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**Keywords:**

interdenominational theology, staff mobility, promoting junior staff, completing theological libraries, strengthening societal responsibility

**Abstract:**

The IP unites three faculties of theology: one in Bern (CH, consisting of two departments, associated with two different confessions) and two in Sibiu (RO). These institutions are all of different – namely: Reformed, Old Catholic, Romanian-Orthodox, and Lutheran – denomination. The project aims at – deepening an already existing partnership (underlined by a former “Institutional Partnership”) with an intensified mobility program, enabling theologians from both countries to exchange their special experience and skills; – improving the education of young scholars by making it possible for them to stay in Bern for three months and to participate in a program of biblical archaeology in Israel; – strengthening the Romanian faculties by modernizing and completing their infrastructure and the holdings of their libraries; – encouraging Romanian theologians to act on the multi-denominational christianity of Transsilvania resp. Romania by giving support to an Ecumenical Institute and an ecumenical periodical in the field of Biblical theology. The IP will not only intensify the partnership of various faculties of theology, it will also effect and deepen an extensive international and interdenominational networking.

SCOPES 2005-2008:– Joint Research Project

## Project no.: 110712 – Waber Niklaus

**Title: Helium migration from water into natural quartz crystals - a new dating technique for very old pore- and groundwater**

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**Keywords:**

hydrogeology, helium, pore water, groundwater residence time

**Abstract:**

Successful groundwater management requires the quantification of groundwater flow and the residence time of groundwater in the subsurface since the time of infiltration. In groundwater system with groundwater residence times up to a few tens of thousand of years several natural radioactive tracers can be applied for groundwater dating. However, no such tools exist for deep groundwater systems and pore water in aquitards with very slow flow rates or stagnant water and with the residence times that can exceed one million of years. Deep-seated groundwater systems in large sedimentary basins ((e.g. Molasse Basin, CH, D; Paris Basin, F; Oman Basin, Arabian Peninsula; Great Artesian Basin, Australia) become increasingly important as groundwater resources while aquitard systems are currently investigated as potential host rocks for the deep disposal of toxic and radioactive wastes. The quantification of such old ground- and pore water residence times is therefore essential for future groundwater resources management and the safety assessment of underground disposal of toxic and radioactive wastes.

In principle, radiogenic helium is a tracer which is able to date very slow processes that last several millions of years in groundwater systems.

The two isotopes of helium ( $^3\text{He}$ ,  $^4\text{He}$ ) are produced in the minerals of a rock via natural radioactive decay of U and Th series ( $^4\text{He}$ ) and associated nuclear reactions ( $^3\text{He}$ ). The energy produced during the decay is large enough that He is released from the mineral to the surrounding pore- and groundwater. Under knowledge of the helium inventory of a water rock system, the relation between local and external source and the removal rate from the system the residence time of the pore- or groundwater can be derived. Previous results support the feasibility of this approach and further suggest that the helium content in certain minerals (e.g quartz) might act as an archive for helium and thus the water residence time. This latter aspect is especially important within the framework of underground waste disposal because such sites are preferably located in aquitards with completely stagnant pore water. Although acting as migration paths for contaminants, this pore water cannot be sampled by conventional groundwater sampling techniques and has to be characterised indirectly based on the rock material.

The present project focuses on the systematic of helium in mineral (mainly quartz) as a tool for dating water with residence times in the order of millions of years. It aims to experimentally derive the diffusion parameters of He in quartz, to characterise the residence sites of He in the mineral, and to derive the theoretical basis (model) of the exchange between helium and the mineral. Due to the low concentrations a very high analytical resolution is required to accomplish this task. The results obtained will be tested and modelled on a regional scale in a case study with well known boundary conditions (Swiss Molasse Basin). It is aspired to develop the analytical and modelling techniques to such a degree that they can easily be applied and transferred to other sites of interest.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110719 – Izui Shozo

**Titel: Selective silencing of autoaggressive B cells in animal models of autoimmune diseases**

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**Keywords:**

autoimmunity, systemic lupus erythematosus, inhibitory receptors, chimeric antibodies, immunotherapy

**Abstract:**

The therapeutic approaches used at present to treat autoimmune diseases are not satisfactory as they are not targeted and induce either 1) general immunosuppression; 2) general suppression of inflammation or 3) a long-lasting elimination of all B cells regardless of their antigen specificity. We propose a novel strategy for the selective silencing of disease-associated autoreactive B cells.

The disease-associated DNA-specific B lymphocytes in SLE are logical targets for a selective therapeutic intervention. Our preliminary studies show that it is possible to inhibit selectively the production of IgG anti-DNA antibodies and to suppress disease activity in mice with spontaneous lupus by administering to them chimeric antibodies that cross-link their DNA-binding immunoglobulin receptors with inhibitory B cell receptors.

We shall produce RIIB and a series of hybrid molecules by coupling monoclonal anti-mouse Fc anti-CD22 antibodies to DNA-mimotope peptides. Their immunomodulatory activity will be tested in young disease-free (6-7 weeks old) and sick (4-5 months old) lupus-prone MRL/lpr mice. Such chimeric antibodies may provide a platform for the development of highly selective therapeutic approaches in autoimmune diseases.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110720 – Giordano Silvia

**Title:** New Priority Disciplines and Algorithms in Queueing Analysis

**Co-ordinator:**

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**Keywords:**

Priority systems, queueing systems, wireless systems

**Abstract:**

The objectives of this research project is to identify critical key problems in Theory of Priority Systems and to develop efficient methods, algorithms and software implementation for solving these problems. The research will emphasize on elaboration, classification and analysis on a large class of priority disciplines more flexible and relevant to the real life processes than traditional ones. The research will be axed on following problems:

- Elaboration and classification of the generalized models with priorities and switching times.
- Description, classification and argumentation of class of new priority disciplines.
- Elaboration of new methods for analysis of generalized models and elaborated priority disciplines.
- Obtaining of main probabilistic characteristics of evolution of these models.
- Elaboration of the numerical methods and algorithms for modeling the obtained characteristics.
- Analysis of steady state and elaboration of the algorithms for solving the traffic equations.
- Application of the traffic characteristics and elaborated priority disciplines in Q S Wireless Access.

From a theoretical point of view, the results obtained in this project will generalize the most part of known results for classical priority systems. From applied point of view the results and research carried out during the project will contribute to solution of important problems challenged by the modern practice S (quality-of-service) problems in the Next Generation needs, such as the Q Internet, multimedia traffic problems, “last-mile” problem in Wireless Access to Next Generation Internet, etc.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110721 – Ratiu Tudor

**Title: Applied Symplectic Geometry and Modeling of Materials**

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**Keywords:**

symplectic manifold, momentum map, domain decomposition

**Abstract:**

This proposal aims at strengthening already existing collaboration between the Geometric Analysis Chair of Prof. T. Ratiu at the EPFL and two groups of researchers in Romania, one at the Mathematics Institute of the Romanian Academy (IMAR) and a second one at the West University of Timișoara (UVT). Collaborative research projects already exist and are documented in the body of the proposal. The previous SCOPES grant (IP project) between the EPFL and IMAR, which was extremely successful, resulted in several joint papers as well as the formulation of various joint research programs, not just with the Chair of Professor Ratiu, but also with the Numerical Simulation Chair of Prof. A. Quarteroni. The links with UVT are also very well documented. Among the group of four researchers there, two have their Ph.D. degree from the EPFL and the senior professor (M. Puta) is a long time associate and collaborator of Prof. Ratiu. In addition, Prof. Ratiu participates actively in the elaboration of instruction and research programs of young talented mathematicians at UVT. At the same time, in the proposed themes of research, there is genuine complementarity of expertise. Pooling of the effort of the three partners to jointly attack some difficult problems will generate further progress in these active areas of research. The proposal contains a theoretical component in areas such as symplectic and Poisson geometry, reduction theory, Poisson-Lie groups, and quantization in various formulations (geometric, star product, and via coherent states). There is an equally strong applied component consisting of Lagrangian reduction and its application to continuum mechanics, domain decomposition methods for nonlinear problems, the study of the shape memory alloy equations, modeling and calculus in continuum thermo-mechanics and gas dynamics. Remarkably, all these themes, pure and applied, are linked via geometric methods in analysis, singular reduction, and infinite dimensional Poisson geometry.



SCOPES 2005-2008: Joint Research Project

## Project no.: 110723 – Hirt Ann

**Title: Environmental applications of soil magnetism for sustainable land use**

**Co-ordinator:**

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**Keywords:**

soils, pedogenesis, magnetic properties, environment, pollution

**Abstract:**

The primary goal of this project is to evaluate the influence of environmental factors – natural and anthropogenic - on the magnetic properties of soils. In order to accomplish this goal, it is first necessary to have a good understanding of how magnetic properties vary within a typical soil profile. Both the Swiss and Bulgarian magnetic groups have already started to put together databanks on soils magnetic properties from their respective countries. The Swiss database covers the magnetic properties of top soils, taken from the pedothek of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), which covers a 5000 square km area between Altdorf, OW and the Swiss Italian border. The Bulgarian data base consists of topsoils from non-cultivated grassland and forest soils in Eastern and Northern Bulgaria. The data cover around 4600 square km in a regular 4 km grid and transect from North to South away from the Danube river until the Fore Balkan. The Bulgarian partners have also applied magnetic methods for delineation of anthropogenic pollution of sediments from the Danube River and soils in Eastern Bulgaria. In the first part of this project we will define which magnetic parameters should be compiled from the two groups for a common data bank in order to determine if there is a generic relationship between specific soil types and magnetic properties. Magnetic properties are mainly influenced by iron mineralogy. Although the magnetic mineralogy is strongly influenced by the parent rock on which the soil forms, pedogenic processes also affect the iron phases. We will investigate the importance of these two factors for specific soil types. Soils from the Bulgarian Antarctic Base will be also included as an example for incipient soils in an extreme environment. The second part of the project will examine the mechanisms that influence the magnetic properties in a soil profile. For example, magnetic enhancement has been observed in many topsoils, and a myriad of explanations have been reported in the literature. These different hypotheses will be tested for specific soil types. In the final part of the project we propose to evaluate how environmental factors influence the magnetic properties. This will include the examination of climatic factors (e.g., annual precipitation, wind) and anthropogenic factors (e.g., land use, atmospheric fallout or pollutants).

Thus, the applied output of the project will contribute towards the practical development of an effective tool, based on magnetic measurements, for preliminary environmental screening of potentially polluted areas, that can serve for further decision-making on geochemical sampling strategies.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110724 – Rossier Ruth

**Title: Farm Transfer Research - developing a rationale for structural policy in Romanian agriculture (Farmtrans)**

**Co-ordinator:**

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**Keywords:**

Agriculture, structural change, family farms, farm transfer, succession

**Abstract:**

The structure of Romanian agriculture has undergone several breaks during the last century that were induced by political changes. As a result, today's agriculture in Romania is characterized by a dominance of small subsistence oriented family farms. Hence, the current agricultural structures are, in spite of a very different history, not too different between the two project partner countries, Switzerland and Romania. Although the farm structure has never been the central subject of contemporary Agricultural Economics and Sociology, some research has been carried out about factors influencing structural change in farm family systems. The Swiss partner institution has developed a theory about the utter importance of the farm transfer process for structural development in such sectors. Therefore, this project proceeds to connect questions of farm transfer with questions of structural development, integrating now the issue of rational future expectations. A survey about the patterns of farm transfer that has been carried out in Switzerland, and in earlier forms also in the USA, Canada, Britain, Germany and France will be adapted for the needs of the Romanian partners. Both 400 current farmers as well as 400 potential successors will be interviewed in three Romania regions. Young farmers and potential successors will also be asked in this survey about the estimated size of their farm 10 years ahead. The results are used to check whether aggregated future expectations can in either way be realistic. To provide an example: If, in a village, all current farms are going to double their size of land during the next 10 years, this is most likely not going to happen and can therefore be classified as wrong future expectations that should be accounted for. The methodology is unique in a way that future forecasts of economic agents can be falsified through aggregation. Another focus in the evaluation will be on gender issues. In spite of the equal rights approach of the former socialist government, farm succession in Western European countries has long been a field with male predominance. It is a goal to check this dominance for today's situation in Romania and to draw political conclusions for the objective of gender mainstreaming. In addition to these two focus points, the survey will provide useful evidence about the patterns of farm transfers in the predominant family farm structure of Romania, regarding age of farmer and successor, education options for successors, interests and motivation in professional farming and influencing factors for the potential successor's takeover decision.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110726 – Meier Wolfgang

**Title: Strengthening and Expert Knowledge Accumulation and dissemination through high quality research on self-assembled polymeric nanotubes (POLYTUBE)**

**Co-ordinator:**

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**Keywords:**

controlled polymerization, self-assembly, hollow polymeric nanotubes

**Abstract:**

The progress in polymer science has a significant contribution in providing a basis to develop important research areas such as nanotechnology, biosensors and biomimetics, new medicines and agrochemicals, etc.

The objectives of this project are: i) to establish cooperation and exchange of knowledge between research teams from the University of Basel and the Institute of Polymers – Bulgarian Academy of Sciences in the fields of controlled copolymer synthesis, nanosciences and nanotechnology;

ii) to systematize the existing and to contribute to the development of new knowledge for preparation of hollow polymeric nanotubes and their application in the practice; iii) to provide improved training of the staff by organizing exchange visits of both senior and junior researchers;

iv) to disseminate the accumulated knowledge among the partners. The main goal is enrichment of expert knowledge by performing a high quality research focused on preparation of novel polymer-based nanotubular formulations and strengthening the competitiveness of partners in the field. The research activities are oriented to synthesis of various block copolymers with designed composition including blocks of poly(ethylene oxide) (PEO), polyisoprene (PI), poly(tert-butyl acrylate) (Pt-BA), poly(acrylic acid) (PAA), polyglycidol (PG), etc., and investigations of possibilities to obtain copolymers that self-assemble into high aspect ratio core-shell micelles or nanotubes. The combination of different polymers will allow preparation of original nanomaterials with versatile properties, e.g., stimuli responsive, bearing functional groups on the periphery and/or in the interior. These materials could find application in such important areas like (bio)nanotechnology, biomedicine, nanoelectronics, etc. The project will have a great impact upon gaining scientific excellence in the field of the newest developments in material science, e.g., nanoscience and nanotechnology. Training of young professionals in leading research centres such as the University of Basel will provide possibilities for accumulation of expert knowledge and improvement of professional skills and their ultimate application in practice.

Improving the research quality and upgrading the research facilities will lead to a long lasting reinforcement of the research potential of Bulgarian partner providing the basis for drawing novel strategies and priorities for further developments according to the socio-economic needs of the country and the European Community. It will open new prospects for speeding up the transition process of Bulgarian partner and its integration to European research family.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110748 – Dach Rolf (formerly Hugentobler)

**Title: Renewal and expansion of high academic teaching and advanced infrastructure for analysis of satellite geodetic data in Romania**

**Co-ordinator:**

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**Keywords:**

global satellite navigation systems, geodynamics, education, plate kinematics

**Abstract:**

One of the most intriguing seismogenic zones in Europe, Vrancea, is located in the Southeast Carpathians in Romania. To analyse the surface expression of the mechanisms inducing the Vrancea earthquakes, GPS (Global Positioning System) measurement campaigns are performed since 1995. A geodetic network consisting of 54 points, including seven permanent GPS stations, has been installed. The goals of this Institutional Partnership (IP) of the Astronomical Institute of the University of Bern with the Department of Geophysics of the University of Bucharest and the National Institute for Earth Physics is to provide the Romanian partners with the necessary capability in terms of hardware, software, and knowledge of precise GNSS data analysis for geodetic applications and for processing of the overwhelming database accumulated in the last decade.

In a first step the necessary infrastructure for GPS data analysis is installed at the partner institutions in Romania and training on data analysis takes place in Bern. The acquired knowledge is disseminated within the Romanian partner institutions. In a second step the correct and efficient transfer of know-how is verified by the execution of a small measurement campaign and the analysis and interpretation of the acquired data. As a test case a small sub-network is used which was developed by the Romanian partners in 2003 in the Southwestern Carpathians.

The final step of the project is the improvement of the educational program at the University of Bucharest by installing a new curriculum on GPS data analysis and interpretation and thus offering the students a complete program in kinematic tectonic investigations. This main goal of the IP allows for a sustainable transfer of know-how of a technique to the Romanian partners that is today indispensable for the measurement and interpretation of the complex active and fractured tectonic structures in seismically active areas as in Romania. The students graduating in this program will be ready to continue advanced research or work for industry, and the country will get a specialized team ready to be involved in new

national and international programs, increasing its role and getting the necessary conditions for full partnerships.

Favorable conditions are created ensuring a permanent and professional monitoring of the tectonic movements, as well as the immediate data analysis and interpretation of the resulting information. Improving geophysical models of the Carpathian Bending Zone will ultimately help to mitigate natural hazard risks and to take measures for the population living in the area.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110767 – Rüegg François

**Title: Nomads and parliamentarians. The influence of mobility and religious affiliation on identity building (Roma)**

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**Keywords:**

public policies, mobility, social integration, identity, Roma

**Abstract:**

The project aims at facilitating the elaboration of public and social policies for Roma people in Romania and the Republic of Moldova. It is based on a better understanding of the role that mobility and religious affiliations play in the making of identities. The opening of borders and markets in 1989 and the ensuing possibility of mobility contributed to the creation of new and mobile identities. In 2007, Romanians will become European citizens. According to the Council of Europe, 10 million Roma live in Europe, one million in Romania. It will be necessary for European constituencies to define new public policies concerning the Roma population, soon representing the largest minority in Europe. For the last forty years, leaders and scholars (Roma and non-Roma) considered the development of a “new ethnic identity” as the major strategy for changing the stigmatised image of Roma in Europe. For the Roma of the Republic of Moldova, status and identities have and will continue to evolve in a different way, because European borders will not be open to the Moldovan citizens. We shall analyse the impact of social and geographical mobility as well as the impact of religious affiliation on the development of national and ethnic identities and social integration of Roma people in these two countries. In order to look beyond existing legislation concerning the Roma people however, we wish to get information from the people themselves. We are adopting an anthropological approach, using qualitative methods and participatory observation, with the collaboration of sociologists and social psychologists. Field research will focus on a sample of individual or small group identity strategies that Roma are using to seek recognition and integration into the civil and political society. It will consist in the collection of 80 qualitative interviews, based on life-stories with a wide representation of Roma people. This methodology has represented, in the past, a significant challenge due to the sometimes difficult access to these communities.



This is why there is no serious research based on consultation with Roma themselves. Our project proposes to fill this gap through an expert and skilled approach from Romanian and Moldovan team partners. From these first theoretical and empirical results, scholars will then compare the evolution of identities and social representations of Roma people in the three chosen provinces (Transylvania, Moldavia from Romania and Republic of Moldova) for the periods between 1989-2000 and 2000-2005. The Swiss team, along with its partners, will analyse, from the gathered material, firstly, how social and geographical mobility and religious affiliation affect developing identities; secondly, how these new ethnic identities are expected to facilitate leaving a state of marginalization; and thirdly, integrate the results of the research into the framework of existing studies about new Roma identities in Europe and the development of a stateless and/or territory-free citizenship. These results could help in promoting adapted public policies for Roma communities without locking them into an ethnic identity.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110772 – Hinz Hariet

**Title: Restoring biodiversity of degraded Romanian pastures through the development of sustainable management practices for invasive weeds using *Lepidium draba* as a model system**

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### Keywords:

restoration, biodiversity, invasive plants, biological weed control, hoary cress, insect-plant interactions, soil fertility, grazing

### Abstract:

The main objectives of this Joint Research Project are to establish two large manipulative field experiments, results of which will be used to develop a sustainable, cost-effective control strategy for invasive weeds, using *L. draba* as a model system, to restore biodiversity in degraded pasture systems in Romania, as well as to integrate the Romanian research teams in an ongoing international project for the biological control of *L. draba*. During the socialist era, most of the agricultural land in Romania was managed by so-called State Owned Agricultural Enterprises (IAS) or by Agricultural Production Cooperatives (CAP). After the collapse of the regime, most of the land went back to the former owners. Due to lack of management the now mostly privately or commonly used pastures are frequently overgrazed. Increased disturbance by livestock, coupled with increased nitrogen input in turn facilitates weed infestations, especially of plants that are unpalatable to cattle. In consequence, the diversity and abundance of desirable plant species has decreased, and sites have become dominated by one or few invasive species, leading to a degradation of these grassland ecosystems. One of these opportunistic weeds is the perennial mustard, *Lepidium draba* L. (= *Cardaria draba*; Brassicaceae). We will establish experiments at two different field sites in eastern Romania, manipulating levels of grazing, cultivation, sowing of competitors (grasses and Lotus), specialist natural enemies and plant available soil nitrogen in a full factorial design, i.e. all possible combinations of these five different treatments will be applied. Herbivores will be excluded from half of the experimental plots by regular application of pesticides, and augmented on the other half of plots by specific release of herbivores known to negatively impact *L. draba*. Plant available soil nitrogen will be reduced by regular application of carbon in the form of sawdust. Carbon additions have been shown to stimulate soil microbes to accumulate soil nitrogen, thus reducing levels of plant available nitrogen, which in turn decreases the growth of fast-growing, dominant weed species.

While grazing, cultivation and sowing of competitors are common management practices, the other two techniques are rather novel, and – to the best of our knowledge - have not previously been used together. In addition, they can be applied with moderate financial input and equipment and are therefore ideally suited for low-input systems. Results are expected to lead to sustainable, cost-effective management recommendations for the control of *L. draba*, and more generally for the restoration of degraded pastures in Romania. At the same time we will be able to tackle current scientific hypotheses on insect-plant interactions under different management regimes. Finally, the project is believed to help the participating Romanian researchers to extend their activities, intensify existing cooperation, open the door for new research opportunities and to contribute to their integration into the international scientific community.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110774 – Apel Klaus

**Title: Identification of genes involved in regulation and execution of programmed cell death in *Arabidopsis thaliana*: a functional genomics approach**

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**Keywords:**

PCD

**Abstract:**

Programmed cell death (PCD) is a genetically controlled suicidal process in which cells self-destruct upon certain cell death stimuli, selectively removing in this way unwanted cells. This process is an essential part of plant development as well as of many plant responses to abiotic stress and pathogens. Examples of PCD can be found during development of the embryo, maturation of tracheal elements and epidermal trichomes, leaf senescence and the hypersensitive response (HR) - a defense against pathogens. While the process is well studied in animals, little is known about the mechanisms and genes involved in plant PCD.

The main aim of the proposed project is to unravel the mechanisms behind the plant PCD by discovering genes involved in the regulation and execution of PCD in the model species *Arabidopsis thaliana*. To realize that goal two experimental approaches will be used: (1) forward genetics, in which we will screen for mutations in genes that render plants altered in PCD responses, and (2) expression profiling of PCD coupled with reverse genetics, in which by extensive microarray analysis we will identify genes that are transcriptionally regulated during PCD and those genes will be functionally studied by the knock out technology or by generating plants with altered expression of the genes.

The proposed project will create vibrant research links between the two partners and improve significantly the research conditions of the Bulgarian partner, thus making the East European partner more competitive on the national and international level.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110784 – Keller Hugo

**Title: Nanoscale properties of high-temperature superconducting cuprates and related compounds probed by magnetic resonance techniques**

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### Keywords:

high-temperature cuprate superconductors, nanoscale properties, magnetic resonance, muon spin rotation

### Abstract:

The proposed Institutional Partnership (IP) aims to strengthen and to develop the already existing long-term scientific co-operation between the partners, to improve teaching and research infrastructure of the New Independent States (NIS) partner Universities and to encourage and train young talented people from the NIS countries to stay in science. The partners consider the present IP as an important instrument to motivate young people to continue their post-graduate scientific work. Therefore, the IP focuses on educational aspect with the aim to introduce students into the scientific part of the project, presenting “state of the art” in the field and objectives of the planned work as well as to provide background knowledge and practical training on the main experimental methods to be used during the project execution. A mobility scheme for joint cooperation, including short-term visits to laboratories in Switzerland, joint experiments and meetings will play a key role to achieve the goals of the IP. Another important goal of the proposed IP is to strengthen and modernize the teaching infrastructure of the NIS partner Universities and the exchange of the teaching experience with the Swiss partners. It is foreseen that experienced Swiss scientists involved in the joint research work can give lectures at the NIS partner Universities about the latest developments in the research field of the IP. A scientific part of the IP is based on the common interest to deepen the knowledge about the unconventional electronic, magnetic and lattice properties of high-temperature cuprate superconductors and related materials using the powerful magnetic resonance methods such as Nuclear Magnetic Resonance (NMR), SR). Special attention will be given to microscopic phase separation in these materials and investigation of their nanotextures at the microscopic level.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110794 - Dyson Paul

**Title:** Experimental and theoretical investigations of low viscosity ionic liquids

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**Keywords:**

Ionic liquids, Physical properties, Computational chemistry, Synthesis

**Abstract:**

The objectives of this project are to overcome the current limitations of ionic liquid research, viz. having theoretical methods that give experimentalist predictive powers, while at the same time overcoming a specific problem, i.e. producing thermally stable ionic liquids with sufficiently low melting points and lower viscosities than those presently available. A further objective is to evaluate all the low viscosity ionic liquids as electrolytes in solar cells (and potentially other applications) in order to increase their efficiency.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110808 – Zehnder Konrad

**Title:** A comprehensive study of Dodo-Rka monastery (6<sup>th</sup>-18<sup>th</sup> cc) and of Gansashori skete (6<sup>th</sup>-9<sup>th</sup> cc) against the background of Byzantine and Eastern christendom traditions

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**Keywords:**

caves, architectural features, mural paintings, epigraphs, artefacts

**Abstract:**

The project applies an integrated approach by use of historical, architectural, art technological, natural scientific and archaeological methods. The following objectives will be scored: The sites under consideration are surveyed and documented in a rough scale as a whole.

Based on this inventory, selected relevant sites and caves, with their architectural features, mural paintings, epigraphs and superficial artefacts are documented and analyzed in detail against the background of local, Byzantine and Eastern Christendom traditions. Written and epigraphic sources will be studied. Historical evidence of David-Gareji rock-cut monastic complex, which comprises Dodo-Rka Monastery and Gansashori Skete, will be established. Materials of stones, mortars and paintings are investigated complementary. Their condition is examined, weathering processes, threats, and stability of caves are assessed as a basis for conservation, safeguarding and sustainable tourism.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110809 – Scheeder Martin

**Title: Assessment of natural pasture resources (essential nutrients) in endemic mountain regions with respect to nutritional balance and quality of sheep milk and dairy products (white brine cheese, yellow cheese, yogurt)**

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### Keywords:

sheep, nutrition, mountain regions, deficiency, ewe's milk quality, cheese

### Abstract:

The project is addressed to the growing market interest in ewe's milk and dairy products as a natural source of components like conjugated linoleic acids (CLA) and n-3 polyunsaturated fatty acids described to be effective in prevention of different human diseases. The study will emphasize the role of nutrition, particularly the supply with trace elements, which are deficient in fodder plants of the respective region, on milk yield and variation in the fatty acid profile during the grazing period.

The basic concept is to supply the ruminants with essential nutrients and substrates according to the composition of pasture vegetation, which depends on geochemical conditions, botanical diversity, season and stage of plant maturity.

The project aims at testing the effect of an optimized nutrition regimen, taking into account the protein, macro-, trace elements and fatty acids offer through natural and cultivated pastures, on the transfer and secretion of biologically active substances in ewe's raw milk and dairy products in an endemic mountain region.

### Objectives:

- Determination of the particular role of geochemical factors (bedrock, physical and chemical soil characteristics) for the transfer of major essential macro and trace elements in the soil-plant system
- Assessment of the nutritional value of permanent grassland (protein, total fat, fatty acids spectrum, limiting macro- and trace element contents) during the grazing period of sheep considering the role of soil characteristics, botanical diversity, and seasonal dynamics.



- Comparative study on the ewe's milk yield, properties and composition (fatty acids, conjugated fatty acids) as affected by the feeding regimen (deficient vs. balanced), lactation stage and trace element status of animals.
- Evaluation of the effect of a balanced nutrition on the quality of dairy products (yogurt, white brine cheese)
- Estimation of intake and effects of the biologically active substances in ewe's milk and dairy products in human consumption.

The project will contribute to the development of strategies for an effective and sustainable use of natural resources in the Rhodope mountain region (Bulgaria) and of beneficial dairy products, which would be competitive for the European market needs and will improve the nutritional status of the population.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110810 – Oberholzer Martin

**Title: Clinical and Educational Telemedicine Network between Uzbekistan and Switzerland**

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**Keywords:**

Telemedicine, telepathology, teledermatology, teleeducation, rural countries

**Abstract:**

Uzbekistan, being one of the new Independent States, is confronted with numerous challenges concerning research and education particularly in health care and information and communication technologies (ICTs). Most scientists and researchers are facing difficult working environments due to lack of funding and severe isolation from the international scientific community.

The project proposed in this document is addressing these problems in a multidisciplinary way with an institutional partnership between the Department of Pathology and the Republican Centre of Pathology of the Ministry of Health and the Institute for Informatics of the Academy of Sciences in Tashkent. The main purpose of the project is establishing a “clinical and educational telemedicine network between Uzbekistan and Switzerland” as a tool for exchange of information and knowledge.

Pathologists in Uzbekistan will be able to use the network for clinical consultations with pathologists of the University of Basel and potentially with any other pathologist worldwide, as well as to benefit from new developments in pathology, to improve their skills in diagnostics and teaching and to foster their participation in the international scientific community.

A regional telemedicine network for Uzbekistan will be set up and operated by the national Institute for Informatics. The network will be based on the open source telemedicine platform iPath developed at the Department of Pathology of the University of Basel, which is already being used successfully in a number of similar projects worldwide (e.g. South Africa, Ukraine). The involvement of the Institute for Informatics will ensure a long term sustainability of the telemedicine network beyond the duration of this particular project and to allow the Institute of Informatics to make the network available and useful to specialists from other medical fields (dermatology, radiology, etc) which may equally profit from this initiative.

Finally, the telemedicine link will be used for joint educational initiatives such as distance presentations and the joint development of educational material for teaching general pathology to medical students in Uzbekistan. This will also include the application of telemedicine in interdisciplinary tumour board meetings and clinical pathological conferences where histological and cytological diagnosis can be demonstrated and explained to the physicians who are treating the patients.

The Uzbekistan telemedicine network will help the partners in Uzbekistan to become a part of the international scientific community – in the medical field as well as in the field of ICTs. Besides the direct application of telemedicine, access to internet and contacts with partners familiar with the international scientific publishing, it is expected that the Uzbek partners can make more efficient use of available, evidence based health information resources (e.g. through HINARI) and eventually play an active part in international scientific publishing.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110815 – Berelowitch Wladimir

**Title: Education and Internal Divisions of Elites in Modern Eastern Europe**

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**Keywords:**

Education, Academic Migrations, Elites, Higher Education, University, Students, Eastern Europe, Central Europe

**Abstract:**

Goals of the research project:

The study of the training, the internal (in particular ethnic and religious) divisions and the transformation of intellectual and political Eastern-European elites in the 19th and 20th centuries, from the formation of the Nation States until the World War II.

2. Context and importance of the project: We hope very much that a snowball effect will be produced by our scholarly experiments since most initiatives attempted in our project have no consistent precedents in the countries concerned. This will be realised, in practical terms, by the dissemination of expertise gained from our experimental research operations among those involved, students and scholars connected to the members of our respective teams as well as among those invited to participate in the planned workshops. The educational impact is secured by the fact that our team leaders have regular or occasional teaching activities themselves. 3. Scientific frame of the project: Specific topics developed in the frame of our project are focused on the following themes : 1. Collection and study of global indicators of the growth of certified and incorporated knowledge in various countries (later Nation States), and in different cultural (ethnic, confessional) clusters from the early 19th century until the World War II. The outcome should be a comparative data bank on chosen regions, with data collected from local, regional or national statistics and other occasional sources. 2. Prosopographies of educated elites via the study of collective biographies of students enrolled at central (national) universities. Each team should produce a piece of such a study for the pre-1919 and the post-1919 period each.

This will exemplify by original and “objectivist” methods the change of locally educated elites (more or less striking in all countries concerned) often under the pressure of dramatically changing power relations. 3. Impact of studies abroad. Peregrinations of East-European students to Western universities, especially to Switzerland, France and Germany, played a crucial role in the elite formation in all the countries concerned (Bulgaria, Romania, Serbia, Russia) up to 1919 and to some extent up to 1939.4. Micro-historical monographs of some secondary schools with socially, ethnically and/or confessionally mixed clientele (concentrated on the pre-1919 period). The focus here will be on different patterns of school behaviour in clusters distinguished by their social background (nobles, old and new elites, majorities and minorities, members of established “titular” national groups as against outsiders or immigrants). Organisation of work and methodology: We are forming a core network composed of a few specialists from Eastern Europe remunerated with SCOPES grants (3 from Romania, 4 from Bulgaria, 3 from Serbia and 2 Russia). Their teams are trusted with pilot studies in fields regarded as essential, under the close guidance of the Swiss team from the Institut européen of Geneva University, and benefiting of collaboration of the international partners from Hungary, France, Germany, Italy and Poland.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110817 – Sorg Jean-Pierre

**Title: Biodiversity and sustainable management of Kyrgyzstan's walnut-fruit forests: development of new silvicultural concepts (ORECH-LES)**

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**Keywords:**

Biodiversity, Walnut, Sustainability, Forest management, Agroforestry

**Abstract:**

Southern Kyrgyzstan's worldwide unique forests of walnut (*Juglans regia* L.) and other fruit-bearing tree species are a biodiversity-hotspot of international significance. After the country's independence many remains of the old Soviet system ceased to perform in the way people were used to; inevitably the importance of the primary sector for food- and energy-security increased during transition time whereas the Soviet forest management system broke down. Kyrgyzstan's "walnut fruit forests" became more essential again for the local population as an important multi-purpose resource (walnuts, fruits, wood, hay, pastures, etc.) for rural livelihoods. Of course, the pressure on forests in general increased. Large areas are silviculturally in a critical condition and are not very productive. – The need to develop multifunctional management approaches that involve local communities is urgent.

The applied research project ORECH-LES is going into its second phase.

The main objective during the first phase was to develop silvicultural approaches adapted to the reality of the multifunctional (also agricultural and pastoral) use of the walnut fruit forests in Southern Kyrgyzstan and to promote their implementation. The main research question was: How can forests and present agroforestry systems be optimised in order to improve their productivity whilst conserving their biodiversity?

During the second phase, ORECH-LES will put more emphasis on the synthesis of the research results and their dissemination whilst continuing its multidisciplinary research on the existing network of 25 well researched and documented trial plots.

Ambitious objectives like providing a contribution to the rebuilding of a functioning Kyrgyz research system and helping to integrate Kyrgyz researchers in the international scientific community take time to be met at the desired scale. It is also a merit of ORECH-LES that forestry research has become more applied nowadays.

ORECH-LES will go on improving the standard of decentralized research in the south of the country. It will continue to promote young researchers through active participation of doctoral students and to collaborate with the Kyrgyz Agrarian University of Bishkek.

The project – which sees walnut fruit forests as an agroforestry-system - already provides information on how the productivity of forests (nuts, wood, hay, diversity etc.) can be raised and risks of outfalls in harvest be minimised. The challenge will be to continue this process for the benefit of the society at large and - in particular - of poor people in deprived rural areas. This goal can only be met through thorough extension work with all target groups (local people, practitioners, decision-makers, scientific community).

SCOPES 2005-2008: Joint Research Project

## Project no.: 110823 – Stoeckli-Evans Helen

**Title: Design, synthesis and study of co-ordination compounds of 3d- and 4f-metals using functionalised macro- and heterocyclic ligands for possible medicinal and therapeutic applications**

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**Keywords:**

heterocyclic ligands, d- & f-elements, tubercular activity, structure-activity relationships

**Abstract:**

The proposed research is focussed on development of efficient protocols for synthesis and study of coordination compounds of 3d- and 4f-metals. The work will be divided into two major parts, where the first is related to synthesis of the new open-chain heterocyclic and macrocyclic ligands, while the second part involves their application in preparation of co-ordination compounds of 3d- and 4f-metals reactions and study of structure-activity relationships.

In the course of the work, a series of 1,4,7-triazecane, 1,4,7,10-tetraazacyclotridecane derivatives will be designed and synthesized utilizing either precursors obtained from the diethylenetriamine, or 1,4,7-triazacyclononane systems prepared from 2-(2-hydroxy-ethylamino)-1-ethanol. The polyamine macrocycles containing selectively protected and functionalized diethylenetriamine units will be used to synthesize new coordination compounds of d- and f- elements. The molecular and crystal structure and spectral characteristic of synthesized organic and coordination compounds will be determined. At the same time the obtained compounds will be tested as potential anti-tubercular activity substances against Mycobacterium tuberculosis H37Rv (ATCC 27294).



SCOPES 2005-2008: Joint Research Project

## Project no.: 110826 – Schaffner Urs

**Title: Weeds in the East, weeds in the West: what makes Russian knapweed a weedy species in the native and in the exotic range?**

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**Keywords:**

Biological invasions, weed management, plant-herbivore interaction, plant-pathogen interaction, habitat disturbance, biogeography, enemy-release hypothesis

**Abstract:**

Exotic invasive plants are a major ecological and economic threat throughout the world, recognised as such under the Convention on Biological Diversity (article 8(h)). Yet, they also provide an unparalleled opportunity for a deeper understanding of the fundamental processes in ecology, i.e. what controls the distribution and abundance of organisms? One of the central mysteries facing managers and academic ecologists alike is how exotic plants attain staggeringly high densities in their introduced range. The prominent hypothesis for exotic plant success is the enemy release hypothesis which states that plant species, on introduction into an exotic range, experience a decrease in regulation by herbivores and other natural enemies which results in a rapid population build-up and spread. To date, the adequacy of the enemy release hypothesis to explain the success of invasive grassland weeds is still a matter of debate. Moreover, a number of plant species that have become invasive outside their natural distribution range can also build up high population densities and become weeds in their native range, suggesting that inadequate habitat management can promote population outbreaks even in the presence of the full set of natural enemies. Russian knapweed, *Acroptilon repens*, is an illustrative example of a plant species that displays a weedy character both in the native and the exotic range. In the late 19th century, this plant, which is native to Asia, was accidentally introduced into North America and has since become one of the most serious exotic rangeland weeds in North America. In its native range, *A. repens* is a major weed in disturbed habitats. This project aims at assessing the underlying mechanisms that contribute to its success in the native and the introduced range. To achieve this goal, we have set up a series of field experiments in Uzbekistan, some of which are also being carried out in the USA by self-funded partners using a standardized experimental protocol. In particular, we want to assess the effects of biotic and abiotic factors on the biomass and the seed output of *A. repens* under different levels of habitat disturbance. This research work will not only yield important scientific results that can be published in high-ranked journals, but the expected findings will also help to raise the awareness for sustainable habitat management that reduce the risk of population outbreaks of weedy species. This project combines research work with training of young researchers in Uzbekistan.

A first workshop will be held in August 2006 offering lectures in experimental ecology and statistical analysis to young researchers of various research institutions in Uzbekistan. By tradition, in Uzbekistan students in biology or agriculture receive an excellent training in areas such as taxonomy or pest management, but little is taught on experimental biology and statistical analysis. This projects aims to further strengthen the expertise of young Uzbek researchers in these fields, and to provide them with teaching material that can be used in lectures at Uzbek universities.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110827 – Giordano Christian

**Title:** Trust, Co-operation and Integration in Agrarian Society in Bulgaria

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**Keywords:**

co-operation, trust, mistrust, post-socialist agrarian society, cohesion, livelihood approach

**Abstract:**

The proposed project aims scientific analyses of trust and co-operation in agrarian communities in Bulgaria.

The central objective of the JRP is to reveal the significance of trust to the successful agrarian development and thus contribute to policy improvement and decision making in shaping conditions for a competitive agrarian sector able to make use of human and natural abilities. In post-socialist Bulgaria the cohesion is high on its agenda. In this frame, trust building, as a key challenge for a successful transformation process, is increasingly needed as a fundamental premise for cooperation and social integration in the process of reforming governance, establishing local institutions, rebuilding civil society and validating the acknowledged human and natural potential of a state like Bulgaria. Of specific significance for the research team is the analysis of low trust societies in which members, individuals and institutions alike are incapable of cooperating or possess other types of trust and cooperation than the ones in the high trust societies. There is a need for deeper understanding of contextual conditions, forces and factors for overcoming low trust status of post socialist societies. Low trust society as the post-socialist Bulgarian one is permeated by a deep-seated culture of concealment. Although its members might consider such type of relationships, together with the related action strategies, as immoral, abhorrent, and illegal, these are used because being socially and culturally legitimate they represent the best way for the parties involved to protect themselves from the dangers and traps scattered over the entire public sphere. Therefore, informal alliances among friends and acquaintances, clientele cartels, connections of corruption and extortion, and finally even mafia networks, are the functional equivalent of trust and represent the necessary social capital to survive in the public sphere's transitional world.

Studying comparatively three distinctively different agrarian settings, the team expects that the results will contribute to the deeper theoretical and empirical reveal of trust and co-operation in agrarian communities in Bulgaria, the promotion and the understanding of the rationality of the livelihood strategies in a low trust society, and the investigation of social and institutional change for a developing social capital, enabling members of society to cooperate productively under conditions of a democratic setting and market economy. It also expects enhancing Bulgarian research capacities for policy dialogue and policy advice.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110830 – Müller-Schärer Heinz

**Title: Checklist of alien and invasive plants in Georgia**

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**Keywords:**

biological invasions, biodiversity preservation, environmental weeds, alien plants.

**Abstract:**

In Europe, as in most regions of the world, the number of alien (non-native, introduced) plant species (AP) has increased considerably in the past 200 years as a result of increasing trade, tourism and disturbance. The increasing number of naturalized AP with negative impacts on plant communities is viewed as a major component of global change.

Successful invaders can affect the invaded communities in various ways, e.g. reducing the local diversity, driving rare native species to extinction (e.g. by competition or hybridisation), changing habitat structures and ecosystem functioning, or increasing erosion. Plants are particularly notorious invaders, since they are capable of changing the food web at the base, which can affect the entire ecosystem.

The native flora of Georgia is exceptionally well studied due to its well-known richness that attracted generations of plant taxonomists from all over the world. The Flora of Georgia is amongst the richest in Europe and comprises approximately 4100 species of higher plants. The vegetation of the country is extremely diverse supporting semi-deserts, wetlands, mosaic deciduous forests, crook-stem sub-alpine forests and species-rich alpine communities. Preliminary observations indicate that this extraordinary wealth is now greatly challenged due to the spread of AP, which has especially increased due to changes in land use, cross-country pipeline construction, and habitat destruction. Especially threatened to plant invasions are seaside habitats (littoral sand beaches, wetland vegetation, swamp forests, etc.) and high-mountain meadows that are seriously transformed due to altered land use regimes (grazing, haying).

Forests are a further ecosystem under high risk of invasion by AP due to severe overexploitation. No inventory of AP yet exists for Georgia.

This Joint Research Project aims at surveying the alien plants of Georgia in expected sensitive habitats that will be identified in 18 out of the 19 historical-geographical regions of Georgia (due to political tension, the region of Abkhazia is currently inaccessible). We propose to conduct a quantitative survey restricted to the seed plants (Gymnospermae and Angiospermae) and to naturalized species only, thus excluding alien crop or ornamental plants that have not escaped from cultivation.

The proposed studies will allow us to roughly estimate the abundance, distribution and invasive potential of AP in Georgia, to identify habitats most susceptible to invasions, and to assess the invasion impact of selected AP. For a selected important plant invader of Georgia with a potential for biological control, we also envisage to perform a molecular marker study (AFLP or microsatellites) to assess the genetic diversity and population differentiation in Georgia, and possibly to identify its origin using corresponding published data. Such basic knowledge is a pre-requisite for potential subsequent biological control measures by introducing host-specific and efficient antagonists from the invader's native range.

We propose an approach, which is elaborate but has the benefit that it can be executed with moderate means and equipment. We think that this Joint Research Project will contribute significantly 1) to increase our knowledge on the abundance and distribution of alien plants on a world-wide scale, and to better understand its causes and impacts, 2) to form the basic knowledge in Georgia to address one of the most important ecological threats causing environmental change and biodiversity loss, i.e. plant invasions, as a prerequisite for targeted interventions, and 3) to the scientific integration of Eastern Europe with that of the rest of Europe. A PhD student from Georgia jointly supervised by the Georgian and Swiss team will carry out most of the field work in Georgia, and will have the opportunity to learn modern molecular tools that are increasingly used in ecology, during his planned stay in Switzerland.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110831 – Staehelin Johannes

**Title: Variability and long-term trends in tropospheric ozone**

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**Keywords:**

Atmosphere, Chemistry, Ozone

**Abstract:**

In this project we will study variability and long-term trends of tropospheric ozone at high mountain sites in the Caucasus and in the Alps. Ozone is not only a key pollutant of photochemical air pollution but also a strong greenhouse gas and its changes have significantly contributed to the changes in radiative forcing and therefore to the anthropogenic climate changes. In our project we will study ozone measurements of two mountain sites of Caucasus (Kislovodsk (43.7°N, 42.7°E, 2070 asl., measurements available since 1989) and Terskol Observatory (43°N, 42°E, 3100 asl, available since 2003) and Switzerland (Jungfrauoch, 46.5°N, 7.9°E, 3580m asl, available since the early 1990s). Neither the long term ozone increase at Jungfrauoch nor the remarkable decrease at Kislovodsk is well understood at the present time. Three dimensional 10 day backward trajectories arriving at the mountain sites will be calculated in order to determine the most important processes for tropospheric ozone trends in the two mountain sites. In addition other background measurements such as Mace Head (Western coast of Ireland), Arosa (2100 asl (Switzerland) and Zugspitze (Germany), high mountain sites of EMEP network might be included as additional stations in the analysis as well as other trace gas concentrations and meteorological information. Changes in anthropogenic ozone precursor emissions and changes in transport of ozone from the stratosphere into the troposphere and transport patterns changes are expected to be the most dominating factors explaining the observed long-term ozone trends. The trajectories will be calculated using the trajectory tool LAGRANTO based on fields of the ERA-40 data which is a homogenized data set of meteorological analyses generated by the European Centre for Medium Range Weather Forecasts (ECMWF). The individual trajectories are first tested for homogeneity of the flow by calculating clusters of trajectories. In order to distinguish between different contributing factors the trajectories will be classified into the following groups: Class A trajectories include those air parcels with stratospheric origin.

For identification we will use an algorithm recently developed (and tested) at ETHZ which can distinguish between reversible and irreversible transport across the tropopause based on potential vorticity (PV) and a residence time criterion. The time after irreversible entrance in the troposphere and the evolution of PV will be further used to estimate the effect of mixing of stratospheric with tropospheric air. Class B trajectories are those with recent contact of the air parcel with (polluted) planetary boundary layer air of Europe or Asia. For that purpose we will use boundary layer height (BLH) stored in ERA-40. In order to characterize the ozone formation we will store the time after contact with planetary boundary layer air and solar radiation. Class C trajectories include those trajectories with contact with planetary boundary layer emissions of another continent which can describe the effect of intercontinental transport, derived in the same way as class B trajectories. The ozone measurements at the receptor points of the individual trajectories will be subsequently compared with the time evolution of ozone in the lower-most stratosphere (class A) and the temporal evolution of the anthropogenic ozone precursor emissions over different continents. This will enable us to compare the different factors for the individual continents. This comparison is particularly important for the term of import of ozone from the stratosphere to the troposphere which is not adequately described by present numerical simulations. The results are also expected to elucidate why background ozone at European background sites have increased during the 1990s while European anthropogenic ozone precursors have substantially decreased.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110837 – Gisel Pierre

**Title: The status of religion in Romania in regard to European society: religion, state of law, social and cultural data.**

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**Keywords:**

Religion; State; Democracy; Pluralism; Europe; Law.

**Abstract:**

The question of the religion status is, in many ways, a cause acting right at the heart of the changes which occur nowadays in our societies, at the hour of religion reconfiguration, religious pluralisms, confrontations of different civilization patterns, new syncretism, creation of sectarian cores and other new religious movements, institutional lack of force and individualization. This question presents juridical, political and socially theoretical dimensions. It also passes through a large perspective of social and cultural data, through an historical plan and a plan focused on the present. This complexity of matters will be approached according to an axis which is thought deliberately as interdisciplinary: it indeed intends to examine the question of the relationships that exist between knowledge and beliefs, relationships which, in our European history, were not always the same; various senses were also given, consequently to what one should have meant by, respectively, knowledge and faithful belief. To speak concretely, the complex of themes approached is interdisciplinary, in the sense that it enlightens as well Theology and the various sciences issued from the study of religion that have developed themselves since the second half of the XIXth century (science and history of religion, the sociology and psychology of religion, cultural anthropology etc.), as Law and Political Sciences. In the background of this debate also rises the question, acute in its modernity, of the relationships between the religious field, with its status and range of action, and the various acquisitions of knowledge gained by the so-called tough sciences (Physics, Biology etc.). If these two sides should have to be distinguished one from another from the methodological and epistemological points of view, they however would be entangled in an indirectly seized interaction, they each influence one upon another, when it comes to the discussion about the statutes. In Romania, like in all the countries issued from the former communist world, the question of the relationships between the various religion and societies is distinctly acute. The soviet period had frozen these relationships by instituting authoritarian external frontiers, impeaching them from any evolution with no regard at all as for what might or could have happened in the life of civil society.



Since then, the fall of the regimes that have been instituted at that time has, on the contrary, brought a great opening, but into which the juridical, social and political premises to leave from in these matters are entirely to be reevaluated. It all happened in a general climate of regulations' lack where a radical liberalism offers the spell of its seduction, claiming for the supremacy of pure individuality, harshly and breaking out its articulates connections to the historical past and to the traditional patterns, as the historical matrices have generated them, being also unable to clearly evaluate its own consequences the social bonds

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110842 – Plückthun Andreas

**Title: Mono- and multivalent single-chain-antibody-enzyme fusion as immunotoxins and bifunctional antibody constructs**

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**Partner:**

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**Keywords:**

Ribonuclease barnase, barstar, heterodimerization module, tumor specific antibody, immunotoxin, immunoassay

**Abstract:**

The ribonuclease barnase (12 kDa) and its inhibitor barstar (10 kDa) form a very tight complex with a  $K_d$  of 10-14 M, and all N- and C-termini are accessible for fusion. The important advantage of barnase/barstar to many other dimerization modules is that the interaction is 1:1 and both partners by themselves are soluble and non-sticky. We are exploiting this system to create novel modular targeting molecules based on tumor specific antibody scFv fragment fusions to barnase and barstar. The main objectives of the project are following: (i) Design of toxin fusions based on tumor specific scFv and module barnase/barstar. In these constructs ribonuclease barnase will be tested as a toxic principle itself. Concurrently it will be used for linking other principles (exotoxin A). In this process the constructs, vectors and purification strategy will be optimized. Delivering of immunotoxins to a tumor and their effect will be tested using cancer cells in vitro and later in vivo. (ii) At the first time barnase/barstar module will be exploited to develop diagnostic system(s) for fundamental research and clinic. The barstar(barnase)-label conjugates will serve as universal reactants being suitable for detection of different antigens in combination with specific chemical or recombinant antibody-barnase(barstar) conjugates. Due to the possibility to obtain recombinant fusions with standardized composition and affinity, the given module may be considered as effective substitute of common biotin-(strept)avidin module for different immunoanalytical applications (immunoenzyme assay, Western-blot assay, flow cytometry, fluorescent microscopy and electron microscopy techniques). (iii) Barnase/Barstar will be used as a new heterodimerization module to design divalent-bispecific scFv constructs (di-bi miniantibodies), in which different (anti-HER2/neu, anti-EGFR etc) single-chain Fv fragments are fused to the enzyme (barnase) or the inhibitor (barstar) in order to construct a divalent miniantibody.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110848 – Wiese Uwe-Jens

**Title:** Nonperturbative dynamics in planar condensed matter systems

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**Keywords:**

Quantum Hall effect, Dirac-type quasiparticles, Graphene, Doped antiferromagnets, Effective field theory

**Abstract:**

The quantum Hall effect is a nonperturbative collective many-body phenomenon arising in planar condensed matter systems in an external magnetic field. While the conductivity of a Hall sample vanishes in the direction of the electric field, it is quantized in the perpendicular direction. Graphene (a single layer of graphite) is a planar system with Dirac-type quasiparticle excitations, for which it is interesting to study the quantum Hall effect. Another class of nonperturbative planar condensed matter systems are antiferromagnets which may turn into high-temperature superconductors upon doping. Lightly doped antiferromagnets can be described by a systematic low-energy effective field theory for magnons and doped charge carriers. The goal of this joint project of Ukrainian and Swiss physicists is to gain a deeper theoretical understanding of these planar systems which are of central importance in modern condensed matter physics.

SCOPES 2005-2008: Abstract Institutional Partnership

## Project no.: 110849 – Mesot Joel

**Title:** Research and education using neutron scattering experiments (RENSE)

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**Keywords:**

Neutron Scattering, magnetism, intermetallics, structure determination

**Abstract:**

The present Institutional Partnership (IP) project continues joint international efforts to get young people (of the NIS countries) interested and involved in science again. A few years ago the leading scientists of the NIS partners of the present IP came to the conclusion that the number of post-graduated students and young scientists in their laboratories is approaching a critically low value. An idea to use the IP mechanism to improve the situation has met enthusiastic approval of the Swiss partners and has been supported by the SCOPES IP project ERAM 7IP65598 (2001 – 2003), the main goal of which was to motivate young people of the NIS countries to continue their post-graduate scientific work. This goal was successfully achieved, as described in the ERAM Final Report. The whole team of young scientists involved in the former IP-project decided to join the NIS partners' laboratories manifesting thus a breakthrough in the "young generation problem", the significance of which cannot be overestimated. A common benefit for all the participants is connected with the scientific results obtained in the frame of the project. The partners consider the IP as an extremely effective instrument of long-term scientific and technical international cooperation of multiplicative orientation. Taking into account the positive results of the previous ERAM project, the present IP project uses similar basic instruments to achieve its goals.

Therefore, the present IP project includes:

- An educational component, consisting of "Lectures for basic concepts and methods in neutron scattering" and lectures on selected "hot topics" in condensed matter physics;
- A program of basic research, the results of which are potentially attractive for practical applications,
- A mobility scheme (short-term visits to foreign laboratories, joint experiments, meetings, specialized schools) as a key instrument to achieve the goals of the IP;
- The development of new forms and plans for further scientific co-operation;
- The development of teaching/research infrastructure of the NIS participants.

The IP focuses first on its educational component. The lectures on neutron scattering and selected "hot topics" in condensed matter physics aim at increasing the scientific outlook of all the participants. These specialized lectures are planned to accompany all the activities in the framework of the IP.

A programme of scientific and technical collaboration between the partners is based on the common interest to explore neutron scattering in studying i) crystal and magnetic structures as well as other physical properties of intermetallic compounds based on rare-earth and 3d-transition metals and their hydrides; ii) interstitial alloys of transition metals (carbides, nitrides, oxycarbides, carbidehydrides, carbidenitrides) as well as intercalated compounds such as titanium dichalcogenides. The potential significance of the expected results is determined by the twofold orientation of the project. On the one hand, new experimental information on a location of the interstitial or intercalated atoms and on structural and magnetic phase transitions, which would help to understand the mechanism responsible for the unusual properties of the systems under study, particularly for magnetism of metal hydrides. On the other hand, the results of the project promise to put forward novel hydrogen storage materials needed for the development of hydrogen as a fuel.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110851 – Tröster Gerhard

**Title: Swiss-Bulgarian Network in Education and Research in Packaging in Microelectronics**

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### **Partners:**

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### **Keywords:**

electronics engineering, microelectronics packaging, education

### **Abstract:**

The project is designed in response to the change processes toward democracy and the real demands of the newly emerging national labour market in Bulgaria, with private small and medium-sized enterprises, where human resources development becomes a priority of a new order. The project aims to strengthen the Bulgarian institution in order to equip young people with knowledge and skills, which will empower them to work effectively in the conditions of the newly formed market economy.

Participating research institutions:

- Electronics Laboratory– (IfE), Department of Information Technology and Electrical Engineering at the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland
- Department of Microelectronics, Faculty of Electronic Technology at the Technical University of Sofia (UT-Sofia), Bulgaria

Objectives:

1. Development of new curriculum and a script in PACKAGING IN MICROELECTRONICS to improve the quality of education and training in electronics in Bulgaria.
2. Adapting the Swiss universities' good practices in management and implementation of eLearning to the specific needs of the Bulgarian university to help the implementation of the educational reform and the use of new technologies in education, and development of eLearning modules in PACKAGING technologies.
3. Adaptation of modules of the new PACKAGING (packaging) curriculum to the needs of small and medium enterprises in electronics in order to provide training courses for professional qualification of their staff and for re-qualification of jobless educated people.
4. Renewal of the infrastructure for research and teaching in MICROELECTRONICS to strengthen the Bulgarian institution's research performance.

Main activities:

- project management
- renewal of the department infrastructure
- development of curriculum in packaging– technologies
- development of the eLearning environment for training in microelectronics
- development of training courses for SMEs in– microelectronics packaging
- evaluation, pilot test, implementation,– dissemination
- Outcomes:
- curriculum on Packaging in Microelectronics
- script on Packaging in Microelectronics
- eLearning course modules
- network of experts and resources
- renewed infrastructure for research and– education in the Department of Microelectronics
- reports on conferences and– publications in scientific journals.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110854 – Figgemeier Egbert

**Title: SYNTHESIS OF DOPED-NANO-STRUCTURED SEMI-CONDUCTOR LIBRARIES FOR HIGH-THROUGHPUT TESTING OF PHOTOCATALYTIC OXIDATION PROCESSES**

### **Co-ordinator:**

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### **Keywords:**

photocatalysis, Titandioxide, laser pyrolysis

### **Abstract:**

Photocatalytic oxidations and in particular photocatalytic water splitting is an attractive way to transfer the energy of sunlight into chemical energy, which can fuel combustion engines or fuel cells. In this context the current project is aiming at the production, high-throughput screening and optimisation of photocatalytically active nano-structured materials. Fe-doped TiO<sub>2</sub> is chosen as model system. The nanoparticles of Fe-doped TiO<sub>2</sub> will be produced by means of laser pyrolysis. In the first phase of the project this method will be established and a small number, but well characterised samples will be produced by the group of Prof. Ion Morjan in Bucharest, Rumania. The samples will be investigated with a scanning electrochemical microscope modified with an appropriate light source towards their oxidative power under illumination. At the same time sample preparation and the screening stage will be adapted to a high-throughput mode, which will enable us in the second phase of the project to screen a large number of samples in parallel. This work will be done at the University of Basel (Dr. E. Figgemeier and Prof. E. C. Constable). In the last phase of the project, an additional photocatalytically active system will be selected, produced and screened towards oxidative and reductive power under sunlight illumination. Currently, nitrogen-doped TiO<sub>2</sub> seems to be an attractive candidate for its water splitting abilities and is therefore tested with priority.



SCOPES 2005-2008: Joint Research Project

## Project no.: 110859 – Allenspach Peter

**Title: Magnetic and electronic properties of cobalt-based perovskites under extreme conditions (external magnetic field, pressure and temperature). COPEC**

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### Keywords:

cobalt perovskite, dimensionality, quantum critical point, charge and spin ordering, metal-insulator transition, extreme conditions, pressure, magnetic field, temperature, neutron scattering

### Abstract:

Perovskite materials have attracted very much attention in the last 15 years, since they represent some of the most likely alternatives to standard materials commonly used nowadays. The most famous examples are given by the high-temperature cuprate superconductors that allow transporting electricity without losses, giant magneto-resistance manganates or ferro-electric titanates that could be used for data storage devices. Recently, another very interesting class of materials showing giant magneto-resistance (MR) and metal-insulator (MI) transitions has been discovered: the cobalt perovskites with general formula  $R_{1-y}(\text{Sr,Ba})_y\text{Co}_2\text{O}_{5+x}$ . In addition, at high temperatures, the cobaltites are interesting for their large ionic conduction, thus showing potential for applications as gas sensors, oxidation catalysts, or electrode materials for fuel cells.

Little is known about the correlation between the spin and charge degrees of freedom in perovskite cobaltites under extreme conditions, i.e. whether and to what extent the spin-state transitions affect the metal-insulator,

charge- and spin-ordering transitions. Besides, the effective dimensionality of the cobaltites is known to directly affect their magnetic and electronic properties. In order to optimise these complex materials for industrial applications, it is crucial to understand the basic interactions that control their electronic and magnetic properties over a large range of magnetic fields, pressure and temperature.

External pressure gives the possibility to change the spin-state of the Co ions by changing bond lengths and/or bond angles. In this respect, external pressure provides a unique tool to tune electronic and magnetic properties by changing the delicate energy balance between the crystal-field and the intra-atomic exchange energies.

Temperature between hundreds and thousand K allows reproducing practical temperature range of gas sensors, electrode materials, etc. In this broad interval of pressure and temperature, the properties of the matter could be strongly modified, some of these modifications being non reversible.

The great interest of some of these compounds also deals with the fact that a quantum critical point (QCP) can possibly be produced by tuning an external control parameter, such as hydrostatic pressure, chemical composition, or magnetic field. The proximity to a QCP is known to give rise to novel ground states, such as quantum magnetism and unconventional forms of superconductivity. Since quantum criticality is becoming increasingly recognized as a universal phenomenon in condensed matter physics, it is of paramount importance to understand how QCPs might stabilize new phases.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110865 – Studer Christoph

**Title: Sustainability of agricultural production in Armenia-analysis of the current situation and improvements through farm advice and facilitation of policy action to adapt framework conditions using the RISE**

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**Keywords:**

Armenia, RISE, sustainability assessment, indicators of sustainability

**Abstract:**

The project aims at analyzing the sustainability of agricultural production in Armenia and at improving it through farm advice and the facilitation of policy action to adapt framework conditions. Applying the RISE (Response-Inducing Sustainability Evaluation) model as sustainability assessment and management tool shall help farmers and decision makers to overcome the difficulties Armenian agriculture faces during the transition period, through research and simultaneous development on the ground.

Context and significance: Since the collapse of the Soviet Union, Armenian agriculture is facing severe changes and problems, particularly with regard to inadequate farming practices and marketing of farm produce. To improve and develop efficient and sustainable agriculture in Armenia, the Ministry of Agriculture together with FAO designed a "Strategy for Sustainable Agricultural Development". RISE is considered a very useful tool to analyze and ease the current situation of Armenian agriculture, and to achieve the objectives of the strategy. Through its dual benefit of (1) facilitating/inducing improvements at the farms level and (2) allowing for the identification of potentials and bottlenecks with regard to framework conditions, large-scale use of RISE allows for simultaneous research and development through a unique combination of research, extension and education. Analysis of farm-level data at higher level (sector, catchments, region, etc.) allows developing recommendations to adapt framework conditions fostering sustainable development.

Methodology and approach: RISE (<http://www.shl.bfh.ch/?id=425>) provides a holistic overview on strengths/potentials and weaknesses regarding the sustainability of agricultural production, covering economic, ecologic and social aspects. By identifying intervention points for improvement, RISE not only aims at diagnosis, but rather at the initiation of measures to improve sustainability. The model allows for benchmarking over time (e.g. for baseline studies, monitoring, impact assessment), over space (even internationally), and over different farm types/sectors and can thus visualize trends and developments. The RISE methodology uses a standardized approach and is, in spite of its complexity, relatively simple to apply.

To introduce RISE in Armenia, a core group of Armenian scientists is introduced to RISE and the principles of sustainable agricultural production. A "RISE hub" (competence center) is being established at the Agribusiness Teaching Center (ATC) of the Armenian Agricultural Academy (AAA), disseminating this knowledge and training advisors and extension agents to carry out RISE assessments and provide the farmers with appropriate feedback. After a pilot project covering different (typical) farm types, large-scale sustainability assessments will provide insight into the current sustainability situation and indicate possible adaptations to the framework conditions to improve the situation and ease the transition period. This information will be disseminated to the relevant stakeholders.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110869 – Ansermet Jean-Philippe

**Title: Mn and Cu doped ZnO nanowires prepared by electrodeposition in ion track templates**

**Co-ordinator:**

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**Keywords:**

ZnO, spintronics, magnetism, wide band gap semiconductors, DMS

**Abstract:**

In the last few years a large number of scientific reports deal with the properties of ZnO and of ZnO nanowires (about 180 papers in the last five years can be found in ISI Web of Knowledge database dealing with ZnO nanowires). The reason for such effervescence in the field is given by the wide field of possible applications in areas as optoelectronics and spintronics. A trigger for the study of ZnO nanowires was given by the 2001 report in Science regarding lasing capabilities of ZnO nanowire arrays presented by the group of Peidong Yang from Berkley (Huang et al., SCIENCE VOL 292 8 JUNE 2001, 1897). Another major direction of research is given by the fact that ZnO is one of the oxide semiconductors which doped with transition metal elements, are one of the candidates for a high Curie temperature ferromagnetic semiconductor which are important in order to realize semiconductor spintronics at room temperature. The present project aims at the preparation and study of Mn and Cu doped ZnO nanowires. The method of preparation is electrochemical deposition in nanoporous membranes also known as the template method.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110873 – Feurer Thomas

**Title: Crystals and optical fibres for novel diode-pumped femtosecond laser systems and applications in nanoprocessing of advanced materials**

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**Keywords:**

nanostructured materials, diamond, ultra-hard coatings, femtosecond laser ablation, crystal fibres, crystal fibre laser, mixed vanadates, picosecond thulium lasers,

**Abstract:**

The IP project is the continuation of the former SNSF project 7 IP 62635 between the Institute of Applied Physics (IAP) of the University of Bern and the General Physics Institute (GPI) of Russian Academy of Sciences. The participating research institutions are the Laser Division of the IAP, the Laser Induced Surface Phenomena Department of Natural Sciences Center of GPI, and the Department of Laser Crystals & Solid-State Lasers of the Laser Materials and Technologies Center of GPI. The joint research activities between the Laser Division of the IAP and the Laser Induced Surface Phenomena Department of GPI include:

- ultra short pulse laser assisted production of nanostructured materials such as nanoparticles, carbon-based nanocomposite coatings, or laser-sintered materials;
- the study of femtosecond laser ablation of diamond materials, including single crystals, polycrystalline diamond plates, and nanocrystalline diamond films.
- femtosecond laser micro- and nanostructuring of diamond materials and super hard coatings from diamond-like carbon. The joint research activities between the Laser Division (IAP) and the Department of Laser Crystals & Solid-State Lasers (GPI) will focus on:
- the development and investigation of high efficient diode pumped thulium lasers (based on Tm:YVO<sub>4</sub>, Tm:YALO<sub>3</sub> and others crystals) with effective generation of picosecond and femtosecond pulses of two micron spectral range;
- the growth of single-crystal fibers of Nd<sup>3+</sup> or Er<sup>3+</sup> doped garnet by a method of "minipedestal with laser heating" and study of fiber laser generation using diode pump and Ti-sapphire laser pump;
- the development technology production of vanadate crystal fiber and investigation of diode pumped vanadate fiber lasers;
- the development of the growth technology of mixed vanadates Nd:YxGd<sub>1-x</sub>VO<sub>4</sub> with broad line width;

- the spectroscopy of cerium ions in high efficient scintillating crystals and glass, as well as the spectroscopy of Nd<sup>3+</sup> ions in mixed vanadates. The realization of the planned activities in the framework of the IP project will result in an improvement of working conditions in Russian laboratories, an improvement of the education of PhD and diploma students to be involved in the project, and an enhancement of professional qualification of the project participants. The strengthening of the collaborative network between Russian and Swiss research institutes, the enhancement of the mobility of the GPI research teams and their competitiveness in the international scientific community will be the primary result of the IP. The extension of joint research areas, motivated by innovative laser technologies and novel laser applications will be of great scientific interest and benefit for both GPI and IAP.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110878 – Ban Nenad

**Title: Structural studies of atypical seryl-tRNA synthetase from methanogenic archaea**

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**Keywords:**

Aminoacyl-tRNA synthetases, tRNA, macromolecular complexes, x-ray crystallography, protein biosynthesis, archaea, evolution

**Abstract:**

Accurate aminoacyl-tRNA synthesis is essential for faithful translation of the genetic code and consequently it has been intensively studied for decades. Conserved structural features of aminoacyl-tRNA synthetases belonging to two distinct classes (I and II) allow in most cases facile recognition of orthologous enzymes in many organisms by sequence similarity searches of the available databases. However, recent investigation with archaea, intensified after the sequencing of the first archaeal genome (*Methanococcus jannaschii*), revealed unexpected levels of complexity and diversity, questioning the notion that aminoacyl-tRNA synthesis is one of the most conserved functions in gene expression. Seryl-tRNA synthetase (SerRS) is a class II synthetase, comprising three signature motifs, characteristic for all class II enzymes. Much of the variation between SerRSs occurs in the N-terminal domain that is involved in tRNA recognition, whereas the catalytic domain (that is the C-terminal 300 or so residues) is rather well conserved. The only intriguing exception is the existence of a uniquely different SerRS form that has only been found so far in methanogenic archaea. It was firstly noticed that SerRS-encoding genes (*sesS*) in methanogenic archaea display only low sequence similarity to the known *serS* genes from all other organisms. Later on, biochemical analysis of purified SerRSs from several methanogens showed that these proteins in fact have canonical SerRS activity. Since none of archeal seryl-tRNA synthetases have yet been crystallized, in the collaborative project sponsored by SCOPES (7KRPJ065693; 2001-2003), we have focused on the crystallization and X-ray analysis of heterologously overexpressed methanogenic SerRS enzymes. Our main goal has been to compare the structure of these unusual methanogenic SerRSs with available structures of canonical bacterial-type counterparts. On the other hand, we wanted to correlate the structure of the methanogenic apo-enzyme with the substrate-bound SerRS, in order to assess the substrate recognition domains and possible structural changes associated with substrate binding. In parallel, enzyme kinetics studies have been performed together with biochemical characterization of SerRS:tRNA complexes. After several crystallization trials with SerRSs from different archaeal organisms, we recently succeeded in crystallization and the structure determination of *Methanosarcina barkeri* SerRS. The structure has now been fully refined to a Free R factor of 20% and a paper describing these findings and associated biochemical experiments is in preparation.



As expected, the 3D structural features of methanogenic enzyme differ significantly from canonical counterparts. The most interesting finding is that enzyme's active site shows closer resemblance to the active site of threonyl-tRNA synthetases than to other SerRSs. The ion of zinc was found in both subunits of *M. barkeri* SerRS and the residues which participate in zinc coordination were identified. Besides two cysteines (Cys 306 and Cys 461) and the glutamate (Glu 355), a water molecule serves as a ligand in the apo-enzyme. All three residues are conserved in the sequence of all methanogenic SerRSs, but not in SerRS proteins from other sources. Structural data now permits design of structure-based biochemical and mutational experiments, which are currently in progress, necessary to elucidate the structure-function relationships in unusual methanogenic SerRS enzymes. The continuation of the project proposed in this application will enable defining the mode of substrate selection by *M. barkeri* SerRS. Our preliminary results imply that, in contrast to the counterparts from bacterial, eukaryotic and other archaeal organisms, the methanogenic SerRSs employ zinc in serine recognition. This finding shed a new light on quality control mechanism in serylation and will be one of the main subjects in our future studies. Zinc-mediated serine recognition in methanogenic archaea suggests that SerRS system could be the first aaRS system that developed two fundamentally different mechanisms for the selection of the same substrate. We also expect to reveal how cognate tRNA is recognized by the methanogenic SerRS, since its N-terminal part exhibits diverged structural features and does not form a typical coiled-coil structure present in all other SerRS proteins. These collaborative studies should complement and extend the ongoing projects on protein translation, and seryl-tRNA synthetases in particular, at both performance sites.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110880 - Zürcher Dieter

**Title: Capacity Building through research partnership - A case study on Decentralisation and Governance in Northern Albania**

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**Keywords:**

Decentralisation, Good Governance, Regional Development, Local Government

**Abstract:**

Albania has made great efforts during the last years to reform and consolidate its political and economic institutions. After decades of highly centralised governance, the Government and donors have been promoting decentralisation and handing over of governance responsibilities to Local Governance Units (LGU) in recent years.

There is only one university in the northern part of Albania, compared to the four in the southern part. The University of Shkodra was heavily impacted by the transition process and suffered by such problems like limited budgets, brain drain of lecturers and students, high rates of qualified people turnover and poor public services (frequent power cuts, etc). Despite these problems, the University of Shkodra is continuously trying to face challenges like curricula reforms (Bologna Declaration) and is also engaged in applied research activities addressing socio-economic and environmental development issues of the region.

The proposed institutional partnership entails a co-operation between NADEL, the Faculty of Economy of the University of Shkodra, ANTTARC (capacity building NGO in Local Governance) and the Institute of Federalism (IRCC; University of Fribourg as a training provider in decentralisation).

The aim of the proposed partnership between NADEL and the Economic Faculty of the University of Shkodra is to strengthen the research capacities and to establish a dialogue on decentralisation and good governance issues, since the latter is also a subject at NADEL. The specific objectives are:

- A) The human and institutional capacity of the Faculty of Economy is improved
- B) The infrastructure of the Faculty is upgraded
- C) A research paper on decentralisation on Shkodra region is published
- D) An efficient co-ordination and administration of the project is provided (NADEL & local Co-ordinator)

The institutional partnership also aims at providing a relevant and actual contribution to the decentralisation efforts that Albania undertakes on its accession path to the European Union, especially in a context where the interpretation and implementation of the laws and rules at local level still pose big obstacles and the effectiveness and efficiency of local tax/fee administration is seen as a critical factor.

The output of the partnership will be a research paper compiling various contributions by lectures of the Faculty of Economy and the Faculty of Law analysing constraints and potentials in local tax/fee collection, distribution of roles between Local Government Units, the region, central Ministries and various committees as well as exploring the co-operation potential among local communes.

The results of this process will be disseminated through a conference at the University of Shkodra, and publications.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110881 – Spini Dario

**Title: Transition to adulthood and collective experiences in former Yugoslavia**

### **Co-ordinator:**

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### **Keywords:**

Human rights, International community, War trauma, Migrations, Intergroup reconciliation, Sense of justice, Political socialization, Transition to adulthood, Multi-level analyses, Life calendars.

### **Abstract:**

An emerging interdisciplinary research network within the University of Lausanne, dedicated to the study of the psychosocial consequences of war in former Yugoslavia, will cooperate with researchers in Croatia (Prof. Dinka Corkalo Biruski from University of Zagreb and Prof. Vera Cubela Adoric from University of Zadar, co-applicants) and Serbia (Prof. Mirjana Vasovic and Prof. Gordana Jovanovic from University of Belgrade, co-applicants). Joint research activities will be organized around the common analysis of a newly designed survey across all regions of former Yugoslavia. This survey, labelled TRACES (“Transition to Adulthood and Collective Experiences Survey”) is intended to produce both contextual and individual datasets. The contextual dataset will inform about collective experiences of the overall adult population, regarding notably issues such as migrations, war experiences, and experiences of poverty or social exclusion. The individual dataset will inform about perceptions of intergroup relations, judgements related to the legitimacy and implementation of human rights and international law, perceptions of the role of the international community, as well as fundamental beliefs about justice, among those who entered adulthood during the war period (1968-1974 cohort). Specific objectives of the scientific partnerships within SCOPES are: (1) to support the realization of TRACES from the research design to the publication of research results; (2) to extend it by a series of specific in-depth analyses; (3) to facilitate the valorisation of the research findings within the studied countries, and (4) to develop the diffusion of methodological skills required to analyse the datasets, in particular among young researchers. The joint research project is structured by five thematic units (TU). TU1 “Collective experiences in a period of societal instability” will be dedicated to the analyses of the contextual dataset in order to produce historically meaningful descriptions of collective experiences before, during, and after the period of war.

TU2 “Institutional discourses on human rights”, will consist in the qualitative analysis of documents produced during this period, in order to describe the changing institutional and ideological context. In the framework of TU3 “Contextual effects on young adults’ political socialization”, contextual knowledge generated within the first two units will be used for explaining various outcomes of political socialization of members of the 1968-74 cohort. TU4 “Perceptions of intergroup relations and social identity construction” will consist in in-depth analyses of the Croatian and Serbian national datasets on intergroup perceptions, and should help to better understand processes which lead to the perpetuation of intergroup conflicts or to sustainable cooperation and reconciliation. Finally, within TU5 “Fundamental beliefs about justice, and coping with traumatic life events” , analyses will contribute to a better understanding of the way beliefs about justice interact with processes of coping with traumatic war events.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110884 – Schmutz Werner

**Title: Modelling of the global ozone and climate evolution in the first half of the XXI century**

**Co-ordinator:**

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**Keywords:**

climate, climate change, ozone, future climate, global climate model

**Abstract:**

The goal of the project is a projection of the evolution of the global climate and ozone concentration during the next decades up to 2050. The evolution of the global climate and ozone in the atmosphere depends on various natural and anthropogenic forcings. The most significant ones are the anthropogenic emission of greenhouse gases (GHG) and ozone destroying substances (ODS), volcanic eruptions, solar activity, and tropospheric air pollution by various source species including ozone precursors. For the prediction of the future global ozone and climate we will use in the first part of the project the present version of the state-of-the-art Chemistry Climate Model (CCM) SOCOL described by Egorova et al. (2004, 2005) and Rozanov et al. (2005) and in the second part an updated version with improvements as outlined below. We will carry out several transient runs covering the period 2000-2050 based on different scenarios of external forcing taken from IPCC (2001). Sea surface temperature and sea ice evolution scenarios, constructed from the set of coupled atmosphere and ocean general circulation models (GCM) runs for the 21st century, will be also included in the numerical experiments in the form of external parameters. The measurements of last decades reveal opposite trends of ozone abundance in the stratosphere and in the troposphere. While the stratospheric ozone decreased, the tropospheric ozone has been increasing; both trends affecting global climate. CCM SOCOL has an excellent stratospheric photochemical module but the description of the tropospheric and mesospheric chemistry needs further improvement. Therefore, in parallel to the simulations with the present version of SOCOL, we will implement photochemistry of basic volatile organic compounds and include the transformations among the relevant basic ion groups. The addition of ion chemistry in the model will allow us to compute more accurately the downward fluxes of the nitrogen oxides (one of key ozone precursors) from the mesosphere and thermosphere into the stratosphere. When the improved version of the SOCOL is ready we will repeat all runs carried out with basic version of SOCOL in order to estimate the importance of tropospheric and ion chemistry for the future climate and ozone development. The basic version of the CCM SOCOL will be provided to the Russian team by the Swiss partner. The simulations with the basic version of the CCM SOCOL will be carried out simultaneously by the Swiss and Russian teams. The modifications of the CCM SOCOL as well as the runs with the improved version will be performed by the Russian team in collaboration with the Swiss team.

The improved version of the model will be made available to the Swiss group who will continue to apply the improved code for studies of the past and future climate and for now-cast and short-term forecast of atmospheric quantities related to space weather issues. The proposed project will be beneficial for both partners in an obvious win-win constellation.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110885 – Spangenberg Jorge

**Title:** Permian–Triassic mass extinction in an ancestor of the Adriatic Carbonate Platform, Croatia

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**Keywords:**

Permian–Triassic transition; biotic crisis; Adriatic Carbonate Platform; sedimentology; stable isotopes; hydrocarbon biomarkers; metabolic evolution; regional geological correlation

**Abstract:**

The proposed Joint Research Project (JRP) is a state-of-the-art study of one of the most intriguing and controversial topics in Earth Sciences: the mass extinction that occurred at the end of the Permian period, approximately 250 million years (Ma) ago, which was the most devastating loss of life in Earth's history. The geochemical records of the biotic crisis of the Permian–Triassic (P/Tr) transition,  $251.4 \pm 0.3$  Ma, encompass large positive and negative secular excursions in the carbonate and organic carbon, sulfur, and strontium isotope abundances, changes in the concentrations of redox-sensitive elements, as well as in abundance and carbon isotope composition of biomarker hydrocarbons. Open sections with continuous sedimentation along the Permian–Triassic transition are rare, but their study is of great value for understanding the causes and effects of the P/Tr environmental changes. Such complete successions occur in some regions of Croatia. The proposed JRP addresses the causes of the P/Tr biotic crisis by using combined biogeochemical molecular and isotopic data from sedimentologically, stratigraphically and palaeontologically characterized sedimentary rocks. The main field study will examine Upper Permian to Lower Triassic deposits in the Velebit Mt., SW Croatia. In this region, approximately 900 meters thick carbonate sequence, deposited from the Middle Permian up to the earliest Triassic (~270–251 Ma), was the ancestor of the Mesozoic Adriatic Carbonate Platform (AdCP). Geological studies in the Velebit Mt. were interrupted almost 15 years ago due to war activities. A JRP will help to relive this research, taking advantage of an ongoing project of the Croatian Geological Survey and the National Oil Company (INA-Naftaplin) on a geological reconnaissance profile across this part of the former AdCP foundation. Three other Croatian reference P/Tr sections (Evaporitic Complex of Central Dinarides, Gorski Kotar region, and Samoborska Gora Mt.) characterized by a range of shallow marine depositional environments (subtidal to supratidal) will be studied. The new data set, based on carbonate and associated organic carbon isotope composition, and the abundance and carbon isotope composition of diagnostic hydrocarbon biomarkers, will provide an excellent opportunity to study the interrelationships of depositional facies, diagenetic alteration patterns, biological and palaeoenvironmental changes, and ultimately petroleum potential.



In particular, the comparison of the molecular and isotopic biogeochemistry with published and additional sedimentological and palaeontological information over a range of deposits of comparable age within the neighboring countries (Slovenia, Hungary) should allow to discriminate local palaeoenvironmental signals from those due to the global secular changes. The project joins and combines capabilities and expertise of sedimentologists, palaeontologists, petroleum geologists, mineralogists and geochemists, stimulating efforts of young researchers through strengthening an interdisciplinary research. In a global scale, the understanding of the biogeochemical carbon cycle, the production and consumption of carbon dioxide and methane, as well as the correlation of biogeochemical changes, with biotic and climatic changes of the P/Tr transition provide a suitable platform against which the potential for future changes in greenhouse gas concentrations as a consequence of anthropogenic activity and their impact on climate and life can be assessed.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110891 – Gern Jean-Pierre

**Title: Conforming to EU standards and efficiency requirements in the SME of Bulgaria: social and economic effects in the food industries**

**Co-ordinator:**

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**Keywords:**

Bulgaria, food industries, conforming to EU standards

**Abstract:**

The majority of Bulgarian SME count exclusively on the internal market with a great segment of low income and not requiring consumers. This brings many enterprises to follow the “low” road of competitiveness (low wages, non-observance of labor and ecological standards, disregard of safety in working processes, escaping taxes, etc.). Those enterprises are mostly threatened by the obligatory implementation of EU standards and external competition. The retard in their upgrading will lead to many bankruptcies with heavy social and economic consequences in terms of employment and living standard.

The basic goal of the research project is to study the social and economic effects of the obligatory implementation of EU standards on quality, safety and environment and the integration in a global market for SME in food and textile sectors in Bulgaria. The two sectors are chosen because of their importance for EU consumers (food), significant part in the country export (textile), and local employment. The achievement of this goal involves the exercise of three groups of tasks, related to: 1) institutional environment for the implementation of EU standards and economic practices; 2) SME's readiness to implement and abide by them; 3) difficulties and problems the SME are facing in these efforts.

The theoretical framework of the research is based on the concept of learning organization in the context of a global economy, e.g. on the idea that conforming to the standards and operational practices of EU creates a chance for SME to renew their production, equipment and processes if they wish to stay on the market. The research will be based on the extensive use of different data sources.

We plan to review and summarize relevant publications on the topic; carry out about 50 semi-structured interviews with representatives of state agencies, trade associations, foreign hypermarket chain and single enterprises; prepare a standard questionnaire and distribute it among a representative sample of enterprises of both sectors; data processing and analyses; publications and public presentation of the results; publication of the users' book; national workshop of the stakeholders.

Based on the expected results adequate recommendations could be done. As it can be expected that there will be a strong incentive to avoid compliance with standards, only a gradual and pragmatic approach, supported by local institutions, is likely to reduce the gaps in the observance of production and working conditions and to improve the operation of SME.

We intend to publish at least one scientific book, many articles and conferences' contributions both in Bulgarian and English. The results will be made accessible to the interested state agencies, trade associations, and local institutions.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110892 – Larkum Matthew

**Title: Pattern-forming roles of heterogeneous dendritic geometry and synaptic input in electrical activity of neocortical pyramidal neurons**

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**Keywords:**

Neuron doctrine, arborization asymmetry, ion channels, multielectrode recording, reconstruction, simulation

**Abstract:**

The general objective is to disclose the biophysical mechanisms determining spatial-temporal patterns of electrical activity in individual pyramidal neurons of neocortex in the brain.

Combined experimental and theoretical methods will be used to ascertain the biophysical mechanisms underlying morphology-related partitioning of neocortical pyramidal neuron into electrically coupled domains. The spatial-temporal signal processing in complex asymmetrical dendritic arborizations and the formation of patterns of neuronal electrical and biochemical processes will be determined. The study will particularly focus on the impact of heterogeneous geometry (asymmetry) and active membrane properties of the dendritic arborization, including its apical, oblique and basal sub-trees.

The result will be gaining new insight into the structural/functional organization of pyramidal neurons by further developing and extending the notion of multiple zones of spike initiation. Thus the classical neuron doctrine will be substantially upgraded by demonstrating that the output patterns known mainly from single-site recordings, predominantly somatic, are fragments of complex spatial-temporal activity with a certain geometry-induced cooperativity between different parts of a cell.

In addition to scientific results and in line with the SCOPES objectives, undertaking this project will help to overcome difficulties of the transition period faced by the Ukrainian partner by enhancing professional qualifications and strengthening competitiveness of scientists, including young researchers and university teachers. It will promote integration of Ukrainian partners into international system of research and education by providing them, particularly young researchers/teachers with the possibility to join Europe- and world-recognized research and get new professional skills in modern electrophysiology and imaging techniques, experimental neuroscience in a leading Swiss research and education center. On the other hand, professional skills of the Ukrainian partners in theoretical neuroscience and in modeling approach to studies of spatial-temporal patterns of electrical and biochemical processes in morphologically complex neurons will be shared with the Swiss partners.

This will help in enhancement of professional qualification of both partner teams. Experience obtained by Ukrainian partners will be used during elaboration of new teaching curricula and contents of teaching courses as a part of educational reform taking place in Ukraine and aimed at joining “the Bologna process” of the creation of a European space for higher education.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110895 – Zollikofer Christoph

**Title:** Comparative analysis of the hominin fossils from Dmanisi

**Co-ordinator:**

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**Keywords:**

computer-assisted fossil reconstruction, early Homo, geometric morphometrics, paleoanthropology, paleopathology

**Abstract:**

The late Pliocene locality of Dmanisi (Georgia) is key to our understanding of the evolution and biogeography of early Homo. The site is unique in its combination of an exceptionally rich hominin fossil sample with stone implements, an extensive zooarcheological record and a well-documented stratigraphy. This ensemble already yielded significant new insights into morphological variability, patterns of resource use and the paleoenvironment of these first hominins outside Africa. Over the past decade, work at Dmanisi has concentrated on three major areas: a) excavation and site stratigraphy; b) analysis of the hominin finds; c) analysis of the archeological and zooarcheological evidence.

The scientific objective of this project is an in-depth study of the Dmanisi hominin finds. Analyses will be carried out by a joint Georgian-Swiss team of anthropologists and archeologists using state-of-the-art methods of biomedical imaging and morphometric analysis.

While first descriptions of the Dmanisi crania have already been published, these fossils must now be studied in greater detail and within an extended comparative framework. Furthermore, a large part of the hominin remains is still unpublished and awaits primary description. It is therefore important to promote comprehensive analysis and publication of the entire hominin sample.

Four major tasks are defined to reach these goals:

1. Improvement of the scientific infrastructure at the Georgian National Museum in Tbilisi, where most analyses will be performed.
2. Three-dimensional digital data will be acquired from all fossil hominin remains with computed tomography (CT) in hospitals in Tbilisi. Georgian scientists and technicians will be trained in respective methods of data acquisition and analysis.
3. The cranial remains will be analyzed with methods of geometric morphometrics in a broad comparative context. Investigations will focus on three topics:
  - a) patterns of shape variability within the Dmanisi paleodeme, and within early Homo;
  - b) patterns of shape change during ontogeny;
  - c) patterns of dental and bone pathology.

4. An inventory of all postcranial bones will be established. Methods of computer-assisted fossil reconstruction will be used to estimate body size and limb proportions, and comparative analyses of the limb morphology will be performed with the aim to infer patterns of locomotion and arm movement.

The results of this project will contribute to a more detailed understanding of the morphologic variability, behavior, and life history of early Homo. In addition to providing new scientific insights, the project will specifically promote the formation of young Georgian scientists, and foster a sustainable scientific infrastructure at the Georgian National Museum.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110898 – Kübler Daniel

**Title: Bosnia and Herzegovina: territorial organisation and inter-regional co-operation**

**Co-ordinator:**

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**Keywords:**

territorial organisation, political collaboration, urban planning, regionalisation

**Abstract:**

Bosnia and Herzegovina is in a very challenging situation. The territorial organisation with the two entities, the Federation and the Republica Srpska, is far from contributing to overcoming ideological and political barriers within the country. The professional and political exchange with the surrounding countries of former Yugoslavia is (to a great extent artificially) kept low-profile. The relation to the EU is as yet mainly marked by the 'foreign governance' of the country, and not by spatial, social and economic coherence. Within the SCOPES 2000-2003 programme, aspects, shortcomings and opportunities of inter-regional co-operation within Bosnia and Herzegovina, but also with the surrounding countries, were tested and evaluated against the background of two specific issues of regional planning and development: the main transport corridors linking to the EU, and the question of city networks and territorial units (project nr. 7BIHP65680). One of the most important conclusions was that that it might not be possible to find an optimal regional structure solving all kinds of tasks and ambitions. Instead, an efficient system and basis for inter-regional co-operation could actually be the primary task, allowing for flexibly generating adequate forms of co-operation for different issues. Bearing this in mind, the project has culminated in a final conference bringing together professionals from all space-relevant fields of work (sociology, planning, economy, ecology, political sciences, law etc.) as well as political representatives, from all countries of former Yugoslavia. The current SCOPES 2005-2008 project is being built upon this strong basis. On the one hand, the impulse induced by the final conference will be picked up and 'institutionalized', establishing a platform of professional and political exchange in the region on the basis of strategic and regional planning tasks. This will challenge and help to overcome the ideologies still strongly determining opportunities in the region. On the other hand, specific issues regarding the territorial organization of Bosnia and Herzegovina will be further developed. In this respect, the aim of the project is to establish principles and criteria for the territorial organization and inter-regional cooperation in Bosnia and Herzegovina.



An appropriate territorial organization and inter-regional cooperation would accelerate democratic processes, improve the efficiency of civil services, and prepare grounds for a thorough exercise of civil rights. At the same time, it would speed up the linking of regions and cities in Bosnia and Herzegovina with those in Europe, which means speeding up the entire development of the country. All of this in a time when European cities and regions – more than ever – are at the heart of the dynamics of the continent.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110901 – Kiwi-Minsker Lioubov

**Title: Innovative Reactor Combining Plasma and Structured Catalyst for the Destruction of Industrial Pollutants**

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**Keywords:**

Non-thermal plasma; structured catalyst; pollution control; metal fibers;

**Abstract:**

The main goal of the project is the development of an innovative type of plasma-catalytic reactors for the total oxidation of organic pollutants to CO<sub>2</sub> and H<sub>2</sub>O in gaseous and aqueous environment. Non-thermal plasma (NTP) generated at atmospheric pressure by electrical discharge (pulse corona or dielectric barrier) will be used in combination with various structured catalysts, aiming at a synergetic effect between both. The treatment of volatile organic compounds (VOC) by NTP is an alternative to conventional pyrolysis or catalytic total oxidation. NTP generates high energy electrons that excite, dissociate and ionize the gas molecules (VOC & O<sub>2</sub>) producing chemically active species easily converted to CO<sub>2</sub> and H<sub>2</sub>O. The gas remains close to room temperature; therefore the process is performed without spending energy for heating the entire gas stream. This gives big advantages especially for the treatment of diluted VOC streams. However, if plasma reactors are used alone, undesirable CO, NO<sub>x</sub> and ozone are formed. The presence of heterogeneous catalyst in the vicinity of discharge is known to increase the selectivity to CO<sub>2</sub> and H<sub>2</sub>O. The catalysts are used generally in the form of oxide particles and placed after discharge zone in order not to perturb plasma generation and diminish the catalyst deactivation. An innovative plasma catalytic reactor has been designed recently at the LGRC-EPFL. The novelty of this reactor is that the metal catalyst serves at the same time as electrode for the discharge. The synergy of the catalyst with the discharge enhances the VOC conversion and the oxidation towards CO<sub>2</sub> since short-lived species produced in the discharge can react with catalytic surface due to its close vicinity. We expect during the work on the proposed project a further improvement of inside-plasma catalytic reactor which should be attained by optimization of the catalytic electrode and of the design as well as operating conditions of the discharge. The second direction proposed in the project is the investigation of a novel process for the degradation of aqueous organic pollutants, based on the combination of electrical discharges and catalytic degradation/(photo)-catalysis. Corona discharges in water and at the water-gas interface will be used in this case. The high energy electrons created by the discharge with the water molecules produce highly oxidative species: hydroxyl radicals (OH), ozone radical ions (O<sub>3</sub><sup>-</sup>), ozone (O<sub>3</sub>), atomic oxygen (O), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and hydroperoxyl radicals (HO<sub>2</sub>). These species are produced in-situ and in the desired amounts by adjusting the operating conditions.

The efficiency for the degradation of organic pollutants by the discharge is expected to increase significantly in the presence of iron ions due to Fenton's reaction. A further improvement is expected when coupling the discharge and photocatalysts. In this way, the UV radiation emitted by the discharge will also increase the concentration of OH radicals by the decomposition of Fe-complexes under UV-light.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110902 – Gheorghe Adrian

**Title:** Conversion of renewable kinetic energy of water: synthesis, theoretical modelling and experimental evaluation

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**Keywords:**

Renewable energy, kinetic energy of water, helical turbine

**Abstract:**

The Government of the Republic of Moldova launched “The National Program for renewable energy sources utilization” which stipulates an increase in the renewable energy sources production up to 10% from the energy gross consumption in 2010. The issue of renewable energy sources utilization has been also included in the Program of the Government of Republic of Moldova entitled “Strategy for Economic Growth and Poverty Alleviation” (SEGPA). The proposed project is in conformity with the development priorities of the Republic of Moldova. The main objectives of the proposed research project are design, analysis and constructive optimization of the working elements of the free flow kinetic energy conversion systems. The proposed project duration is 36 months.

In order to achieve the main goals of the proposed research, the following tasks are proposed:

- i) Conceptual design of an anchored mini-hydro-electric power station with multiblade vertical axis rotor, and a floating mini-hydro-electric power plant with helical turbine placed in a diffuser. The designed power stations will possess improved turbine efficiency in free fluid flow (Betz coefficient).
- ii) Multidisciplinary analysis of the rotor structure and fluid characteristics using optimization techniques and computational software, and design of the efficient free flow kinetic energy conversion systems for consumers.

The following investigations are necessary in order to achieve the proposed objectives:

- Conceptual design of: an anchored mini-hydro-electric power plant with a vertical axis rotor and hydrodynamic profile blades, a floating mini-hydro-electric power plant with horizontal axis and helical turbine;
- Numerical modeling of the hydrodynamic profile blades and derivation of the optimal geometrical characteristics;
- Numerical modeling of the helical turbines placed in diffusers with hydrodynamic profile surfaces;
- Numerical modeling of the fluid flow action on the rotor blades and the establishment of the optimal position of the blades in order to minimize the energy losses;

- Numerical simulations of the fluid flow between the interior surface of the diffuser and the exterior surface of the helical turbine;
- Numerical modeling of the interaction between fluid flow and working elements, and the establishment of the energy potential;
- Assessment of the energy potential of the multiblade rotor with vertical axis and hydrodynamic profile blades;
- Experimental testing in the laboratory conditions of the functional characteristics of the multi-blade rotor and helical turbine;
- Optimization of the geometrical characteristics of the multiblade vertical axis rotor, helical turbine and diffuser.

The rich experience of the Swiss partner in the field of computer modeling, his useful advice on purchase of computer workstation, licensing of fluid flow analysis software CFX5.7, and acquisition of measuring and data processing computer system created the basis for successful performance of the mentioned research project. The experience gained by the Moldovan team will be crucial for the success of the proposed research project. It is good to mention that 3 of the 5 members of the research team are under 35 that could ensure future cooperation among participants.

The proposed research project is of major fundamental and practical significance. Multidisciplinary and multi-criteria analysis will permit functional and constructive optimization of multi-blade rotor helical turbines with diffuser, which will be used as working elements of the micro-hydro-electric power plants that will be manufactured and installed in 2007 and 2008. The designed rotors will possess the highest possible efficiency and reliability, and reduced manufacturing cost. The construction of micro-hydro-electrical power plants does not require dams and thus the river ecological balance will be protected. The utilization of hydraulic energy from rivers will contribute to the reduction of rural population poverty and will support rural producers by providing new jobs and by favoring setting up small businesses for agricultural production processing.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110911 – Leuenberger Hans

**Title: New concepts in training industrial pharmacists and pharmaceutical engineers to be developed and implemented at the Russian-Swiss scientific and educational centre in MUCTR, Moscow, Russia**

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### Keywords:

Bologna master courses, industrial pharmacy, pharma engineering, technology transfer

### Abstract:

The objective of this continuation project is based on the outcome of the first IP (No. 7IP 62613) and comprises the development and implementation of a unique and innovative Bologna master concept on the base of the Russian-Swiss Education and Scientific Centre for pharmaceutical and biotechnologies transfer (Russian-Swiss Centre) involving the Russian pharmaceutical and biotechnological industry. The Centre is headed by Prof. N. Menshutina ([www.muctr.ru](http://www.muctr.ru)) as executive director, Mendeleev University of Chemical Technology of Russia (MUCTR) and supported by Prof. H. Leuenberger, University of Basel, as honorary director ([www.pharmtech.unibas.ch](http://www.pharmtech.unibas.ch)). The new SCOPES project (IB 74 BO 110911) will boost the development of the Russian industry in the area of pharmaceuticals and biotechnology. Up to now the education of Industrial pharmacists and Pharmaceutical engineers did not exist and the industry was employing pharmacists which were trained for community pharmacies (retail pharmacy shop). By introducing the master programs according to the Bologna agreement and establishing the learning modules according to the needs of the industry the graduate students have an excellent future. The objectives can be summarized as follows: 1. Development and implementation of Bologna Masters “Industrial Pharmacist” and “Pharmaceutical Engineer” programs at MUCTR on the base of Russian-Swiss Centre for mutual benefit of both partners (University of Basel and MUCTR). 2. Development and implementation of the multimedia-based virtual training platform for industrial and laboratory training courses. 3. Strengthening Russian-Swiss Centre by implementing the Centre as a technology transfer platform academia – industry and vice-versa. The impacts of the SCOPES project: A) Strengthening of institution: The initial project and present project of SCOPES resulted in the fact that the Russian Swiss

Centre became an institutional part of MUCTR. In a new building in Tushino (High Tech Research Park of MUCTR in the north of Moscow) lab and office space will be provided by MUCTR for the establishment of this Centre. B) Impact on national and international networking The centre has the real potential to become the turning platform and the interface between the industry and university. The Russian Swiss Centre will serve as a platform for national and international technology transfer in both directions. C) Impact on economy and/or society of partner countries The strengthening of the Russian Swiss Centre will boost the development of the Russian pharmaceutical and biotechnological industry and will help to create partnerships with foreign companies.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110912 – Calzolari Valentina

**Title: The work of David the Invincible: the diffusion of neoplatonic thought and the spread of neoplatonic texts in ancient and mediaeval Armenia**

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**Keywords:**

ancient philosophy, classical heritage in Orient, Armenian language and literature

**Abstract:**

The JRP is the continuation of the research conducted within the framework of the JRP Nr. 7AMPJO65632 (JRP 2001). The JRP 2001 had two different and complementary aspects, one philological and linguistical, the other historical and philosophical. The primary focus of the research was a comparison of the Greek texts and the Armenian translations of David's commentaries on the logical works of Aristotle (VIth century). The comparative study aimed to establish, first, the precise relation between the indirect evidence supplied by the Armenian sources for these texts and the direct evidence provided by the Greek manuscript tradition; and at the same time, it attempted to identify the linguistic characteristics of the Armenian translations and to describe the techniques on which they relied. Secondly, the comparative study was used to further our understanding of the transmission and the reception of Greek philosophical works beyond the frontiers of the Greek world. In addition, particular attention was paid to the spread of philosophical speculation—that is to say, of Platonic speculation—in Armenia and to its influence on early Armenian historiographical thought.

The results obtained during the JRP 2001 were submitted to the attention of the learned world at an international workshop organized at Geneva in 2004. Among the participants were armenologists, historians of Greek philosophy, and orientalists who specialized in the Neoplatonic tradition in its Syriac and Arabic manifestations. During the workshop it became clear to everyone how sophisticated and how exciting was the work done by the different scholars associated with the JRP—and in particular by the scholars from Armenia. The applicant (Dr. V. Calzolari) and the Swiss co-applicant (Prof. J. Barnes) were persuaded that the research carried out on the texts of David during the JRP 2001 made both possible and highly desirable the publication, in five volumes, of the corpus of David's works, with detailed introductions and extensive commentary. This project has been accepted by the series *Philosophia Antiqua* (Brill).

The purpose of the JRP 2005 is to answer the questions posed by the previous study and to complete and publish the important work so far done partly. Only an interdisciplinary approach and collective work of competent scholars with mutually complementary skills will make a research of such volume possible.



The JRP involves the collaboration of three équipes: the Genevan team consisting of scholars from the Department of Armenian Studies; the team of the University of Fribourg, Department of the History of Ancient Philosophy (Prof. O'Meara); and the Armenian team from the Institute of Ancient Manuscripts of Yerevan. Prof. Barnes (currently professor at the Sorbonne) will be actively involved in the JRP 2005.

SCOPES 2005-2008: Joint Research Project

## Project no. 110914 – Blondel Alain

**Title: Modernisation of education in nuclear and particle physics – Swiss-Bulgarian partnership (BUCHEDU)**

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**Keywords:**

University education, graduate level, Master degree, Ph.D., particle physics, nuclear physics, radiation protection, radioecology

**Abstract:**

The project aims are twofold:

1. modernization of education in nuclear and particle physics and radioecology at graduate level at Sofia University and increased attractiveness of the Masters program;
2. widening of the basis of students at Masters level at University of Geneva in particle physics and further enhancement of competitiveness.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110915 – Maignan Michel

**Title:** Creation of GIS for health risk assessment of the population of Bishkek city

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**Keywords:**

Environmental health monitoring, Family physician groups, Health risk, GIS, maps of diseases

**Abstract:**

Aim:

The aim of the project is to organize environmental health monitoring (EHM) and create GIS based on medico-demographic, environmental and socio-economic indicators of the city of Bishkek of the Kyrgyz Republic.

Context and importance

Within this joint research project a database will be built up on the health of the population and environmental conditions in the urban settings. The analysis of population health will be carried out on the basis of information on morbidity, mortality; ranking of territories will be made on the basis of medico-demographic indicators. Assessment of health risk to the population of the city will be made having regard for environmental and social factors.

The created GIS will help reveal relationships between the health of the population and the influence of environmental conditions in conjunction with socio-economic and demographic factors. Results of the project will be useful for the development of an effective strategy for health management and forecasting.

The project will contribute to the education of young scientists and physicians in the field of environmental and public health.

The project will help strengthen international cooperation between scientists of Kyrgyzstan and Switzerland and other countries.

#### Scientific framework and methodology

Two teams from Switzerland and two teams from Kyrgyzstan are involved in the project. Multi-disciplinary approaches will include collection of environmental, epidemiological and social data and the conduct of multivariate statistical and geostatistical analysis of health data using modern information technologies, international standards and guidelines.

This scientific consortium will create a geographical information system on health taking into account demographic, environmental, social and economic parameters; develop an environmental health monitoring and assess health risk to the population of an urban area.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110916 – Dominik Janusz

**Title: Network for environmental assessment and remediation in the aquatic systems: environmental curriculum and training at the postgraduate level (NEAR 3)**

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### Keywords:

environmental education, postgraduate, curricula, aquatic environment, teaching models

### Abstract:

Two sequential IP projects, NEAR 1 and NEAR 2, have been successfully carried out (1998-2003). NEAR 3 will focus on widening the topics engaged in the curriculum in environmental sciences on aquatic systems with an emphasis on implementation of the curriculum as a teaching vehicle in Eastern European universities. Linkages will be established to European Union institutes to improve the profile and excellence of the Eastern European partners. A stronger leadership role will also be developed in one or more of the partners to bring greater impetus to the Eastern European partners (Romania, Bulgaria, Ukraine, Georgia) adopting and sustaining ongoing advanced teaching programs.

### Objectives

Develop advanced teaching and training in sustainable water management.

Expansion of curriculum to encompass wetlands and related systems with an emphasis on reservoirs and their unique status as water management systems.

Propose teaching methodologies based on interactive teaching and distance learning methods.

Develop hard copy, electronic and audio/visual teaching materials to meet curriculum criteria.

Activities will include workshops on: a) Social aspects of sustainable water management including public awareness and participation (from totalitarianism to governance). b) Remediation required to eliminate degradation of water quality and quantity. Engineering solutions for waste treatment, watershed and land use management and all aspects of restoration of degraded water systems. c) Wetland environments including deltas, coastal lagoons, nature reserves and related habitat systems with an emphasis on reservoirs.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110917 – Saner Raymond

**Title: Inter-ministerial Coordination of Trade Policy at Central Government Level in Macedonia and Kyrgyzstan.**

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**Keywords:**

Interministerial coordination for Trade Policy Making

**Abstract:**

The goal of this JRP is to identify the conditions that facilitate or hinder efficient and effective trade policy coordination in small transition economies impacting negatively or positively these countries' international trade negotiations at bilateral, regional and global levels. Target countries of this study are: Macedonia and Kyrgyzstan.

Reports from the field and relevant research literature indicate that despite international efforts in providing support (trade capacity building), countries of small transition economies are often not able to improve their trade negotiation performance due to deficient policy coordination at inter-ministerial level.

The study therefore aims to identify the underlying causes of inadequate policy coordination that negatively impact the countries' negotiation capacities in bilateral, regional and global trade negotiations. Such causes could be e.g. lack of administrative coordination and consultation mechanisms, deficient administrative law and procedures, absence of public management competencies etc.

Conversely, the study also aims to identify positive scenarios (best practice examples) of policy mechanisms and related enabling organisational and institutional factors of inter-ministerial policy coordination which demonstrate positive impact on the country's trade negotiation capability.

Identification of positive and negative policy coordination could offer valuable insight for other transition countries facing similar difficulties. In addition, such insights could also help donor countries adjust their technical cooperation programmes in order to support positive scenarios of policy coordination mechanisms.

Best practices that have been deployed in trade policy coordination will be captured in the two case studies. It intends also to examine the institutional barriers that prevent effective and efficient coordination from taking place in the countries taking part in this study.



SCOPES 2005-2008: Joint Research Project

## **Project no.: 110918 – Blondel Alain**

**Title: Joint Swiss-Bulgarian Project in Neutrino Physics (BUCHNEU)**

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**Keywords:**

neutrino physics, novel accelerator techniques, muon cooling

**Abstract:**

The aim of the BUCHNEU project is to facilitate participation of the group from University of Sofia in neutrino physics projects in which the DPNC-University of Geneva plays an important role. These comprise the BENE European network of activities towards the design of a Neutrino factory; construction, running and analyzing data from the MICE experiment; and finishing the ongoing analysis of data from the HARP experiment.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110921 – Shklover Valery

**Title:** New sensitive focal plane arrays for terahertz radiation detection

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**Keywords:**

Detector, Terahertz, Infrared, Focal plane arrays

**Abstract:**

The project is directed towards the development of new highly sensitive materials for “continuous” focal plane arrays for Terahertz (THz) radiation detection. The arrays will be based on doped lead tin telluride alloys. Indium doped lead telluride-based photo-detectors have demonstrated extremely high performance of operation in the Terahertz wavelength range at least up to 240 microns. These materials reveal also a number of other advantageous features such as “internal” accumulation of the incident radiation flux, high spatial and temporal stability of parameters, high radiation hardness, enhanced quantum efficiency and others. Specifics of the impurity states in the indium-doped lead-tin tellurides allow the construction of a special type of “continuous” focal-plane array (FPA). Photo-excited free electrons do not diffuse from the region of generation in these materials, therefore spatial distribution of the incident radiation flux reflects in the spatial distribution of concentration of photo-generated free electrons. The idea of suggested FPA is following. The incident radiation produces a picture of spatial distribution of the radiation intensity (“image” of THz radiation distribution) as a profile of free photo-excited carrier concentration in the active layer (AL). The task is to readout this profile. To do this, we have two additional layers – a layer of intrinsic (therefore semi-insulating) wide gap semiconductor and a “substrate”, which is a heavily doped semiconductor with even wider gap. The quantum energy of the laser should be in between the gaps of the substrate and wide-gap layer. Then the laser radiation would pass through the substrate and will be absorbed in AL. Absorption of the laser radiation in the AL will produce a highly conductive area (red spot). Therefore the current between the electrode and the substrate will be defined by the conductivity of the AL in the area of the laser beam. If the laser is switched off, the highly conductive area in the AL disappears because the photo-excited electrons and holes recombine. If we then move the laser beam to a different position, the current through the structure will be defined by the conductivity of the AL in this new position of the laser beam. It means that if the laser beam scans through the substrate area, it in fact probes the conductivity of the AL through measurements of a current in the structure.

Three teams are taking part in the work on the project: Group of Functional Materials for Industrial Applications of the Institute of Crystallography at Department of Materials of ETHZ, Zürich, (<http://www.crystal.mat.ethz.ch/research/FunctionalMaterials>), Low-Temperature Physics Laboratory (LTPL) of Moscow State University, Moscow, (<http://mig.phys.msu.ru>), and International Laboratory of Superconductivity and Solid State Electronics (Kishinev, <http://phys.asm.md>) . First results are submitted to the Conference 6297 “Infrared Spaceborne Remote Sensing 2006” of The International Society for Optical Engineering (San Diego, California, USA, 15-17 August 2006).

SCOPES 2005-2008: Joint Research Project

## Project no.: 110923 – Popovic Radivoje

**Title: Micro/Nanocantilevers-Based detection of Small Electromagnetic Forces**

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**Keywords:**

cantilevers, magnetic tip, piezoresistors, force sensitivity

**Abstract:**

Microcantilevers are very attractive as central components for a number of extremely sensitive new-generation sensors. For detection of cantilever deflection various mechanisms are used (optical, capacitive, piezoresistive, piezoelectric). Among all these methods, piezoresistive is the most compact one and allows fabrication of stand-alone (autonomous) miniature sensors. Our goal is to study possibilities of detection of small electromagnetic forces using microcantilevers with built-in piezoresistive sensors. In order to determine minimum detectable force it is necessary to study (a) the noise mechanisms inherently related with cantilevers (mechanical-thermal noise due to Brownian motion, adsorption-desorption noise, thermal noise due to temperature fluctuations of the microcantilever), (b) the noise related with piezoresistors (1/f noise, thermal noise, generation-recombination noise), (c) the influence of these noise mechanisms on fluctuations of resonant frequency of the detection oscillatory circuit (which requires the calculation of phase noise in self-oscillatory circuits). The experimental part of this project consists in the fabrication of microcantilever with a miniature magnet on the cantilever tip. The magnetic tip will be realized using sputtering technique or by deposition of epoxy powder with magnetic particles. Measurement of small forces will be done using the interaction between the miniature permanent magnets and currents in Au conductor lines on Si-SiO<sub>2</sub>. Next, we plan to perform measurements of noise caused by the above stated mechanisms. Special attention will be paid to measurement of 1/f noise in piezoresistors. The results obtained during the study of noise generation mechanisms in microcantilevers and determination of the phase noise in detection oscillatory circuit should enable us to theoretically determine minimum detectable force. The above experiments for measuring of small forces and noise will serve for verification of theoretical results. Finally, this will lead us to design an optimal system for detection of small forces using magnetic microcantilevers.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110928 – Deplazes Peter

**Title: Development of educational and research tools for the study of parasitic zoonoses in Kyrgyzstan**

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**Keywords:**

Zoonoses, cestodes, diagnoses, epidemiology, technology transfer, medical Parasitology, veterinary parasitology

**Abstract:**

This proposal aims to strengthen the infrastructure capability of the two main institutes that investigate parasitic zoonoses in Kyrgyzstan, the Department of Biology of the Kyrgyz Medical Academy and the Department of Parasitology of the Institute of Livestock, Veterinary Sciences and Pastures. The coordinating Swiss institute, the Institute of Parasitology in Zurich (IPZ) is common to both the Medical and Veterinary Faculties of the University of Zurich and is recognised as a World Health Organisation collaborating centre for Parasitic Zoonoses. The Kyrgyz Medical Academy is one the two medical faculties in Kyrgyzstan and the department of biology is involved in the research and teaching of parasitic diseases. The Medical Academy is presently changing its teaching courses from Russian to English as part of an institutional effort to upgrade the medical facilities and make the medical school more attractive to international students. The Department of Biology has a history of collaboration with the IPZ and has an interest and expertise in parasitic zoonoses. The Institute of Livestock, Veterinary Sciences and pastures is an important veterinary institute in Kyrgyzstan, and the Department of Parasitology will be involved in this infrastructure proposal. Zoonotic diseases such as echinococcosis have increased dramatically in recent years in central Asia since the profound economic and social changes that occurred as a result of the collapse of the Soviet Union in 1991. There are many urgent needs in public health in Kyrgyzstan, and this Institutional Partnership aims to improve the infrastructure and educational facilities in the area of parasite zoonoses so that sustainable research and training opportunities will be possible in this important field. Although the IPZ has already undertaken limited joint research projects with the Kyrgyz Medical Academy, it is frustrated by the lack of basic infrastructure.

This is due to the chronic lack of financial support in the last 15 years resulting in diagnostic, research and teaching facilities in parasitic zoonoses being in a relatively poor state. Therefore, investment is urgently needed so that meaningful programmes to control and undertake research in parasitic zoonoses can be undertaken. The institutional partnership between Zurich and the two institutes in Bishkek aims to create a centre specialising in parasitic zoonoses through the transfer of technology, the provision of urgently needed equipment, the establishment of a regional reference centre for the diagnosis of important parasitic zoonoses, the implementing of student courses, and initiation of a post graduate programme. If these aims are achieved it will equip the institutes in Kyrgyzstan to undertake better surveillance through improved diagnostic procedures and create a critical mass of individuals with the skills needed to undertake research into these diseases and implement regional control programmes. This institutional partnership will therefore act as a seed by which longer term collaboration can be undertaken and the basis for future research partnerships.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110931 – Kunz Andreas

**Title: Implementing new collaboration scenarios in education, research, and industry**

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**Keywords:**

Collaboration over network; machine tools; virtual reality; manufacturing processes; product development processes

**Abstract:**

Development of industry and the response of the higher technical education to the demands of the industry play an important role in defining the right scenarios for implementing new collaborations in education, research, and industry. One important aspect in this context is the fact, that solutions to given problems are not realized by one single person anymore, but within a networked team, spread over the whole globe. This holds true for industry and for research institutes as well. This net-based collaboration is not only a domain of the so-called “global players”, but with an increasing amount also of small and medium enterprises, which could be part of a supplier network for instance. Taking into account all the above-mentioned necessities, many business processes do not take benefit from this new collaboration technology, although other technologies like FAX, E-mail, or telephone are well established. Unaware of its potential, collaboration technologies are often treated as a “visual telephone”, ignoring that there are many more perception channels, which can be addressed. Thus, all technologies remain unused, which support a collaboration in a team, resulting in large efforts and costs for team meeting with physical presence. Introducing an IT-support for business processes in the field of mechanical engineering also results in a modification of those processes. Unaware of the benefits and being insecure about the application fields of the new technology, the users often have acceptance problems. The universities and other research institutes are needed to intervene in order to improve the man-machine interfaces and to use and teach these new technologies within collaboration together with other research institutes and with industry. By spreading the required knowledge they help to increase the overall acceptance and also transfer the knowledge into industry. Five major steps define the proposed project: - Introduction of the technology and definition of an application- Implementing collaboration technology at the Romanian partner- Preparation of a students’ exercise- Preparation of a use case for industry- Final report on the achieved results and outlook The project team has developed a logical structure, in which each step is defined by an implementing step, step that is analyzed at a round table. The round-table conclusions are re-introduced in the implementing process in the following step. The important step here is the feedback process. Within the proposed project, new collaboration technology will be implemented in university and SMEs as well in order to spread the knowledge about these systems.

In particular, the project focuses on applications and business processes, since there is a large demand for that by the Swiss partner and by the Romanian partner as well. Within other projects, the Swiss partner develops the base technology, but in parallel the proposed project focuses on the non-technological facts, i. e. the possible user and the business processes, in which he is involved. Simultaneously, new demands on technology and processes can be achieved from this implementation step.



SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110932 – Cattin Philippe

**Title: Non-rigid Registration of Multi-modal Medical Images**

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**Keywords:**

elastic multi-modal medical image registration, mutual information

**Abstract:**

Medical imaging has been developing extremely fast during the last decades, bringing new techniques to improve existing clinical procedures or facilitate the establishment of completely new approaches. Maybe the most important component of this process is the quickly growing role of imaging in supporting therapy by delivering essential information for pre-operative planning and intra-operative navigation. All the related procedures are using a large number of digital images on a routine basis. Taken at different time intervals or by different radiological modalities, these images are usually containing complementary information and their proper integration is often required. The quality and information content of the intra-operatively acquired images are often by far inferior to those provided by pre-operative data. In addition, the sometime excessively time-consuming extraction of all relevant information cannot be performed during the actual intervention. It is therefore essential to spatially map the pre-operative information to the actual intra-operative morphology of the patient. This would allow to carry over the complete spectrum of available pre-operative information to the actual patient on the operation table. The crucial step in this fusion process is the registration procedure to ensure that the images of interest are in a sufficiently good spatial alignment. Accordingly, registration has become one of the key components in medical image analysis. In this project we propose the development of non-rigid registration techniques for integrating pre- and intra-operative data. To guarantee the general applicability of the method it should be able to register multi-modal images. To achieve this, mutual information will be used as the similarity measure. This non-rigid registration process will have to cope not only with deformations resulting from shifts of the anatomy, but also with missing data and topological changes resulting from the partial or full extraction of tissue during surgery.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110933 – Slaveykova Vera

**Title: Black Sea Ecotoxicity Assessment (BSEA)**

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**Keywords:**

ecotoxicity survey, bioavailability, marine biota, Black Sea, As, Cd, Pb

**Abstract:**

Black Sea is unique as the largest natural anoxic water basin in the world, with a shift in sulfur chemistry because of high level of hydrogen sulphide, which will very probably affect the speciation and uptake of some toxic elements. The Black Sea receives river inputs from a large catchment territory with diverse land uses and high degree of eutrophication. It might be assumed that the heavy metals could contribute to important pollution, thus affecting the ecological situation and public health.

There is a lack of information on the chemical speciation of different pollutants, their transfer, bioaccumulation and effects. The main objectives of this project are therefore: development and validation of combined and hyphenated highly selective procedures, improving qualifications of personnel of regional laboratories and common application of developed procedures for survey of sea water, with an emphasis on three priority pollutants: arsenic, cadmium and lead. New information on the contents of ecologically relevant species of chemical elements at Bulgarian Black Sea Coast, including seasonal variation, relation to sea currents and bioaccumulation in biota from different representative levels of the trophic chain will be obtained. The bioassays are expected to provide new information on the extent of deleterious effects of the pollutants of interest. Advanced statistical treatment of data by modern chemometric approaches will result in a representative picture of marine pollution and its better control with a view to development of tourism and better utilization of marine resources. Results will be compared and discussed with colleagues from Black Sea Basin countries in order to strengthen current collaboration and improve effectiveness of future co-work on Black Sea studies.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110935 – Ohmura Atsumu

**Title:** Investigation of the variability of aerosol optical thickness and solar irradiance in an urban environment of Kishinev

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**Keywords:**

radiation, aerosol, optical thickness, optical depth, climate, urban atmosphere

**Abstract:**

The project initiates a long-term monitoring and study of radiation and optical depth at Kishinev in Moldova. The site has more than 30 years continuous record of radiation measurements. The site is updated with advanced radiometers and precision filter radiometer for monitoring aerosol optical depth. The site is considered ideal to investigate the change in radiation and air quality from the time of the Soviet Union, through a difficult time of transition and to the modern time. The observation substantiated by this project started in October 2005 and is planned to continue for 36 months. After this period, the station is considered to be self-sustaining. The measurements so far went successfully and if this tendency continues, the Kishinev station can be made one of the Baseline Surface Radiation Network stations.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110939 – Michel Patrik

**Title: Stroke survival, recurrence and mortality in Tbilisi, Georgia: a population-based follow-up study**

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**Keywords:**

Stroke, epidemiology, mortality, survival, recurrence

**Abstract:**

**Background and Purpose:** Stroke is a well-established major cause of death and disability in developed countries. However population-based studies assessing stroke incidence, case-fatality, risk factors, clinical patterns, survival and mortality in developing countries are still lacking. In the framework of the Joint Research Project (JRP) of the previous SCOPES call (2000-2003), the incidence, case-fatality, clinical patterns and risk factors of stroke in a defined population of Sanzona district (approx. 50 000 inhabitants) of Tbilisi, Capital of Georgia were estimated. The results of the study were published recently (Stroke. 2004; 35: 2523-2528). The present study aims to follow-up the major epidemiological patterns of stroke in the same population of Tbilisi with emphasis on survival, recurrence, case-specific mortality and predictors of mortality of the first-ever stroke cohort identified during previous JRP.

**Methods:** A cohort of 233 first-ever stroke patients were identified from 2000 to 2003 in Sanzona suburb of Tbilisi. This cohort is followed-up prospectively. All cases of recurrent stroke and stroke mortality are registered by means of immediate notification /referral system, and analyzed. For patients with ischemic stroke possible etiologies are defined using the TOAST criteria, and infarct subtypes using Oxfordshire Community Stroke Project classification. Hemorrhagic strokes are classified as (a) supratentorial: putaminal/thalamic, lobar; (b) infratentorial: pontic, cerebellar; (c) subarachnoid hemorrhage. The project is carried out by the same teams as in the previous JRP (2 Georgian teams of neurologists and public health specialists with close coordination with Swiss partners from the Neurology Service of the Lausanne University Hospital).

**Preliminary results:** Since November 2000 up to date (8/2006), 151 (65%) patients of the original cohort of 233 patients with strokes have died. Among those who died, 73 were patients with ischemic stroke, 46 - patients with intracerebral hemorrhage, 14 - patients with subarachnoid hemorrhage and 18 - patients with unspecified stroke. Stroke recurrence rate was 53% during the observation period.

The most frequent causes of death were cardiac disease (myocardial infarction, congestive heart disease or arrhythmias) (32% of cases), followed by respiratory tract disease (pneumonia) in 25% of cases.

Expected impact of the project: Expected results of the JRP will increase the knowledge on stroke survival, recurrence, mortality and important causes of death for a defined population of a country in transition, and prepare a ground for changes in the focus of poststroke rehabilitation and medical care including secondary prevention with further goal to reduce the burden of stroke on individuals and on the society throughout Georgia.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110940 – Urs T. Rüegg

**Title:** Calcium dysregulation as a trigger of apoptosis in muscular dystrophy

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**Keywords:**

Calcium, apoptosis, muscular dystrophy

**Abstract:**

The objectives of this IP are to improve conditions for research and teaching in partner institutions in Russia and Uzbekistan and to draw the students from the Biological Faculty of Moscow State University into academic research. These goals will be reached by:

1. Involving of partner institutions into collaborative research with Swiss laboratory and facilitating their access to new ideas and sources of information;
2. Organization of practical courses in molecular and cell biology and summer schools for the students on the basis of the Institute of Developmental Biology; training of the under-graduate and post-graduate students;
3. Exchange visits of post-graduate students and young scientists to Geneva and Moscow in order to participate in joint experiments and to learn methods of molecular and cell biology;
4. Up-grading of scientific level in partner institutions by introducing new technologies and partial renewal of the equipment;
5. Exchange visits of senior scientists and professors to Geneva and Moscow to present lectures, become acquainted with the teaching programs and methods, and to discuss and co-ordinate collaborative research.

In order to facilitate the achievement of these objectives, the activities are based on a joint research program aimed at the investigation of the mechanisms of calcium regulation in Duchenne muscular dystrophy (DMD), one of the most severe and common dystrophies. The work is initiated by the data obtained in the Laboratory of Pharmacology of the University of Geneva showing that in myotubes from mdx mice (an animal model of DMD) calcium influxes in response to stress (Leijendekker, Passaquin et al. 1996) and carbachol (Basset, Boittin et al. 2004) are significantly higher than in myotubes from normal mice (Ruegg and Gillis 1999).

It was also demonstrated that in mdx myotubes contrary to normal myotubes phospholipase C and IP3 are involved in calcium regulation (Basset, Boittin et al. 2004).  $\text{Ca}^{2+}$  influx in myotubes from mdx mice might be activated also by the products of lipid degradation by phospholipase A2 (PLA2), the activity which is 10-fold enhanced in tissue (Lindahl, Backman et al. 1995); this laboratory showed that  $[\text{Ca}^{2+}]_c$  elevation in these cells is suppressed by inhibitors of PLA2 (Boitti et al.). Based on these data it is expected that chronically elevated  $\text{Ca}^{2+}$  influx is one of the initiating processes causing apoptosis and/or necrosis in skeletal muscle and development of muscular dystrophy.

The main questions addressed are as follows: i) which  $\text{Ca}^{2+}$  channels in the plasma membrane are responsible for the elevated  $\text{Ca}^{2+}$  entry into mdx myotubes; ii) what are the mechanisms through which PLC-IP3 system and PLA2 are activated in mdx myotubes; iii) is it possible to correct calcium dysregulation and prevent apoptosis in mdx myotubes by suppressing PLA2 activity; iv) are the approaches developed on cultured myotubes effective in vivo for preventing muscular dystrophy using the model of mdx mice?

Solving these questions might be useful for the development of pharmacological means for treatment of DMD.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110942 – Avellan François

**Title: Turbomachinery swirling flow optimisation and control with technology of magnetorheological fluid systems**

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**Keywords:**

swirling flow control, magnetorheological devices, hydraulic turbine, efficiency and safety improvement

**Abstract:**

Project goal

The project main goal is to develop, test and implement novel flow control techniques to significantly improve the unsteady behaviour of hydraulic turbines operating far from the best efficiency regime. We investigate new methods for controlling the swirling flow breakdown, aimed at mitigating the self-induced unsteadiness and associated severe pressure fluctuations, vibrations and efficiency loss. Enabling technology of magnetorheological devices will be employed to develop practical solutions for swirling flow control.

Project context and importance

Because of the variable demand on the energy market, as well as limited energy storage capabilities, turbines tend to be operated over an extended range of regimes quite far from the best efficiency point. However, operating hydraulic turbines at part load is often hindered by inherent flow instabilities that result in severe pressure fluctuations, vibrations and noise, power swings and overall efficiency depreciation. Mitigating these undesirable phenomena, while maintaining the relative simplicity and robustness of classical turbine design, such as Francis turbines, will significantly increase the flexibility and safety in operating hydroelectric power plants.

Project description:

When operating Francis hydraulic turbines at partial discharge, there is a high level of residual swirl downstream the runner as a result of the mismatch between the swirl generated by the guide vanes and the angular momentum extracted by the turbine runner. Further downstream, in the turbine draft tube, this decelerated swirling flow often results in vortex breakdown causing severe pressure fluctuations experienced by hydraulic turbines operating at part load. The project develops novel methods for mitigating and controlling the breakdown of swirling flow in the turbine draft tube cone. Mathematical and numerical models are used and/or developed to investigate the swirling flow in axisymmetric diffusers.



Both inviscid and turbulent flows are investigated in order to identify the location and character of swirling flow instabilities. Our results are included in a joint paper “Numerical Simulation and Analysis of Swirling Flow in the Draft Tube Cone of a Francis Turbine”, to be presented at the 23rd IAHR Symposium on Hydraulic Machinery and Systems, Yokohama, Japan, Oct. 17-21, 2006.

Once the instability sources identified, we are developing devices (passive or semi-active) using magnetorheological suspensions (MRS) to be used for practical flow control. For a hydrocarbon based magnetorheological fluid we are performing a magnetic characterization, using the vibrating sample magnetometer VSM 880, and rheologic and magneto-rheologic characterization using the PHYSICA MCR 300 rheometer with a magnetorheological cell. Several design options will be investigated, according to the flow control specific requirements and a demonstrator will be designed, built and tested to assess the flow control technology with magnetorheological devices.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110950 - Hoffmann Christian

**Title: Promotion of Forest and Wood Sciences in the Ural, in Siberia and in the Carpathians to Mitigate the Effects of Climate Changes on Long-term Forest Development - Strengthening of an International Network**

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**Keywords:**

Climate Change, Forest Ecosystems, Storm Damage, Carbon sequestration, Mathematical models

**Abstract:**

Since 15 years, close and very effective partnerships exist between the Swiss Federal Research Institute WSL and several partner institutions within Russia. This partnership was supported by the Swiss National Science Foundation during the years 1996-1998 and 2000-2003 as IP. Within this partnership 31 scientists from Russia took part at international activities such as conferences, field weeks, and scientific trainings in Switzerland. During this period they published 72 articles in newspapers, in local national journals and in highest rated international journals. The continuation of the partnership is questioned because of the critical financial situation of the Russian partner institutions. The objectives of the present IP-project are to strengthen the scientific capacities by providing scientific training and essential equipment, to diversify the existing partnerships by including new partner institutes from Krasnoyarsk, to improve the communication within the partnerships by supporting in maintenance of equipment, and to deepen mutual understanding between WSL and partners institutes, of both mentality as well as the way of doing research and using scientific methods.

Six research institutions are participating in this IP: Switzerland(2): - Swiss Federal Research Institute WSL, Birmensdorf;- Federal Institute of Technology ETH, Zurich Russia(4): - Ural Forest Engineering University USFEU, Research Division, Ekaterinburg; - Institute for Plant and Animal Ecology IPAE, Laboratory of Dendrochronology and Laboratory of Population Ecotoxicology, Ekaterinburg; - V.N. Sukachev Institute of Forest, Laboratory of Dendrochronology and Laboratory of Forest Zoology , Krasnoyarsk; - Department of Geobotany, Moscow State University, Moscow.Ukraine(1): - Ukrainian State University of Forestry and Wood Technology, Faculty of Forestry, Institute of Silviculture, Lviv.Six scientific activities are running within this IP:A. Forest-ecological research on reforestation of storm damage areas in the Ural and in the Carpathian mountains - A comparison of natural and man-made processes;B. Spatio-temporal dynamics of the upper tree-line in the Urals in relation to global warming in the 20th century; C. Climate in Siberia from tree ring width, density and  $\delta^{13}C$ ;D. Carbon sequestration in soils of tree-line ecotones under a changing climate; E. Assessing mathematical models for forest growth under extreme conditions;F. Oil-derived gas torches as research facilities to detect the effect of global warming on northern taiga forest ecosystems? Investigating the impact of torches on forests;G. Long-term monitoring of old-growth forest lichen populations in the Ural Mountains

SCOPES 2005-2008: Joint Research Project

## Project no.: 110957 – Friis Robert Reaney

**Title: The Control of Twist and other effectors of Epithelial-Mesenchymal Transition in breast cancer.**

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**Keywords:**

Twist, E-cadherin, sFRP4, DNA hypermethylation, breast cancer

**Abstract:**

The loss of E-cadherin expression has been recognized as an important determinant in local tumor invasion and in metastasis and is now widely accepted as the most immediate marker for a change in cell behaviour known as Epithelial-Mesenchymal Transition (EMT). In cancer, downregulation of E-cadherin, an epithelial cell adhesion molecule, is accompanied by progression to a more aggressive phenotype. The main mechanisms acting to produce downregulation are 1) the expression of one or more of the transcription factor repressors acting on the E-cadherin gene like Twist, Snail, or Slug or 2) hypermethylation of its promoter. Because Twist alone among these transcription factor repressors also downregulates p53, its action is particularly relevant for cancer progression, since p53 provides vital signals for apoptosis both physiologically and also in response to most forms of chemotherapy. Thus, strong Twist expression especially, by contributing to the onset of EMT as well as suppressing apoptotic mechanisms, induces invasion and metastasis while subverting normal safeguards which should force incipient cancer cells to suicide. Furthermore, it contributes to cancer therapy resistance. Most of the available information about Twist derives from developmental studies with *Drosophila* and from a recent report comparing the growth of nonmetastatic and metastatic mammary tumor cell lines in mice (Yang et al., 2004). The objective of our planned collaboration is to study Twist, Snail and Slug expression prospectively in cases of breast cancer presenting at the University Clinical Centre Tuzla during the next 18 months (approximately 120 – 150), as well as retrospectively selected archival cases required to have a sufficient sample of invasive lobular carcinomas. We propose that these expression data will be obtained using conventional methods of immunohistochemistry and will be correlated with a standard set of markers followed by the Pathology Section routinely as detailed below, including patient follow-up. Strangely, though Twist is the best candidate responsible for the function downregulating E-cadherin in breast cancer, it is itself subject to gene silencing and downregulation following hypermethylation of its promoter. How can this be? One hypothesis is a selective pressure against its activity beginning after its role in invasive and metastatic progression in the tumor has been fulfilled.

In order to explain this apparent contradiction, we propose that the Bern and Tuzla Teams collaborate in examining Twist positive regions of breast tumor cases from which DNA is isolated using laser capture dissection, and investigated using methylation-specific PCR according to established procedures.

SCOPES 2005-2008: Joint Research Project

## Project no: 110958 – Hayoz Nicolas

**Title: Civil society, trust and transformation in Russia**

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**Keywords:**

civil society, State, opposition, NGOs, democratisation, transformation, trust, social capital

**Abstract:**

It is almost trivial to observe that civil society matters – particularly in a process of democratisation. However for some countries such as Ukraine or Russia conventional wisdom told us, that since these countries managed quite well to hold down the political opposition, change will not come through elections, particularly if one considered the weakness of civil society and the political opposition. Then came the “orange revolution” in Kiev and with it a negotiated regime change. This “cunning of the history” reminded scholars once again that social and political change occurs very often when you expect it the least. The events in Georgia and in Ukraine pointed to the fact that civil society can under certain conditions also be mobilized in countries with stalled transformation processes and semi-authoritarian regimes – if certain conditions are fulfilled. True, Ukraine is not Russia, and one may consider the fact that since the Orange Revolution succeeded in Ukraine, the Kremlin seems to be determined to pre-empt any civic initiative – particularly on the eve of the next presidential elections, the “problem 2008”. On the other hand, however, it is also clear that democracy moves eastwards. Societies are not “dead-locked” by their own Communist legacy.

A halted democratisation process can start again. In Russia this will be more difficult. But even here, in the context of a broadly accepted semi-authoritarian regime the pressure on the regime increases on a series of policy issues but also on the level of the “power vertical”. Opportunities for change and new developments are likely to be found on the sub-national, regional level. This is why this study wishes to examine the following questions in three different regions with each showing a specific profile on socio-economic and the political level:

- The project examines first obstacles and promoting factors in the development of civil society in Russia
- It aims at examining the various functions of public organisations and evaluates them in terms of its political functions in western societies: to build up trust and to function as a natural opposition force in society
- To what extent actors of civil society in Russia could build up the necessary capacities in order to become agents of change

- To what extent public organizations of regional civil societies may be able to contribute to the building up of trust and to the reinforcement of networks of cooperation and democratic citizenship?

SCOPES 2005-2008: Joint Research Project

## Project no.: 110961 – Wirz Jakob

**Title:** Tautocrowns - new aza crown ethers with active sidearms

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**Keywords:**

Excited state proton transfer, flash photolysis, molecular switches

**Abstract:**

The main goal of the project is to explore tautomerism for potential use in signal conversion. Change in a tautomeric state can be accomplished by a fast proton transfer reaction leading to a structure with different molecular properties. Switching between two tautomeric states is linked to changes in the complexation abilities of the guest-host system by modulation of the hydrogen bonding ability to the antenna. At the same time, engagement of this antenna causes a clean change in the tautomeric state. The sensitivity of the electronic ground- and excited states of the tautomeric forms to environmental stimuli (light, pH, T, solvents), and to the presence of a variety of substituents or hydrogen bonding can be exploited in the design of flexible tools for control. As a host receptor, crown ethers, calixarenes or cyclodextrines could be applied. The successful design of such switches requires substantial and detailed knowledge about the rates of proton transfer (and especially excited state proton transfer) and about the effect of the stimuli. Compounds exhibiting excited state proton transfer (ESPT) are used as high-energy radiation detectors, as fluorescent probes, and as polymer protectors. At the same time hydrogen bonding and proton transfer reactions are two major mechanisms in biological signal processing. A detailed study on the mechanism of proton transfer will be performed. The accumulated systematic knowledge will allow us in the second stage to screen suitable tautomeric compounds for use as signal converters and to concentrate on optimizing the molecular design.



SCOPES 2005-2008: Joint Research Projects

## Project no.: 110962 – Graeser Andreas

**Title:** Recognition and intersubjectivity. Towards a foundation of democratic society

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**Keywords:**

recognition, intersubjectivity, philosophy of politics, theory and democracy

**Abstract:**

Georgia, like many other Eastern European countries making a difficult transition to a society based on democratic principles, is in need of a theoretical reflection which can serve as a guiding force for her ongoing transition to democracy.

Taking into account the lack of any tradition of philosophical reflection on society independent of ideological bias, the research on the topic of recognition and intersubjectivity fulfills two objectives at the same time.

First of all, it fills the theoretical gap felt by Georgian philosophers and social scientists in the field of political philosophy and social theory. Recognition as a founding principle of democratic societies as well as the theory of intersubjectivity, which serves as a foundation for the conception of recognition – and which is oriented not at the subject-object dichotomy, but at the interaction between subjects –, are among the issues most frequently discussed in the last decades by leading Western philosophers and social scientists. Research into the topic enhances the theoretical level of the Georgian philosophical discourse by confronting it with modern challenges. At the same time it makes an important contribution to the international discussion on the topic by introducing into the discussion a specific historical and cultural experience of a post-Soviet country moving away from a totalitarian towards a democratic society. Research results of the project participants will be discussed at a public colloquium to be held at Bern University in November 2006.

Second, research into this topic has an important influence on the social awareness of the Georgian intellectuals and politicians since the issue of recognition is far from being an exclusively theoretical problem. It has a crucial social dimension which is all the more important for Georgia given the significant problems of integrating her ethnic, cultural, and religious minorities. Making the concept of recognition a foundation for political discourse will significantly change the framework within which ethno-cultural or religious conflicts are treated.

SCOPES 2005-2008: Joint Research Projects

## Project no.: 110965 – Kohli Jürg

**Title:** DNA repair and recombination in meiosis of *S. pombe*

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**Keywords:**

genetic recombination, DNA repair, meiosis, fission yeast

**Abstract:**

The project is a collaboration between the laboratory of J. Kohli at the University of Berne, concentrating on meiosis and homologous recombination (HR) in *S. pombe*, and the laboratory of V. Bashkirov at the Academy of Sciences in Moscow studying DNA repair and homologous recombination in *S. pombe* and *S. cerevisiae*. The regulation of DNA repair and recombination by checkpoint mechanisms is a research subject of both groups. The collaboration has been built up in the frame of earlier SCOPES grants. A major goal of the proposal is the support of young Russian scientists. The proposed experiments aim at the understanding of the mechanisms of the different pathways of meiotic recombination, and their regulation, in the fission yeast *S. pombe*, an excellent model organism for the study of DNA recombination and repair. The work will advance the understanding of genome diversity and evolution. Applied aspects of meiosis (sexual reproduction) are animal and plant breeding, and human health (sterility, mutation, chromosome aberrations, cancer and other genetic diseases). The following objectives are pursued: 1) Basic characterization of HR gene functions: A number of newly discovered candidate genes are analyzed for their function in meiotic recombination and mitotic DNA repair. 2) Description of HR pathways: The involvement of these genes in different pathways of meiotic recombination is studied. New pathways may be defined. 3) Understanding the control of HR subtypes: An HR initiation event may be processed in different ways, some crucial for successful meiosis and mitotic cell propagation, others detrimental to survival in certain circumstances. Candidate genes are assessed for coordination, inhibition or stimulation of the HR pathways. 4) Understanding the transition from DSB formation to DSB repair: A newly discovered candidate interaction of early with late recombination proteins is investigated by molecular genetic methods and fluorescence microscopy. 5) Cytological localization of meiotic proteins: The *in vivo* interaction of specific recombination proteins with each other, and with nuclear structures are investigated (two-hybrid and co-immunoprecipitation assays). 6) Understanding the structure of meiotic protein complexes: The biochemical and biophysical analysis of the complexes of recombination proteins is likely to identify new members of these complexes that are active at different points in mitosis and meiosis.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110968 – Bearth Thomas

**Title:** Exploring an African terra incognita: lexicology and reconstruction in South Mande languages

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**Keywords:**

lexicology, African language description, historical and comparative linguistics, minority languages, Mande languages, Ivory Coast

**Abstract:**

The objective of the present co-operative venture between St. Petersburg State University and the University of Zurich is the study of a little known group of languages spoken in West Africa. This language group, known as the Southern Mande (sometimes also South-Eastern or Mani-Bandama) sub-family of languages, is located almost exclusively in Central and Western Ivory Coast, with an extension across the border into neighbouring Liberia. Southern Mande is a sub-family of the larger family of Mande languages, the best known of which is Bambara, the major national language of the Republic of Mali.

The current project is a follow-up to a previous joint research project which had been supported by the Swiss National Science Foundation under the title “Lexicology of Eastern Mande languages in the context of Mande linguistic comparison” (grant nr. 7SUPJ062156.00). The primary scientific objectives remain unchanged:

1. Lexicographic and grammatical description of all South Mande languages.
2. Further elaboration and application of the St. Petersburg model of bilingual dictionaries.
3. Reconstruction of the proto-South-Mande sound system, as well as proto-South-Mande morphology and syntax, as part of a comprehensive comparative study of the Mande language family.

Nevertheless, as compared to the previous research, the follow-up project has enlarged its scope and includes all Southern Mande languages except two, i.e. a total of eight from ten. Also, as a result of the descriptive work done during the first period, the researchers are now involved, alongside with Ivorian linguists and local constituencies, in practical applications such as orthography-making and literary creativity in several of the languages under study.

Due to divergent institutional developments in the field of African studies in Switzerland and in Russia, the co-operation between the partners had to be redefined for the period 2005-2008. While the focus of the Russian partners continues to be on development of capacities in the field of African linguistics with a considerable involvement of young scholars, as has been the case so far, the main contribution of the Swiss partners draws on field experience (general scientific experience and wide exposure to African linguistics; computer lexicography and African languages editorial experience), in order to help ensure audience-targeting and impact of results.

An innovative feature of the new project is what might be called “Lexicography from below”. This approach to lexical research has been developed in the context of the political crisis in Ivory Coast, which has made research in the language areas difficult or impossible. By training villagers to become “assistant lexicographers” and by taking advantage of internet technology, editorial work for instance on the Tura dictionary could continue in spite of the limitations imposed on the mobility of the main researchers. This model of “tele-cooperation” is currently being tested for its possible wider application, not necessarily limited to situations of crisis and conflict.

For preliminary results from the project, including some dictionary databases, and for further explanations, please consult the project web page <[www.mandesud.net](http://www.mandesud.net)>.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 110970 – Sukhorukov Evgeny

**Title:** Spin-dependent transport in silicon gate-controlled rings

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**Keywords:**

spin interference, coherence, one-dimensional rings, silicon nanostructures, spin-orbit interaction

**Abstract:**

We offer the field-effect version of the spin transistor structure based on the Rashba gate-controlled ring embedded in the p-type self-assembled silicon quantum well that is prepared on the Si (100) surface using the planar diffusion CVD technology. The coherence and phase sensitivity of the spin-dependent transport of holes are proposed to be studied by varying the value of the external magnetic field and the gate voltage that is perpendicular to the plane of the double-slit ring. Firstly, the effects of the quantum scatterers connected to two one-dimensional leads and the quantum point contact inserted in the one of the arms of the double slit ring on the conductance oscillations as a function of both the gate voltage and the magnetic field are suggested to be analysed theoretically and experimentally. Secondly, the amplitude and phase sensitivity of the hole quantum conductance staircase caused by the quantum point contact inserted bring forward to reveal the interplay of the spontaneous spin polarization and the Rashba spin-orbit interaction in the formation of the “ $0.7 \cdot (2e^2/h)$ ” feature. Finally, the effect of the hyperfine interaction between the spin-polarized holes and the  $^{29}\text{Si}$  nuclei on the processes of the weak antilocalization and the spin-dependent transport will be defined by the electrically detected nuclear magnetic resonance in order to use the Rashba gate-controlled ring as the key element of a quantum computer.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110971 - Lacroix Christophe

**Title: Bioencapsulation for protection and development of new probiotic bacteria in food and health products**

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**Keywords:**

Microencapsulation, probiotics, traditional fermented food, lactobacilli, bifidobacteria, antimicrobial activity, technological properties, process optimisation, microcapsule properties

**Abstract:**

Lactic acid bacteria (LAB) have been consumed in very large quantities by man for thousands of years. They largely contribute to preservation, sensory and innocuity of fermented foods of animal and plant origins through the production of organic acids and other antimicrobial products and their complex enzymatic activities. Traditional fermented foods, such as fermented milk products (cheese, fermented milks, yogurts, etc), fermented meats (e.g. cured meats, dry sausages) and plant products (e.g. olives, pickles, sauerkraut) are staple foods in Eastern countries and Serbia and Monte Negro. The diversity of metabolic activities of LAB offers a great potential for developing new functional foods with health benefits through the addition of probiotic bacteria that have positive effects on gut health.

This project aims to develop new probiotic bacteria with antimicrobial activity and microencapsulation technologies for their application in food and health products. The objectives of this research are two-fold.

1. To isolate, identify and characterize new strains with high potential for applications as probiotic cultures in foods and health products from the biodiversity of local high quality traditional fermented foods in Serbia-Monte Negro. New probiotic from the genera Bifidobacterium and Lactobacillus exhibiting antimicrobial properties will be screened.
2. To provide new and original microencapsulation methods for protection and stabilisation of sensitive probiotic cultures. Research will be carried out on the formulation, stabilization and target delivery of probiotic micro-organisms using cell bioencapsulation for food application. The technologies will support the development of the market for probiotic food and health products with high activity.

The proposed project is closely related to important issues of biodiversity preservation, production of food and high value food supplements containing probiotic bacteria, and development of new advanced technologies to improve food quality and safety and health benefits for the consumers. The production of health-promoting foods is a central issue for countries that are in a transition period, like Serbia and Montenegro.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110973 – Mosar Jon

**Title: The eastern Great Caucasus: Geodynamics of an active mountain belt at the cross-road of Europe, Middle-East and Asia**

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**Keywords:**

Tectonics, Greater Caucasus, Geodynamics, Azerbaijan

**Abstract:**

The Great Caucasus is Europe's highest mountain range at the cross-road of Europe, Asia and Arabia. Its eastern termination, in Azerbaijan, plunges into the South Caspian Sea, one of the world's major oil provinces, and area of geostrategic and geopolitical importance to western countries.

Under the leadership of the World Bank the world's longest oleoduct, between Baku (Azerbaijan) and the Black Sea has just been built. This highlights the strong interest of many international governments and petroleum companies in this area to the south of the Russian federation.

Some of the world's major oil reserves are buried in the South Caspian Sea. The sediments, which host the oil reservoirs, are deposited in the very deep basin formed by the South Caspian (> 20km). The provenance/source of the sediments is the Great Caucasus where they are eroded and subsequently carried by huge rivers such as the Volga, the Samur and the Kura.

The continued growth of the Great Caucasus, since beginning Tertiary (some 65 Ma) and the huge subsidence of the South Caspian basin are the focal points to understand the erosion vs. sedimentation processes in this area, and hence the origin, formation, migration and trapping of hydrocarbons.

In order to understand the links and interaction between sources and sink of sediments it is necessary to understand the relation between tectonic processes and surface processes. The present topography is also the surface we live on and any dramatic changes or ruptures in this surface are likely to cause important economic damage and possible loss of human life (earthquakes f.ex.). The proposed project focuses not only on the recent past geological history, but also on the present ongoing tectonic activity. Indeed, the Great Caucasus is not only Europe's highest mountain range, but also it is the fastest growing. The growth of the Caucasus is due to the rather fast convergence between the Arabian plate and the Eurasian plate, leading to continued earthquake activity and growth (surrection) of the mountain range.

The continued convergence (since Tertiary) makes the Great Caucasus a unique mountain belt where tectonic activity is expressed in the morphology and where large rivers not only keep eroding the mountain range, but also scavenge the deposits of their ancestors (Paleo-Volga, -Kura and -Samur).

Therefore, the Greater Caucasus and more specifically its eastern termination in Azerbaijan is a unique natural laboratory to investigate the link between lithospheric and surface processes. The project intends to study the dynamic links between surface and subsurface structures.



SCOPES 2005-2008: Joint Research Project

## Project no.: 110974 – Hora Pavel

**Title: Improvement of performances of formability models for sheet metals using new constitutive laws**

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**Keywords:**

forming limit curves, anisotropy, yield criteria, sheet metal

**Abstract:**

The main objective of the research project consists in developing a general formulation of the Modified Maximum Force Criterion (MMFC) that should be able to give accurate predictions of the limit strains, especially for aluminium alloys. The consortium has been established taking into account the complementarity of the results previously obtained by the partners: MMFC - developed by Prof. Pavel HORA and his team from ETH Zurich, and BBC yield criteria - developed by Prof. Dorel BANABIC and his team for the Technical University of Cluj-Napoca (Romania). In the first stage, the computational robustness of the MMFC model will be enhanced by removing the mathematical singularity arising in the plane-strain region of the yield locus. The next step will consist in the implementation of two modern anisotropic yield criteria (BBC2003 and Cazacu-Barlat) in the general frame offered by the MMFC model. These yield criteria have proved their capability to capture the anisotropy exhibited by aluminium alloys used in automotive and aerospace industry. The computational models developed in the frame of this project will be subjected to experimental validation. A special task is devoted to the experimental determination of forming limit diagrams both for steel and aluminium alloys. The models could be implemented in the MATFORM software package developed by ETH Zurich, becoming thus available to industrial users as a stand-alone application or part of a finite-element commercial code (AUTOFORM, e.g.). Young scientists and PhD students will be included in the research teams. The project will give them the opportunity to improve their qualification. The scientific results could also be used in the educational activities of the partners. The research performed during the project could be continued in the frame of an extended European Project.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110976 – Decurtins Silvio

**Title: New Approaches for Building Potential Magnetic Materials: From Isolated Metal Clusters to Molecule-Based Magnets**

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**Keywords:**

Synthesis, Molecular Magnetism, Coordination Chemistry

**Abstract:**

There is currently a great deal of interest in the design, synthesis and properties of coordination polymers. They represent a new and active area of coordination chemistry because of their special roles in magnetic materials, non-linear optical materials, catalysis, etc. The most successful strategies for the design of coordination polymers are based on a building block (or “supramolecular synthon”) approach (like making things out of LEGO blocks). The design of one-, two-, or three-dimensional crystalline network structures can thus be achieved by choosing the desired combination of nodes and connectors.

Polynuclear metal carboxylate clusters represent versatile frameworks for the generation of numerous molecular magnetic arrays. Moreover, they also realistically exhibit phenomena known as “single molecule magnetism” (SMM). However, despite the characterization of many new polynuclear complexes, including those as SMMs, little analogous work has been done to build magnetic coordination polymers through the linking of metal clusters. Networks of metal clusters bridged by multifunctional ligands can result in stronger magnetic interactions than they are possible without such bonding.

The main goals of the proposed project “New Approaches for Building Potential Magnetic Materials: From Isolated Metal Clusters to Molecule-Based Magnets” is

- (i) to fabricate new magnetic materials by connecting both small metal aggregates and nanosized clusters without decomposition of the latter using adequate linkers such as carboxylate and N-containing ligands
- (ii) to examine the physical properties of both metal clusters and coordination polymers, looking for unusual magnetic behaviour.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110977 – Hafner Christian

**Title: Simulation and Synthesis of Metamaterials for Electromagnetics and Optics**

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**Keywords:**

Metamaterials, Biisotropic and Chiral materials, Photonic Crystals, Computational Electromagnetics, Numerical Optimization

**Abstract:**

Metamaterials is a new term describing a concept of artificial, man-made materials composed of small cells containing at least two different natural materials. Metamaterials can exhibit much more pronounced electromagnetic properties than natural materials or even completely new properties such as a negative index of refraction or an electromagnetic band gap. In general, one can distinguish different kind of metamaterials, depending on the size and orientation of the cells that establish the metamaterial. When these cells are small compared with the wavelength and randomly oriented in space, the macroscopic properties of the metamaterial are as simple as homogeneous, isotropic natural materials. When the cells that establish the metamaterial are not small compared with the wavelength or oriented in a certain direction, the macroscopic properties become much more pronounced and complicated (anisotropic and strongly frequency-dependent). For both cases, efficient and accurate 3D field solvers are currently not available.

Nanotechnology currently provides the technology to fabricate metamaterials for a very broad frequency range up to optical frequencies.

This makes the concept of metamaterials very attractive for future technologies. Beside the extreme case of negative index materials one can think of more realistic materials with strong chirality, perfectly absorbing metamaterials, and low index metamaterials that are excellent for beam-forming applications.

The design procedure of a metamaterial with desired properties is an extremely demanding synthesis process. The only promising way towards an efficient design consists in a combination of accurate field solvers that can analyze any possible metamaterial and derive the corresponding macroscopic properties with an efficient numerical optimizer that designs the cells that establish the metamaterial.

The main goals of the project are the development, implementation, and application of efficient and accurate 3D field solvers for metamaterials.

Furthermore, sophisticated numerical optimizers that are well adapted to the specialties of metamaterials shall be developed and combined with the field solvers for designing promising new metamaterials with attractive electrodynamic properties.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110978 – Samietz Jörg

**Title: Transition to sustainable pest management in Eastern European horticulture: Implementation, adaptation and validation of novel methods for forecasting, monitoring and control by example of the key pest in apple, the codling moth**

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**Keywords:**

sustainability, pest management, phenology modelling and monitoring, mating disruption, attract-and-kill

**Abstract:**

Sustainable agriculture should maintain productivity over time by being resource-conserving, environmentally friendly, but also commercially competitive. This involves persistence in the applicable cropping systems, maintenance of soil quality, preservation of water, air and other environmental resources, and continuance in pest management strategies that comply with preservation of natural resources. In contrast, over the past decades many horticultural pests have developed resistance to classical chemical insecticides. A variety of novel methods is available for successful pest management and forecasting systems offer exact timing of methods to avoid unnecessary treatments, but in many regions these methods are not adopted yet. The codling moth, *Cydia pomonella*, is the most important pest of apple worldwide. Most of recently applied insecticides have a large spectrum of action – they also eliminate the beneficial insect- and spider fauna. Also, the codling moth developed a wide range of resistance to latter insecticides, which are hitherto nearly exclusively used against codling moth in Bulgaria and all over Eastern Europe. Therefore the codling moth was chosen as target organism and will serve as an example for further key pests.

Being on the transition to the development of new production systems, Eastern European agriculture offers the possibility for implementation of sustainable approaches ab initio. The present project therefore aims (1) on the transfer of knowledge and development of novel ideas between Swiss and Eastern European partners, (2) on the adaptation of methods to the local environmental conditions, cropping systems and pest phenology, and (3) on the validation of methods under local conditions.

On the basis of extensive experience of the partners in the field, the implementation process of novel method for sustainable codling moth control will involve following approaches:

Methods for monitoring of the codling moth are available on the base of pheromone trapping and will be tested under the conditions of the Bulgarian orchards. Experiments will clarify how often the traps have to be checked under the local climate and on what spatial scale the monitoring has to be carried out.

Assessment of field phenology of the pest species will be combined with phenology modelling of the codling moth which will be established on the basis of the present forecasting system SOPRA used to support extension services in Switzerland. This model is developed and run by the Swiss partners and will be modified to match the regional codling moth populations. Laboratory experiments under controlled climate conditions to establish life history data will accompany the model validation.

Novel methods of codling moth control to be tested will be: pheromone-based mating disruption, pheromone-based attract-and-kill, selective insect growth regulators, and virus-based biological insecticides. Prior to the application of novel methods, the status of codling resistance to classical insecticides will be established. Modelling results and field monitoring will be combined for proper timing of control methods.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110980 – Kälin Walter

**Title: Swiss-Georgian international co-operation in legal education**

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**Keywords:**

education, constitution, law

**Abstract:**

The Institutional Partnership between the Georgian and Swiss partners will establish two actions in the domain of educational exchange. It provides a course of Georgian higher education that is tied into the certificate portfolio of Berne University. And it improves framework conditions for research and teaching in Georgia by introducing selected researchers to the teaching methods and facilities in Berne.

During the time of two years, two groups of postgraduate students (15 each) will have the opportunity to study for a “Certificate of Advanced Studies in Constitutional Law”. Without leaving their country, they will receive legal education that is up to the Swiss standards and provided by teachers from Swiss universities. The course will focus on a problem of the transition period, namely, how the 1995 Georgian constitution, targeted towards democratic order, economic freedom, and the rule of law, can be brought to life within the legal culture of Georgia.

Prior to each year’s coursework, up to two teachers of the Georgian partner will visit Berne for two weeks in order to improve their know-how in education and research. They will have the opportunity to participate in the educational process at Berne Law School, observe the workings of the new Bologna curriculum in Berne and follow the Swiss partners in their daily routines of teaching and research. Depending on ability, interest and specialities, they will be given an opportunity to present a lecture and receive an evaluation for their performance. They attend some of the coursework in Georgia to discuss the transfer of educational techniques with their Swiss partners.

Teaching initiative and teacher exchange will modernise the institutional aspects of higher education in Georgia, enhance the attractiveness and competitiveness of the Georgian partner institute, and initiate an improvement of the computer and teaching infrastructure in Tbilisi. It will give the Swiss partners first hand experience with the application of constitutional law during transition periods and provide multicultural exchange.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110981 – de Rooij Nicolaas F.

**Title: Southern Nanoengineering Network (SONNET)**

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**Keywords:**

microsystems, MEMS, nanotechnology, nanoengineering,

**Abstract:**

The Southern Nanoengineering Network (SONNET) aims to increase the competitiveness of partner countries toward the development of teaching and research aptitudes at micro and nanoscale. The network - as partnership - includes three universities, one institute of the academy of science, one professional nongovernmental organisation, one small research-production company from Switzerland, CEEC (Bulgaria and Romania) and NIS (Moldova) countries, grouped in the South Eastern part of Europe. The project is especially designed to respond to current challenges in the field of nanoengineering, by reaching a critical mass that would enable a larger scale development of the field in Eastern European countries. The activities to be carried out will facilitate the scientific and technological integration of an entire European region by: valorisation of high quality ongoing research, restructuring of the regional educational and research targets, formation of a regional research market in the field of nanoengineering research, favouring of the free movement of knowledge, research and technology through increased co-operation between regional groups working in the same field; establishment of a model for co-operation in development of new fields of research.

The Institutional Partnership is expected to lead to an educational offer better adapted to current and future national needs, to an increased research capacity to participate in significant activity at international level and to the improvement of the managerial skills of the partners, while the students from the universities involved will have better chances on the job market. The "Southern Nanoengineering Network – SONNET" will be a seed for additional interested partners and will facilitate the interaction with similar networks interested in developing the field of nanoengineering under the auspices of national or international joint research and collaboration frameworks.



The impact on the CEEC/NIS countries will occur from the integration of the productive activities in the high-tech range, the development of SMEs, the restructuring of research activity in transition countries, and the enhancement of professional qualifications during master courses in the field of micro/nanoengineering. SONNET considers as a major aspect the applicative part and the research activity is focused on the way the scientific results can be transferred into practical applications.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110982 – Piérart Marcel

**Title: Epigraphy in the context of the renovation of historical studies in Russia**

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**Keywords:**

Greek epigraphy, Latin epigraphy, corpus, inscriptions, Black Sea

**Abstract:**

Epigraphy represents one of the major branches of the classical studies and ancient history, because it continuously provides new written sources, which often change our ideas about the Antiquity. The Greek and Latin epigraphy had been well developed in Russia in the 19th and early 20th centuries, but experienced many difficulties in the last decades and is now on the verge of disappearance. One of the factors aggravating the situation is the system of organizing researches and higher education, which was inherited from the Soviet Union. In this traditional system, the Academy of sciences, the main scholarly institution in Russia, is completely separated from the Universities. The lack of contacts between the Academy and the Universities hampers the education and training of new generations of researchers. The proposed project intends to unify Russian epigraphists around a common research enterprise and to create necessary conditions for a revival of the Russian epigraphic school. Besides mature scholars, young doctors, post-graduate and graduate students also take part in the project. A participation in a common research work is the best way to educate and to train young scholars, which creates conditions for a natural succession of generations in the frame of a scientific school. Another task of the project is the integration of the Academy and the Universities, including organizing of teaching of the epigraphy and practical work with the inscriptions for PhD students. The main aim of the project is the preparation of a new corpus of the Greek and Latin inscriptions from the northern shore of Black sea, which will include all published and unpublished inscriptions from this regions. It will be initially prepared as an electronic database created with the help of the software PETRAE devised at Bordeaux University. In the future, the printed version of the corpus in Russian and in one of Western European languages will also be prepared. The Russian team is working in a close contact with colleagues from other countries. The contacts with Fribourg University, which are traditional for some team members (some of them made research stays in Fribourg and the team leader defended his habilitation thesis there), play an especially important role in the project. Professor Piérart from Fribourg is directly involved in writing of the commentaries of the corpus (especially institutions of the Greek cities of the region and their religion). In addition, Fribourg University and especially its Doctoral School will help in organizing of a system of teaching of the epigraphy in Russia.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110986 – Kapon Eli

**Title: Confined excitons: interaction and localization effects**

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### Keywords:

Excitons, low dimensional semiconductors, quantum confinement, condensation, electron-hole liquids, photoluminescence, disordered systems, localization, superlattices

### Abstract:

This joint research project aims at exploring the dynamics of exciton complexes in semiconductor nano-systems, particularly quantum wells (QWs) and quantum wires (QWRs). Moreover, effects of condensation of electrons and holes brought about by Coulomb interaction in low-dimensional semiconductors will be investigated. The results might also contribute to the development of novel optoelectronic device applications in fields such as optical communication and quantum information processing.

Although excitonic states in semiconductor systems of reduced dimensionality were studied intensively, this field still attracts much interest. Among others, exciton interaction and excitonic complex formation, disorder and localization effects, collective behavior, and phase transitions in systems of low-dimensional excitons remain widely discussed topics. An important advantage of low-dimensional nanostructures is the possibility to choose the conditions for the observation of a desired effect by varying the design and parameters of the structures under study. This makes possible the observation of effects that are either difficult or impossible to be realized in bulk semiconductors.

The project is based on collaborations between groups of scientists at EPFL in Switzerland as well as the Lebedev Institute in Moscow and the Ioffe Institute in Saint Petersburg, Russia. The work consists of experimental studies of the dynamics of excitonic-complex formation in QWs and QWRs, exciton localization in QWRs and their radiative properties, and collective effects in low-dimensional systems at high exciton density. In particular, condensation of electron and hole in liquid phase originating from Coulomb correlations between the particles in a system of closely spaced 2D layers (QWs) or 1D wires will be investigated. Application of a high magnetic field, which in most cases results in a strong modification of electronic states of a semiconductor, will be instrumental in these studies both as a research tool and as a means for achieving desirable physical conditions in the systems under study.

For instance, by applying a magnetic field perpendicular to the wire axis we will be able to determine the extent of the exciton wavefunction along the wire axis, thus probing the disorder potential. We also believe that application of a high in-plane magnetic field, which breaks down tunneling between the neighboring QWs, can create conditions for electron-hole condensation in short-period superlattices. We plan to study the properties of such magneto-stabilized liquid phase if found.

In the theoretical part, we intend to develop a theory of the exciton confined states in QWRs (possibly including the effect of localization), to consider collective effects in 1D exciton gas and to analyze the effect of imperfection on tunneling of excitons through superlattices of QWs and QWRs under strong magnetic field perpendicular to the superlattice axis.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110987 – Zogg Hans

**Title:** Lead Chalcogenide Infrared Optoelectronic Devices

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**Keywords:**

lead chalcogenides, infrared optoelectronics, infrared spectroscopy; infrared detectors; infrared lasers

**Abstract:**

Although substantial advances have been achieved in the development of edge emitting mid-infrared semiconductor lasers with type II antimony lasers and III-V quantum cascade lasers, the IV-VI lead salt semiconductors are still the most favourable materials for making mid-infrared lasers owing to their unique energy band structure and low nonradiative recombination rate including Auger recombination. Lead salt infrared optoelectronic devices including a diode laser and a detector are very promising for sensitive, real time trace gas analyzers which can be applied in many areas like pollution control and environmental monitoring, combustion diagnostics and medical diagnostics. The purpose of this project is the development and investigation of edge and surface emitting lasers based on the lead salt chalcogenides (PbS, PbSe and PbTe and their solid solutions) and the investigation of the PbTe:Ga photodetector prepared on the silicon substrates. So it consists of two parts. The first one is directed to the development of the vertical cavity surface emitting lasers (VCSEL) with optical pumping, optimization of their characteristics, development of diode VCSELs and demonstration of their usefulness for spectral gas analysis. The VCSEL structures will be grown on both BaF<sub>2</sub> and silicon substrates. For the last ones the silicon integrated read-out circuits are possible. The second part is devoted to the gallium doped PbTe which has unusual photoelectrical properties. Our goal is to obtain the uniform epitaxial PbTe:Ga/Si layers with different, relatively low doping levels ( $10^{18} - 10^{20} \text{ cm}^{-3}$ ) and to investigate the fundamental properties like thermal and optical ionization energies, threshold energy for quenching effect, DX-center concentration.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110991 – Luginbühl Thierry

**Title: Nokalakevi (West Georgia) in the first millenium B.C. and earlier, cultural and environmental context**

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**Keywords:**

Protohistory, pluridisciplinary, chronology, paleoenvironment, Colchida

**Abstract:**

The project is pursuing objectives of different kinds:

It is expected to develop pluridisciplinary co-operation with Georgian scientist teams. This includes:

- a) to build up and develop a network,
- b) to open the possibility of scientific exchanges between Georgians, Swiss and French scientists,
- c) to update the approach and methods in archaeological and environmental research,
- d) to realise collaboration between researchers of different scientific fields in the same project,
- e) to sensibilise about the destruction of national patrimony and the question of environment and its endangered actual situation (preservation of biodiversity),
- f) and to lay concrete bases for the beginning of new projects.

The project includes the participation of students of each side in the research program and aims at being a contribution to the education and training of the new generation of researchers.

To work in the field of archaeology, as a cultural basis, and to study the existence of an original local culture by concrete data nourish the question of the origin of the concerned region. By this means, it can contribute to reinforcing the definition of the national identity.

In addition, the area is of special interest to the Georgian authorities. This archaeological settlement was proposed, not only for its scientific interest, but also because it has a great economico-cultural potential. The long term aim of the project is to contribute to the to the cultural and economical development of the area of Nokalakevi (Senaki district) in connection with the National Museum of Georgia.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110992 – Leumann Ernst

**Title: Implementation of a New Teaching Concept in Lviv and Chisinau via Yerevan for Selected Paediatric Disciplines**

**Co-ordinator:**

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**Keywords:**

Education, Paediatrics, Nephrology, Diagnostic imaging, Armenia, Moldova, Ukraine

**Abstract:**

A new concept in advanced training for Lemberg and Chisinau via Yerevan for chosen paediatric disciplines. Aim: Improvement of basic and advanced training in paediatrics together with patient care in Lemberg (Ukraine) and in Chisinau (Moldova) with the help of two partners in Yerevan (Armenia). This concept is also important for further paediatric disciplines and should boost motivation and scientific collaboration. Context: for more than 17 years the co-ordinator (Prof. E. Leumann) has been involved in a professional partnership programme with the Arabkir Children's Hospital in Yerevan, especially in the domain of paediatric kidney diseases. Thus, competence could be considerably improved there and the niveau raised to western standards. In many other post-Soviet countries, development has stood still. As a result of the positive experience from the previous NF-project (IP 65608), the idea was born to use the better-trained partners in Yerevan for the advanced training in the Ukraine and Moldova. The partners in Armenia have the advantage, compared with western experts, that they had to master the big leap away from the Soviet way of thinking themselves and can communicate new concepts credibly. A further advantage is that the courses and workshops can be held in the Russian language. This concept, tested in a pilot project in 2005 (valorisation grant IB76B0-106045), has proven to be extremely successful. Project execution: the project will be steered from Zürich by the co-ordinator (EL) together with the local co-ordinator Dr. Ashot Sarkissian in Yerevan, supported by the radiologist Prof. U. Willi (Zürich/Stanford) and Dr. Narine Manoukyan (Yerevan). Both Armenian partners held their first seminars in May 2006 and will repeat them (with EL) in 2007. Conversely, five doctors from Lemberg and Chisinau will participate in a seminar (1 week) in Yerevan in September 2006 and 2007, at which Swiss experts will also participate. Training has top priority, but essential resources will also be purchased.

A supplementary project is to compile a practical textbook in the Russian language as the available textbooks are still predominantly influenced by the Soviet way of thinking. Altogether, 35 exchange stays are to take place, 28 of which will be in the CIS. Thanks to lower travel- and accommodation prices and no visa rules within the CIS, the project can be carried out cost-effectively.



SCOPES 2005-2008: Joint Research Project

## **Project no.: 110996 – Thielemann Friedrich-K.**

**Title: The Role of Neutrons and Neutrinos in Supernovae and their Nucleosynthesis**

**Co-ordinator:**

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**Keywords:**

Neutrons, neutrinos, supernovae, ejected abundances

**Abstract:**

Observations of supernovae and models of their explosions have improved significantly in recent years. Based on our modelling of core collapse supernovae, we plan to address key questions in nuclear astrophysics, such as the production of elements and their isotopes by making use of complete sets of thermonuclear reactions, including especially the role of neutron-induced reactions and weak interactions (beta-decays, electron/positron captures and neutrino-induced nuclear reactions). We expect major advances by (i) providing a new and expanded nuclear data base for all such reactions, (ii) performing numerical models of the explosive events with highly sophisticated radiation hydrodynamics codes which employ complete Boltzmann transport for neutrinos, and (iii) making use of observations to test the role of uncertainties in the theoretical models in terms of physics input as well as hydrodynamic modeling.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110997 – Lanza Michele

**Title:** NOREX - Network of Reengineering Expertise

**Co-ordinator:**

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**Keywords:**

software reengineering, web services

**Abstract:**

In an information technology society that is increasingly relying on software, software productivity and quality continue to fall short of expectations: software systems suffer from signs of aging as they are adapted to changing requirements. The main reason for this problem is that software maintenance and reengineering is still undervalued in traditional software development processes.

The only way to overcome or avoid the negative effects of aging in legacy software systems and to facilitate their smooth evolution is by providing engineers with a fully automated and integrated support for the entire reengineering process.

Unfortunately, the reengineering of large scale software systems is a highly complex activity, which demands both multiple scientific insights (e.g., metrics, visualisation, meta-modelling etc.) and various engineering skills (e.g., compiler techniques, graphics, database engineering etc).

Consequently, tackling all the issues involved in a reengineering process is excessively challenging, and barely impossible to be addressed by a single research group.

The three research groups proposing this project and other European research groups have developed over the last 7 years valuable artifacts to support in different manners the reengineering process.

Each of them have focused their attention on specific issues and provided remarkable solutions. Yet, all these scientific and engineering „gems" have a reduced impact if used in isolation, as they are unable to address the entire spectrum of challenges that appear in real-world reengineering activities.

In this context, the goal of this joint research project is to provide a comprehensive and extensible support for complex, full-fledged reengineering activities applicable on real-world systems. Specifically, we want to address these issues by building a distributed reengineering environment which is able to make all the techniques and models defined and implemented by each of the three research teams to complement each other.

Then we want to use this environment to integrate different reengineering techniques to support complex reengineering techniques and validate based on large-scale experiments the feasibility of the approach.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 110998 – Exner G. Ulrich

**Title: Enhancing the teaching and training in paediatric and tumour orthopaedics in Armenia**

**Co-ordinator:**

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**Keywords:**

club foot management, hip dysplasia (Screening, early detection, treatment) Vitamin D resistant rickets, Muskuloskeletal Oncology

**Abstract:**

Background: The coordinator since many years is active in supporting the development of care for children with orthopaedic problems in Tanzania, Ukraine, and Mongolia. Based upon this experience some principles have been published recently in the JPO.

One highly important aspect is that in the countries mentioned the critical evaluation of data is not sufficiently respected with regard to simple tasks as precise acquisition of data before and after treatment.

For this purpose besides the goals of exchange set by the FNSNF in the SCOPES project a few specific topics named in the keywords have been included with the goal to publish results in national and international Journals.

Partners: The co-ordinator is Prof. Dr. G. Ulrich Exner, University of Zurich. The co-applicant is Dr. Garen Koloyan, Head of the University Clinic for Paediatric Orthopaedics and Trauma, Yerevan, Armenia. As a third partner for the project of club foot management is Mrs. Verena Haldi-Brändle, Physiotherapist, Wallisellen/Zurich, Switzerland.

Program: Dr. Koloyan has already visited the Orthopaedic Department in Zurich in July. Surgeries have been performed together and details of the projects have been set up.

Mrs. Haldi has visited Yerevan in Septemeber, 2006 and during an intensive week has given instructions for the manual treatment of club feet and for the documentation. The first of the annual visits of two fellows of Dr. Koloyan is scheduled for Novemebr/December 2006 in Zurich. The first visit of Prof. Exner in Yerevan is planned for January 2007.

Materials: The project includes the improvement of hard ware available for the documentation as well as for presentations. Part of this material could already be provided.

Impression: From Dr. Koloyan's visit here in Zurich and the first visit of Mrs. Haldi in Yerevan it appears that there is an excellent background for the SCOPES project with the experience of Dr. Koloyan during his fellowship in the Hospital for Crippled children in Oregon (Prof. Dr. M. Sussman).

SCOPES 2005-2008: Joint Research Project

## Project no.: 110988 – Hoffmann-Lehmann Regina

**Title: Elaboration of a low-cost microtest for identification, rapid cultivation and antibiotic susceptibility testing of *Helicobacter pylori* in clinical samples**

**Co-ordinator:**

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**Keywords:**

*Helicobacter pylori*, culture medium, urease, rapid microtest, antibiotic sensitivity testing

**Abstract:**

Research topic: *Helicobacter pylori* (*H. pylori*) is a causative agent of gastro-duodenal ulcer disease and an established carcinogen for gastric adeno-carcinoma. Diagnostic and treatment of *H. pylori* infection is an important direction of public health related with large outlay. *H. pylori* is a fastidious micro-organism and its cultivation is technically complicated. For clinical practice, rapid tests such as the non-invasive urease-test or polymerase chain reaction (PCR) specific for *Helicobacter* were elaborated. At present, physicians usually use empirical treatment schemes in treatment of patients with diagnosed *H. pylori* infection.

Growing resistance of this germ to accepted antibiotics and lack of convenient and rapid antibiotic susceptibility tests result in inefficient therapy and inadequate antibiotic-resistance surveillance. In this connection, return to culture methods seems necessary.

Objectives: The goal of the present study is to design and realize a three-in-one *H. pylori* combination test in a single microtest. The test will comprise: 1) an indicator test, 2) a selective medium for rapid cultivation of *H. pylori*, and 3) an orientational antibiotic susceptibility tests for *H. pylori*. First, a new selective culture medium for rapid (24 hours) cultivation will be developed; this medium will be based on a classic cell culture medium. Preliminary results with a medium containing Medium 199 are very promising and seem to demonstrate that this goal will be achievable. Integration of this medium in a microtest and combination with a simple biochemical test for *Helicobacter* will permit concomitant cultivation and indication of the pathogen. This medium/indicator combination in addition with antibiotics used in *Helicobacter* eradication therapy will allow for rapid qualitative susceptibility tests and subsequent rational antibioticotherapy.

Expected results: The present study investigates a topic in a research field that is located at the edge of microbiology, immunochemical and molecular techniques and gastroenterology. The intended three-in-one microtest will represent a new low-cost clinical solution, which will be valuable for the healthcare sector in both developed and low-income countries.

SCOPES 2005-2008: Joint Research Project

## Project no.: 110990 – König Barbara

**Title: Ecology, behaviour and population genetics of the forest living Bechstein's bat (*Myotis bechsteinii*) in two glacial refuges: South-Eastern Europe and the Caucasus**

**Co-ordinator:**

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**Keywords:**

Bechstein's bat, Conservation, Ecology, Glacial refuge, Population structure

**Abstract:**

We combine field observations with genetic data to reveal information about habitat use, population size, dispersal, colonization, demographic traits, and genetic relatedness within and among Bechstein's bat populations in Central Europe, the Balkan region, and the Caucasus. *Myotis bechsteinii* is a non-migratory, forest-living, widespread, but generally rare European bat that is listed to be vulnerable with declining populations. We focus on the regional flexibility of the species' ecology, social system, and population structure over most of its range. Such data are lacking for bats however they are required to understand the evolution of their diverse social systems. Detailed information on the Bechstein's bat's biology, particularly with respect to local conditions, is not only of high scientific interest but is urgently required to design appropriate conservation plans. Our study extends our previous Scopes project (2001-2004) on Bechstein's bat's ecology and genetic population structure in Bulgaria and Central Europe. This follow-up study is based on our progress on the species' socio-genetics, which raised new and exiting questions. We now include the Caucasus region, because the available genetic data suggest that the Caucasus harbours Bechstein's bat populations with a genetic background that is very distinct from other European populations. Our study is scientifically highly rewarding for at least three reasons. It is the first study to analyse macro-geographic population structure in a non-dispersing bat over almost its entire range, including populations in the species' glacial refuges. Second, it is unique in comparing the ecology and behaviour of bat populations, separated by large distances, that live in different environments, and that have a distinct genetic background. Third, it will result in genetic and behavioural data that are prerequisites to understand the evolution of sociality in bats in general.

Additionally, our study provides an excellent possibility to contribute knowledge and data for national conservation management of the endangered Bechstein's bat in Eastern European countries that cannot afford to gather such data within the framework of national research programs. Besides its scientific value and its implication for conservation, our extended cooperative Swiss-Eastern European project has a strong capacity building effect on future research projects in Eastern Europe, including the Caucasus region. By sharing modern field equipment, which is largely unavailable in Eastern Europe with researchers from countries that currently undergo rapid and dramatic transition processes, the project will allow for future studies on bats and other native animals in the respective regions. Last but not least, education of young scientists from all four countries involved (Bulgaria, Georgia, Russia, and Serbia), via transfer of sophisticated methodological knowledge, will be important for future biological projects that try to answer scientific questions of high standard and international significance.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111004 - Tregenna-Piggott Philip

**Title: Experimental and Theoretical Study of Exchange and Vibronic Interactions in Compounds Containing Orbitally Degenerate or Quasi-Degenerate Metal Ions: Prospects for Practical Applications**

**Co-ordinator:**

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**Keywords:**

Valence tautomerism, Fluoromanganates, Single Molecule Magnets, Cooperative Phenomena, Jahn-Teller effect

**Abstract:**

This project concerns the study of compounds containing orbitally degenerate or quasi-degenerate transition metal ions such as high-spin Mn (III) and Co (II) ions in octahedral or quasi-octahedral ligand environments, and rare-earth Tb (III) and Dy (III) ions with first-order orbital angular momenta. Three classes of compounds of current interest will be investigated: 1) 3d-4f Single Molecule Magnets (SMMs), 2) hexa-amine fluoromanganates (III), and 3) valence-tautomeric compounds. Experimental characterization of these systems, primarily using Inelastic Neutron Scattering (INS) technique, High-Field Multi-Frequency EPR (HFMF EPR), far infra-red spectroscopy, and time-resolved extended X-ray absorption fine structure (EXAFS) technique will be complemented by the comprehensive theoretical description of the single ion anisotropy, orbitally-dependent superexchange, vibronic and elastic interactions, and the cooperative Jahn-Teller effect.



SCOPES 2005-2008: Institutional Partnership

**Project no.: 111005 – Sturm Jan-Egbert (formerly Schips)****Title: Improving business tendency survey (BTS) in industry and expanding sectors covered by BTS as a first step of introduction of the national-wide business tendency surveys system in Ukraine****Co-ordinator:**

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**Keywords:**

Ukrainian economy, leading indicators, qualitative data, survey at firms, regional and sectoral developments

**Abstract:**

The transition of Ukrainian society from the post-Soviet system to a market-oriented democracy is characterized by the establishment of new institutions and structures. Due to inevitable lags between implementing policy measures and achieving the expected results, no economic policy can be efficient without reliable and actual economic data, which offer estimates and predictions of key economic variables. Surveys directed at business opinions and expectations have become more and more important in the statistical field, since these data have turned out to be particularly valuable for observing, forecasting and explaining economic processes. This information deals with entrepreneurial knowledge of conditions and events in their enterprises.

Compared to traditional statistical surveys, which cover only one or a few related variables from one area of the economy, business tendency surveys (BTS) collect information about a wide range of variables selected for their ability to monitor the business cycle. Priority is given to variables, which measure the early stages of production (e.g. new orders), respond rapidly to changes in economic activity (e.g. inventories), and measure expectations or are sensitive to expectations (e.g. overall economic situation).

The main objectives of this project are:

- Developing the institution's capacity for conducting business tendency surveys to develop National Wide indicators for the Ukrainian economy.
- Improvement of the existing long-run BTS in industry to make its output more accurate and useful.
- Development of reliable statistics, oriented towards the requirements of policy-making in a market-based economy; development of time series of independent and reliable data on research about the economic situation at the micro-level;

- Search for an early warning system by means of leading indicators of core-data on the Ukrainian economy (e.g. GDP).
- Creation of a forum in which government policymakers can discuss key problems facing Ukrainian enterprises.

The Institute for Economic Research and Policy Consulting (IER) has already some experience with BTS because it is conducting a survey in industry since 1999. But the sample size is small and the regional coverage unsatisfactory. The sample size has to be increased, and the weighting techniques and the aggregation method should be improved. In addition, there is a need to expand the Survey to branches not belonging to manufacturing industry. Moreover, the disposable time series are now long enough that the search for coincident and leading indicator out for the BTS could begin.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 111010 – Boller Beat

**Title: Characterization of *Festuca* spp. (*Festuca pratensis* Huds. and *Festuca arundinacea* Schreber) from diverse habitats of Bulgaria**

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### Keywords:

*Festuca pratensis*, *Festuca arundinacea*, genetic resources, in situ, ex situ, diversity, grassland, evaluation, characterization

### Abstract:

Aims of the project

Research will be carried out to assess the genetic variability among and within Bulgarian natural populations of two grass species with Europe wide potential for forage production: *Festuca pratensis* Huds. and *Festuca arundinacea* Schreber. The objective is to correlate variation in important plant characteristics with site-related factors like management, type of vegetation, altitude etc. The results should help establishing recommendations for in situ conservation of forage genetic resources.

Context and significance

Genetic resources of forage crops occur naturally in permanent meadows and pastures. These make up the most important reservoir of genetic variability of these species. Genetic variability within a species is a prime component of biodiversity, provides opportunities for breeding and is essential for adaptation of the natural populations to changing environmental and management factors. However, these genetic resources are poorly characterized and the importance of factors which might threaten their genetic diversity is not known.

Research plan

The Bulgarian ex situ forage collection will be searched for suitable *Festuca* accessions and a targeted collecting mission in Bulgaria will be carried out to maximize the range of ecological niches represented in the collection. The sites will be characterized with maximum available habitat information, including recent and historic agricultural management practices. A restricted number of already preserved and newly collected accessions will be selected for further experimentation.

Seed of selected accessions will be multiplied and a field nursery with spaced plants will be established to record morphological traits known to be highly heritable.

Genetic diversity within and among a selected subset of *Festuca pratensis* accessions will further be assessed by two marker approaches: diversity of DNA markers (micro-satellites, SSR) and seed storage protein profiles. After seed multiplication, the accessions will be evaluated agronomically in plot trials under two contrasting environments: Bulgaria and Switzerland.

The results from the field nursery experiment will be used together with the results from the marker study to assess genetic variability within and among accessions. The plot trials run in parallel, aim at assessing the potential of the different accessions to serve as new genetic resources for plant breeding. These results will be compared with the habitat data to identify site characteristics which are related to valuable genetic variability and/or agronomic potential of *Festuca* populations found therein. Such comparisons should help making recommendations for the in situ conservation of forage plant genetic resources in relation to ex situ conservation efforts.

SCOPES 2005-2008: Joint Research Projects

## Project no.: 111015 – Günter Peter

**Title:** Chalcogenide crystals for all-optical photonics devices in the near infrared

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**Keywords:**

nonlinear optical waveguides, photorefractive effect, tin thiohypodiphosphate, laser beam cleanup, applications of nonlinear optics

**Abstract:**

Tin thiohypodiphosphate (Sn<sub>2</sub>P<sub>2</sub>S<sub>6</sub>, SPS) chalcogenide crystal is a new fast responding infrared sensitive material with best performance in view of different applications involving near infrared light. As a consequence of its unique properties combining ferroelectric and semiconductor characteristics, it exhibits high photosensitivity in the near infrared, high optical nonlinearity, and large transparency range. Compared to nowadays state-of-the-art materials, Sn<sub>2</sub>P<sub>2</sub>S<sub>6</sub> exhibits one order of magnitude higher sensitivity and two orders of magnitude faster response in the near infrared. This is important in connection with the rapid recent development of the semiconductor (diode) lasers, operating in the near infrared spectral range, and their wide implementation in optical technologies and telecommunication. The planned investigations in this project include the growth of high optical quality pure and doped Sn<sub>2</sub>P<sub>2</sub>S<sub>6</sub> crystals by the vapour-transport and Bridgman techniques, as well as the development of post-growth treatment techniques for this material. Bulk single crystals with the optimized characteristics will be used in the holographic optical schemes for the optical beam phase conjugation and two-beam coupling, which will be implemented for diode laser beam cleanup. Besides, the set of the studied materials will be expanded to other crystals of this family (SnP<sub>2</sub>S<sub>6</sub>, CuInP<sub>2</sub>S(Se)<sub>6</sub>). Another aim is the fabrication of the crystalline waveguides in Sn<sub>2</sub>P<sub>2</sub>S<sub>6</sub> for highly integrated photonic devices.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111016 – Martin Ivan

**Title: Development, Validation and Modelling of a Novel Bioreactor System for Cartilage Tissue Engineering**

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**Keywords:**

physiological model system, mathematical model, interstitial medium flow, mechanical stimulation

**Abstract:**

Tissue engineering of articular cartilage has been motivated by the need to develop novel treatment options for the repair of articular cartilage lesions, which are a significant clinical problem and none of the current clinical therapies can predictably restore a durable articular surface.

Functional cartilaginous constructs could also serve as a controlled physiological model system for quantitative studies of tissue development and function that are designed to distinguish the effects of specific biochemical and physical signals from other systemic effects present in vivo. One approach to functional tissue engineering involves the use of:

(i) cells isolated from a small tissue harvest and expanded in vitro, (ii) a biodegradable scaffold designed to serve as a structural and logistic template for tissue development, and (iii) a bioreactor designed to provide environmental conditions necessary for the cells to regenerate a functional tissue structure. Generally, it is attempted to recapitulate aspects of the environment present in vivo during native tissue development and thereby stimulate the cells to regenerate functional tissues in vitro. Functional tissue engineering thus critically depends on the ability to control culture conditions (i.e. hydrodynamic environment, biochemical, and physical regulatory signals) at different hierarchical levels (i.e. from molecular to tissue levels).

In the proposed project we aim to develop a novel bioreactor system with the control of the local cellular microenvironment by incorporation of interstitial medium flow and mechanical stimulation, and assess the optimal in vitro conditions for cultivation of functional cartilage tissue equivalents. The central hypothesis is that the integration of facilitated mass transport of biochemical regulatory species and controlled delivery of mechanical stimuli in the novel bioreactor system will have synergetic and stimulative effects on regeneration and assembly of functional cartilaginous tissues.

Specifically, the project will include: (i) design of the novel bioreactor based on design concepts of the existing bioreactor systems with mechanical stimulation built at the University of Basel and bioreactors with interstitial medium flow used at the University of Belgrade, (ii) validation of the novel bioreactor system in tissue culture studies and assessment of optimal regimes for cultivation of functional cartilaginous tissues, and (iii) development of mathematical models correlating bioreactor cultivation conditions, cellular microenvironment, and tissue regeneration.

The proposed project is based on interdisciplinary scientific research aimed to provide essential contribution in fundamental understanding of mechanisms of cell responses and key cultivation parameters for in vitro assembly of functional cartilaginous tissue. At the same time, the project is addressing highly relevant clinical problem of cartilage tissue loss by development of novel technologies and products potentially transferable to the industrial scale.

Finally, the project is expected to have valuable societal and scientific impacts in Serbia and Montenegro by establishment and promotion of biomedical research. Rapid progression in highly sophisticated and expensive technologies such as biomedical technologies imposes difficulties for developing countries to pursue even at the research level, threatening to increase the gap between highly developed and developing countries. Establishment of such scientific and academic centers in developing and countries in transition is of high importance to provide professional, scientific, and technological resources for country development and future incorporation in European educational, scientific, and economic systems. The participating research groups from Serbia and Montenegro have put significant efforts over the last 3 years to initiate and establish research in the field of biomedicine and especially tissue engineering. This project would institute a formal collaboration with the group at the University of Basel, which has already unofficially supported the research groups in Belgrade over the last years. In this way, the proposed project will strengthen the biomedical research in Belgrade and Serbia and Montenegro by collaboration with one of the outstanding research groups in this field, providing complementary expertise, knowledge transfer, and education and training of young scientists.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111017 – Buchegger Franz

Title: Development of radiotracers based on the radionuclide Y-86 (DRBRY)

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### Keywords:

Radiotracers, 86-Yttrium, dosimetry

### Abstract:

The project goal is the production of  $^{86}\text{Y}$  for labelling of antibodies and peptides in the frame of the Institutional Partnership of the Service of Nuclear Medicine, University Hospital of Geneva and the Laboratory of Physics of the Vinca Institute of Nuclear Sciences, Belgrade. The COSTIS target station produced at the Vinca Institute has been installed on the Cyclone 18/9 cyclotron at the University Hospital, Geneva. The verification of the proton beam has allowed obtaining a well centered beam of high quality on the target. The production of  $^{86}\text{Y}$  is based on the  $^{86}\text{Sr}(\text{p}, \text{n})^{86}\text{Y}$  process, bombarding highly enriched  $^{86}\text{SrO}$  with 15 MeV protons from the IBA Cyclone 18/9 of the Geneva Cyclotron Unit. The radiochemical separation and purification technique is based on sequential electrochemical process. The corresponding process was developed using  $^{90}\text{Y}$  as surrogate radiotracer. In the first separation step the  $^{86}\text{Y}$  is deposited on a dedicated cylindrical Pt-electrode made from a Pt-grid. In the second step of purification the  $^{86}\text{Y}$  is electrochemically re-dissolved and deposited on a Pt-electrode in a wire form. Finally, as a third step in the production protocol the  $^{86}\text{Y}$  is dissolved from the Pt-wire in 250  $\mu\text{l}$  of 10 to 50 mM mineral acid providing a preparation that is directly suitable for labeling procedures of bio-conjugates. The corresponding optimal parameters (time, current, current density, pH, temperature) of all three steps have been determined in detailed systematic studies. It is planned to describe the current results in a short publication. A candidate peptide for  $^{86}\text{Y}/^{90}\text{Y}$ -labeling for dosimetry and therapeutic targeting, respectively, is in evaluation in a clinical study performed simultaneously at the University Hospitals of Lausanne and Geneva. The new peptide binds with high affinity several somatostatin receptor subtypes. It has been developed at the Institute of Nuclear Medicine, University Hospital of Basel. The study compares in the same patients by scintigraphy the commercially distributed  $^{111}\text{In}$ -octreotide with the  $^{111}\text{In}$ -labelled new peptide. Complementary financial support for this project from the Geneva Cancer League and from the Geneva University Hospital research foundation is acknowledged. The radiochemical studies are performed by a doctoral candidate (radiochemistry) from Belgrade (Mr Dragoljub Lukic) working for 1 year at Geneva University Hospital. This fellowship is supported from the Swiss Government.



An external beam-line for optimizing of the irradiation condition of solid targets, as needed for the reliable and optimal production of  $^{86}\text{Y}$  and other radioisotopes will be installed and commissioned in the frame of a scientific collaboration with the laboratory of subatomic and cosmologic physics, University of Grenoble, France. Research and development at the Geneva cyclotron is assisted by Dr Jozef Comor, radiochemist, within the frame of the SCOPES partnership agreement between the Laboratory of Physics from Belgrade and the Service of Nuclear Medicine of Geneva University Hospital.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111020 – Courvoisier Thierry

**Title:** Creation and maintenance of a computing astroparticle centre

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**Keywords:**

astrophysics, computing

**Abstract:**

There are many sources of publicly available high quality astrophysics data in the world. These can be used to extract very significant results also by groups who were not directly associated with the corresponding observations. Our project aims at giving to the Ukrainian astronomical community access to some of these data, in particular in the domain of high energy astrophysics, starting with the data of the INTEGRAL satellite for which we are responsible.

In order to achieve this we put together the necessary computing hardware in Kiev, we organise sets of lectures with practical exercises and we organise a number of visits of young Ukrainian astronomers to the INTEGRAL Science Data Centre. We expect thus to provide the tools with which the Ukrainian astronomical community will be able to contribute to the scientific exploitation of modern satellite data.

SCOPES 2005-2008: Institutional Partnership

## **Project no.: 111026 – Dubied Pierre-Luigi**

**Title: Consolidation of knowledge and competences in study of religious culture at the State Universities of Omsk and Kurgan (Russia)**

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**Keywords:**

religious culture, Russia, State Universities Omsk and Kurgan

**Abstract:**

The aim of this programme is to reinforce the strengths of the Centre d'étude de la culture religieuse (Centre for the study of religious culture) of the University of the State of Kurgan and of the Faculté de théologie et des cultures du monde (Faculty of theology and of world cultures) of the University of the State of Omsk (Dostoyevsky University) in studies on theological hermeneutics and religious culture. This work is carried out in a number of ways: grants for the purchase and for the publication of books, study sojourns for Russian researchers at the University of Neuchâtel, the organization of a congress at Omsk in 2008 and conferences given by theologians from French-speaking Switzerland in the two Russian universities. On the one hand the intention is to make up for the problems caused by what can be described as the amnesia imposed by the bolshevik regime in the area of religious themes (the presence of these themes in Russian culture is to be noted) and on the other hand to deal with the problems raised by religious pluralism and also by the arrival of new religious movements (and in particular American ones) especially in Russia and Siberia.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111027 – Hribal Lucie

**Title:** The role of the mass media for political participation in Kyrgyzstan

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**Keywords:**

Mass media, political participation, civic engagement, Kyrgyzstan, transition, democratic development

**Abstract:**

The project investigates the relevance of mass media for political participation in Kyrgyzstan. It aims at explaining how media inform and educate their audience on politics, social problems, and rights and duties of civil society. Concentrating on the audience, its use and perception of media, and on the socio-cultural background of audience attitudes and preferences, it incorporates perspectives from media science, sociology and anthropology. The project runs from September 2005 to June 2007. The fieldwork is conducted in various regions in Kyrgyzstan, the desk-work performed in Bishkek and Zurich, involving two Kyrgyz and one Swiss team.

The research consists in a survey among 1200 Kyrgyz adult nationals sampled in the North and South of the country, in urban and rural regions and remote villages. It uses a questionnaire containing closed-ended questions for statistical analysis and open-ended questions for qualitative content-analysis. The project's scope is explorative, it generates basic knowledge, creates entry points for further analyses, and contributes to verifying existing and new sampling procedures in Kyrgyzstan.

Following the Kyrgyz uprising in March 2005, a new government has reinstated democratic procedures and norms. The vision of more secure political and civil liberties may stimulate political and civic engagement. Thus it is relevant to study public attitudes towards political participation in this phase of democratic consolidation. Owing to subsided repression and new liberties the media are undergoing changes in editorial policies and their portrayal of news. They may emerge to adopt a new role in Kyrgyzstan's transition and encourage political engagement. Apart from badly needed knowledge on these phenomena in Kyrgyzstan, it is scientifically relevant to investigate mass media in transition countries, in order to provide input for theory building and generate findings for comparative analyses.

The project aims to have impact on particular publics in Kyrgyz society, and on the capacities and international visibility of participating Kyrgyz researchers. The research yields relevant input for media policy-makers, practitioners, and development organizations.

The nature and organization of the project support the strengthening of the existing research experience and scientific expertise of the Kyrgyz researchers: by ensuring the relevance of method and findings for international comparative studies, and encouraging them to submit proposals and articles to high-quality academic conferences and journals.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111032 – Bachofen Reinhold

**Title: Limnologic and hydrologic assessment of the Buvilla basin (Albania) and its watershed, focused on drinking water use**

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### Keywords:

artificial lake, hydrology, limnology, potable water

### Abstract:

The recently constructed Buvilla reservoir is the main water supply for the town of Tirana and its suburbs. In 2001 the water had for a short period a bad smell and taste, the origin of which could not be determined. Nothing is known about the physics, chemistry and biology of the water of the reservoir, the basis for a successful water management.

The present research project investigates the physics, chemistry and biology of the water, determines the impact on the lake metabolism of the rivers flowing into it, and evaluates the human impact by agriculture and forestry of the belt surrounding the reservoir, with the goal to ensure high quality drinking water. The study aims at producing a first scientific limnological description of the Buvilla reservoir over a 2 to 3 years period, but more important it will provide a planning instrument for the government offices concerned for an ecological management of the lake and the surrounding vegetation belt. Furthermore it will contribute to an integrated environmental understanding in the population living in the watershed area for the care of this important freshwater resource.

The research is carried out in co-operation by groups of scientists from institutes of the University of Tirana and the Agricultural University Tirana, and the Treatment Plant of Drinking Water, Babru, Tirana, the main water supplier of Tirana. The research topic emerged from these local scientists and was developed together with a Swiss group.

Many of the participants have collaborated before in a project on heavy metals in Albanian rivers supported by SCOPES 2002-2005. As before the partnership will include training of coworkers and Ph.D. students and foster the research capacity of the different members of the project group.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111034 – Clot Bernard

**Title: Monitoring and forecasting airborne ragweed pollen concentrations in the South-Eastern part of its European distribution**

**Co-ordinator:**

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**Keywords:**

Aerobiology, weed science, meteorology, data exchange, forecasting

**Abstract:**

During the last decades, there was an important increase in the prevalence of allergies in most European countries. Pollen related allergy is an important disease, resulting in symptoms of hay fever and asthma in 10% to 20% of the population, with notable higher prevalence rates in some countries, and especially in young age groups. Ragweed (*Ambrosia artemisiifolia*) pollen is known as the main and most dangerous allergen in the areas infested by this invasive species. This North-American plant is spreading all over Central, Eastern and Southern Europe since the 1960's from three main infested regions: Hungary, Lyon in France and the Po Valley in Italy. Monitoring airborne ragweed pollen has two main applications:

- survey the spread of the plant and the effectiveness of the eradication measures,- provide physicians with necessary data for diagnosis, therapy and prevention of allergic diseases, and allergic persons with information in order to reduce the pollen exposure to a minimum. In all countries of Western Europe, pollen monitoring and forecasting is well developed and has proven to be useful for many groups, allergy sufferers, medical professionals and pharmaceutical companies. In contrast, many Eastern countries have very few pollen monitoring sites and no developed forecast models. This proposal will focus on the following points: - installing pollen monitoring sites in regions where they are lacking- providing complete aerobiological data for these sites to the medical community and the public- developing forecast models of ragweed airborne pollen presence and concentration for allergy prevention - allowing aerobiological survey of ragweed extension in the whole central Balkan region and then recommendation for ragweed eradication - integrate and share results and data above national borders.



The 2000 – 2003 SCOPES project "Forecasting of the main allergenic pollen types in Albania and development of the monitoring network" has demonstrated the usefulness of such a network at a national level. Now, the present project focuses on the extension of the use of aerobiological data towards the survey of a dangerous health threatening plant species and the recommendations for preventive or eradication measures, and international collaboration. Existing forecast models need to be adapted to this particular region, and modified to be valid for a larger area. New models will be developed and tested. These models will integrate the pollen situation in the different participating countries and the neighboring ones. For the first time in Europe, pollen forecasting models will be cross-borders.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111038 – Tiwari Ayodhya Nath

**Title: Development of stable and high efficiency CdTe solar cells and mini-modules**

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**Keywords:**

Solar energy, solar cells, thin films, photovoltaics, CdTe

**Abstract:**

The renewable energy production systems can meet the growing energy demands of the world in a sustainable and safe way without increasing the ecological damage. Solar cell is a device for direct conversion of solar light into electricity. The solar cell (also called photovoltaic or PV) market has been growing at the average rate of about 35% per year during the last few years. Almost 95% of the current PV market is based on Si wafer technology, which has the problem of high manufacturing cost. It is well known that the thin film solar cells based on compound semiconductors (CdTe, Cu(In,Ga)Se<sub>2</sub>) and amorphous Si have potential to provide lower manufacturing cost and be cost competitive to conventional power generation in future. The PV devices produced from thin-film materials have significant advantages for low-cost, large-area power production due to lower material consumption and an inherent ease of fabricating integrated modules. Of the various alternatives for low cost PV materials, CdTe is a leading candidate. One of the objectives of the IP program is the help to establish wider network of scientists in Eastern European countries and strengthen their ties to contribute to the solutions of important problems related to the solar energy utilization. A combination of the skills of Moldovan and Ukrainian scientists in technology of fabrication and investigation of thin films and photovoltaic devices on glass substrates, and knowledge of Swiss partner in solar cell development on polymers can result in creation of stable, high efficiency and low cost CdTe solar cells and PV minimodules. The next objective is the information exchange of partners to further development and modernization of aspects of research and higher education in order to enhance their attractiveness and competitiveness in the international scientific community. The participation of Moldova and Ukraine in the IP program will improve the implementation of the National Program in the field of Renewable sources of Energy as well as to reach the international standards of the high education training level of students and specialists in the photovoltaic and integrate local efforts in that field. On the level of infrastructure, possibility to supply technological equipment, software, access to the interesting files in field in Internet and other. This will improve the working conditions of staff-members and students.

The main scientific goal of this project is to join the experience and facilities of different technological and experimental groups for demonstrating efficiency and stability improvement of CdTe solar cells and mini-modules with simplified processes.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111041 – Jeltsch Rolf

**Title: Supporting the Bologna Process in Applied Mathematics and Computer Science at the Tbilisi State University in Georgia**

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**Keywords:**

Applied Mathematics, computational mathematics, simulation, theoretical informatics, computational science and engineering

**Abstract:**

Supporting the Bologna Process in Applied Mathematics and Computer Science at the Technical State University in Georgia. With the political change in Georgia a new law on Higher Education has been passed which requests to bring the partner Institution at the Technical State University roughly speaking on western levels in all aspects. The IP will concentrate on four of these aspects. a) Improving existing curricula as well as introducing new ones according to the needs. Here curricula should be done in view of the bologna process in the Bachelor/Master structure. Currently the partner institution is planning for the following two new programs: Scientific Computing and in computational mathematics. A program in Computational Science and Engineering can also be envisaged. In addition a program for Ph.D. students is planned. b) Transferring and adapting courses from SAM to the faculty at TSU. This involves new teaching methods, working with beamers and software for demonstration and exercises as well as writing and/or translating of textbooks and slides. c) Improving of the teaching infrastructure: hardware (Beamer and computers) as well as software. d) Evaluation of current state of the faculty and improvement of the integration in international networks.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111044 – Forro Laszlo

**Title:** Thermal-transport and magnetic properties of highly frustrated magnets

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**Keywords:**

thermal-transport properties, magnetism, correlated electrons, frustration, spin liquid

**Abstract:**

In last several years a rather great deal of the scientific attention was devoted to the investigation of the magnetic geometrically-frustrated systems. Geometrical frustration is a phenomenon when energy minimum and magnetically preferred spin interaction can not be established at the same time. The typical example of the geometrical frustrated systems is tetrahedron-base pyrochlore-like structure. One of the experimental realizations of the geometrical frustration exists in copper-tellurides of the general formula  $\text{Cu}_2\text{Te}_2\text{O}_5\text{Cl}_{2-x}\text{Br}_x$  ( $0 < x < 2$ ) and spin ices  $\text{A}_2\text{B}_2\text{O}_7$  (A is a rare earth element and B a transition metal). In both systems there is interplay between orders of the short and long range. Short range order is achieved by quantum interactions of the antiferromagnetic origin, while the tetrahedral structure frustrates the system. Inter-tetrahedral interaction in the copper-tellurides yields to the magnetic phase transition below 20 K with the formation of magnetically ordered state made of helically ordered spins with a period incommensurate to the crystal lattice. Copper-telluride compounds are close to the quantum criticality limit, as seen from the magnetization measurements. Dipole long-range interaction in spin-ices makes the overall interaction ferromagnetic. To the lowest experimentally reached temperatures, spin-ices do not exhibit magnetic ordering and spins freeze below some temperature. The questions of the origin and the nature of the magnetic phase transition and the proximity to the quantum criticality are still unresolved for copper-tellurides. In the case of spin-ices, the influence of the interplay between short- and long-range orders to the spin-ice-state formation is not resolved. The objective of the proposed JRP project is to widen the knowledge of the magnetic phase transition in copper-tellurides and to get an insight into the mechanisms leading to the spin freezing in spin-ices. In that sense the consortium will join efforts and available facilities to produce single-crystal samples of the highest possible quality. Their investigation will be done by means of the electron spin resonance (ESR) and magneto-thermal transport measurements.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111046 – Moritz Robert

**Title: Tectonic and magmatic controls on Cretaceous and Tertiary gold and copper deposits in the Rhodope Massif, the Srednogie belt and the Caucasus, Bulgaria and Georgia**

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### Keywords:

Metallogeny, magmatism, geodynamics, Au-Cu deposits, Balkan, Caucasus

### Abstract:

The project presented in this grant application is part of a European Science Foundation (ESF) program on "Geodynamics and Ore Deposit Evolution" (GEODE). The funding requested here will support field and laboratory work of our Bulgarian colleagues involved in this international research program. Previous extensive tomographic and seismic studies of the EUROPROBE program and tectonophysical modeling have yielded a very detailed knowledge of the deep structures and thermal anomalies of the crust and mantle of Eastern Europe. This knowledge combined with the particular metallogenic character of the Carpatho-Balkan belt has led the ESF to include it within an international research program on the relationship between Geodynamics and Ore Deposit Evolution. This research program started in 1998 and will last until 2003. The goal of the GEODE project is to link the geological and geochemical processes related to ore deposit formation with the underlying regional scale geodynamic evolution. The aim of this SCOPES grant application is to contribute to this international research program. The research area is the Carpatho-Balkan belt which contains the most important magmatic-associated copper and gold deposits of Europe. These deposits are related to plate convergence and orogenic collapse settings, and were formed during two major periods: (1) from Early Triassic to Late Cretaceous within the Banat-Srednogie metallogenic belt (southwestern Romania to eastern Bulgaria), and (2) during the Tertiary in the Rhodope tectonic zone (Bulgaria and Greece). The research proposed in this grant application will focus on : (1) an investigation of the magmatism and the metallogeny of the Panagyurishte ore district of the Bulgarian Srednogie belt, with an emphasis on the world-class Chelopech gold deposit and associated gold deposits in the district; and (2) a study on the chemical and isotopic evolution of a mineralising system from the metal source reservoir to the depositional site in the Rhodope Massif on base metal and precious metal epithermal deposits.

The investigation in the Panagyurishte district is a regional metallogenic and geodynamic problem where two complementary approaches are followed: (1) the regional geology and the geochemistry of the magmatic rocks will be investigated, and the genesis of the ore deposits will be interpreted with respect to the tectonic setting of the host rocks, and (2) the major ore deposits of the Panagyurishte district will be compared to identical deposits from better understood tectonic settings. The second investigation is set in a province with a better understood tectonic setting, namely the Rhodope Massif, where recently precise absolute Ar/Ar ages give us the opportunity to study processes and trace the ore components from their source to the hydrothermal ore formation site by isotope systematics. A particular emphasis is placed on the magma to hydrothermal fluid transition by studying melt inclusions. The two continental arcs provide an excellent opportunity for the evaluation of: (1) the time relationships between magmatic pulses and ore deposits, (2) the role of composition of magmas and basement rocks as sources for specific ore deposit, (3) the control of geodynamic processes on the genesis of ore-forming magmatic systems, and (4) the relative role of the different fluid types in ore-forming hydrothermal systems. This project will consist of field and laboratory (microscopy, XRF, XRD) work in Bulgaria, and labwork in Geneva (partly also in Lausanne and/or Zürich), including ion chromatography, mass spectrometry for isotope determinations, fluid inclusion microthermometry, Raman spectroscopy, Ar-Ar dating, microprobe, SEM and LA-ICP-MS.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111050 – Chergui Majed

**Title:** EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE SHAPE EFFECTS ON THE OPTICAL AND DYNAMICAL PROPERTIES OF METALLIC NANOPARTICLES

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**Keywords:**

nanoparticle, surface plasmon, shape effects, frequency, damping

**Abstract:**

The aim of the project is the experimental and theoretical investigation of optical and ultrafast dynamical properties of metallic nanoparticles (NP), with emphasis on shape effects, because the optical properties (spectroscopy and ultrafast optical response) of such particles are largely determined by their shape. In the dynamical properties, both the electron dynamics and the vibrational (phonon) dynamics are considered.

The experimental tools include the chemical synthesis of anisotropically shaped NPs (especially triangular silver NPs and two coupled gold NPs), their characterization by absorption and Raman spectroscopy. Their dynamics will be investigated by ultrafast femtosecond pump probe techniques with a resolution of approximately 30 femtoseconds.

As far as the theoretical studies are concerned, these will consist in modeling the plasmon resonance energy for the different shapes of nanoparticles synthesized in the frame of the project. The second part consists in simulating the ultrafast dynamics of the electron gas in the NP, and its cooling by transfer of energy to the lattice.



SCOPES 2005-2008: Joint Research Project

## Project no.: 111055 – Killias Martin

**Title: International self-reported delinquency study in Russia and Armenia**

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**Keywords:**

youth, self-reported delinquency, crime, Armenia

**Abstract:**

Existing official crime statistics in Russia and Armenia are not very satisfactory. In this connection the idea of International Self-Reported Delinquency (ISRSD) study as an alternative and supplement to crime statistics is very important for scientists, policymakers and practitioners. ISRSD will reveal the real situation of youth delinquency. Besides this, in recent years countries of the European Union have undertaken measures to obtain comparative data on crime problems. One of these measures is the ISRSD. The main goals of the ISRSD are measurements of prevalence and incidence rates of delinquency (this is more trustworthy than official crime statistics) and evaluation of correlation of offending. Neither in Russia nor Armenia has self-reporting methodology ever been used and this missing information which the study will provide can be of great value.

The project will be realized by two teams from the Russian side consisting of one Professor, three Doctors, and four PhD students: the first team is based at the Sector for the Studies of Social Deviance at the Institute of Sociology, Russian Academy of Sciences; the second team is based at the Non-Governmental Organization 'Center for Analytic Studies and Development situated in Privolzhskiy Federal District of Russia in Kazan city. Members of both teams have substantial experience in studying the issues of youth delinquency. From the Armenian side the project will be realized by a group of scientists based at the Faculty of Law of Yerevan State University. The group will consist of 1 senior researcher, 2 Assistant-Professors, 2 Doctors, 1 PhD student, and the team-leader. Members of the group have essential experience in studying the problems of youth delinquency.

As a practical output of the study national research reports as well scientific articles in the Russian and Armenian languages will be prepared for publication. Additionally, information letters entailing main results of the project will be sent to different Russian and Armenian organisations dealing with youth crime and delinquency, as well as being disseminated via professional e-mail lists and Internet. Research results will be broadly used in teaching and preparation of dissertations of the involved PhD students.

The proposed project will strengthen the capacities of its participants providing them with the unique experience of conducting international research project; facilitate more in-depth studies of these issues; help to keep the existing and create new scientific schools dealing with juvenile delinquency, and have a considerable impact on maintaining and creating international scientific networks. New knowledge that will be produced as a result of this study will contribute not only to the criminological and sociological sciences, but also to the development of crime and violence prevention programmes among youth in Russia and Armenia.

SCOPES 2005-2008: Joint Research Partnership

## Project no.: 111056 – Siegfried Weichlein (formerly Furrer Markus)

**Title: Institutionalization of Scientific Networks and Scholarly Activities for the Promotion of Cross-Cultural and Inter-Disciplinary Approaches on Nationalism in the Europe of Small Nations**

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### Keywords:

network interaction between scholars/institutions, curriculum development, cross-cultural research environment, educational exchange, methodological and discursive transfer  
Interdisciplinary co-operation

### Abstract:

The aim of the SCOPES Program between the Seminar für Zeitgeschichte of the University of Fribourg and the Centre for Advanced Study Sofia is to facilitate network co-operation between scholars and institutions in order to promote cross-cultural research and develop a new curriculum in studying modern nationalism in the “small states” of Europe.

Our aim is to further research networks and curriculum development (Ph.D.) in an innovative way, via activities such as the organization of international workshops, the exchange of scholars and faculty, the preparation of a new cross-cultural Ph.D. curriculum and the production of auxiliary materials and methodological back-up for studying and teaching national movements and ideologies. This shall lead to a new research infrastructure for carrying out cross-cultural projects, to innovative research, but also to educational reform with regard to the fields of nationalism incorporating non-mainstream European cultural experiences in pluri-cultural contexts. This experiment also anticipates the direction of inter-cultural course-building inherent in the logic of the Bologna process, aiming at creating transferable knowledge and inter-cultural course-materials corresponding to the needs of the trans-European mobility of students.

The key elements of the co-operation are the following:

- Workshops of international researchers linked to the Centre for Advanced Study and/or the Seminar für Zeitgeschichte of the University of Fribourg.
- Exchange of scholars and faculty: Visits of scholars representing the two institutions to Fribourg and to Sofia – seminars, discussions, exchange of expertise, institutional networking.
- Preparation of a new cross-cultural curriculum in studying nationalism in Europe.
- Training sessions for junior scholars in view of preparing them to study and teach along cross-cultural curricula.

- Equipment: purchasing auxiliary technical equipment and research materials such as a limited number of basic books not available in libraries in Southeast Europe, producing thematic and methodological “Readers”.
- Auxiliary material production: web site development for the representation of the network, as platform for interaction and medium making educational materials and bibliographies available for the broader public.
- Dissemination of the results and the acquired expertise: newsletter, annual series, collection of working papers stemming from the cooperation, cross-cultural curriculum on nationalism in Europe, together with annotated bibliographies on methodological and thematic issues in studying and teaching nationalism in East-Central and Southeast Europe.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111057 – Witzigmann Bernd

**Title: Correct wavelength-scale computer simulation of resonant-cavity light emitting diodes by an advanced method of single expression (SERCLED)**

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**Keywords:**

RCLED Simulation Optoelectronics

**Abstract:**

Resonant-cavity light emitting diodes (RCLEDs) are novel, highly efficient semiconductor devices, which employ very small microcavities in the dimension of the wavelength. RCLEDs are an advancement of light emitting diodes and are product of a continuous improvement of LEDs characteristics during the last decade. An essential reduction of LEDs spectral linewidth and the enhancement of the emission power and directionality is achieved by incorporating the LED structure into the resonant cavity. Nowadays RCLEDs are efficient, low-cost, and highly reliable transmitters for the optical communication in low-cost parallel interconnects for local area networks and are recently adopted as versatile and highly efficient solid state light sources. RCLEDs feature most of the advantages of vertical cavity surface emitting lasers (VCSELs) avoiding their high technological processing impact. In order to further increase the efficiency, different physical and technological issues related to the LEDs operation are under intensive theoretical as well as experimental investigation. The enhancement of the external quantum efficiency by optimizing the design of the micro-resonator, the positioning of the active layer inside the micro-resonator and the spontaneous emission modification are the key issues for RCLEDs design within this context. Though some RCLED constructions have been commercialized already, there is still a high demand for further optimization, in particular from the electro-dynamical point of view. While it is commonly known for instance that the optimal position of the active layer is the standing wave antinode, there have not been investigations on the impact of the active layer thickness. However, our computer simulations of 1D RCLED structures show that the thickness of active layer is also crucial for the design of high efficiency RCLEDs. We adopted a novel approach for the correct numerical solution of multi-boundary electro-dynamical problems, the method of single expression (MSE). The MSE is a very fast computational method, which is suited for the deployment on common desktop computers. Its fast operation allows for an algorithm based parametric optimization of 1D resonant-cavity light-emitting diodes (RCLEDs) to find the optimal configurations. Within the project it is planned to exploit our preliminary results regarding optimal 1D RCLED configurations for the cooperation with the Computational Optoelectronics (COE) group and to extend the MSE to allow for 2D TE/TM wave simulations. In cooperation with the COE group, benchmark structures of RCLEDs will be

defined and simulated with the MSE as well as the software tools used by the COE to calibrate and verify the Model. The proposed project will encompass the following objectives:

1. developing and calibrating simulation software based on the MSE to provide practical recommendations about optimal position and thickness of active layer in 1D RCLED structures,
2. extending and calibrating the simulation software based on the MSE for TE and TM waves providing the angular radiation characteristics of RCLEDs, and
3. developing software based on the MSE for the simulation of the impact of high power TE/TM-wave self-action in RCLEDs in order to obtain the saturation values for output radiation intensity.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111064 – Pawlowski Jan

**Title: Molecular systematics of amoeboid protists**

### **Co-ordinator**

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### **Keywords:**

evolution, systematics, eukaryotes, amoebae, foraminifera

### **Abstract:**

During the last few years, our group has contributed significantly to the development of molecular systematics of amoeboid protists. In collaboration with specialists from Eastern Europe, we have obtained the first DNA sequences for major groups of amoeboid protists, including gymnamoebae, radiolaria, and heliozoa. Based on the DNA sequence data, we established the phylogenetic position of these groups in the Tree of Life and we inferred their relationships with the other eukaryotic phyla. Two new supergroups of eukaryotes composed of a majority of amoeboid protists, the Amoebozoa and the Rhizaria, have been described. However, the phylogenetic relationships within these supergroups and their species diversity remain largely unknown. In the present project, we propose to continue our work on evolution and diversity of selected groups of Amoebozoa and Rhizaria, in collaboration with the Eastern European scientists. The project will focus on diversity of lobose amoebae and foraminifera. The main objectives of the project will be: (1) to complete the DNA database for some poorly known groups of amoeboid protists, (2) to examine the genetic variations among selected morphospecies, and (3) to develop a reliable methodology for environmental DNA surveys of eukaryotic diversity. Realization of these objectives will contribute (1) to establish a solid phylogeny of lobose amoebae and foraminifera, (2) to assess their species diversity, and (3) to test the hypothesis on cosmopolitan distribution of microbial eukaryotes. The DNA sequence data gathered within this project will also contribute to the development of new molecular tools to evaluate the global diversity of microbial eukaryotes and to promote their use as biomarkers of environmental changes. This project is a continuation of the previous SCOPES joint research project, which has initiated a very successful collaboration with participating Russian teams. Two of these teams are participating in the present project together with the teams from Bulgaria and Ukraine.

The Eastern European partners will benefit from a transfer of new molecular technologies and know-how, which will provide new tools for their research on diversity and ecology of amoeboid protists. At the same time, the Swiss team will benefit from the excellent taxonomic knowledge of the partners, their unique culture collections and an access to new sampling areas.



SCOPES 2005-2008: Institutional Partnership

## Project no.: 111065 – Aubert Jean-Jacques

**Title:** Development and implementation of master studies in didactics of classical languages

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**Keywords:**

Education Reform, Didactics, Classical Philology, Greek language and literature, Latin language and literature, Ancient Studies

**Abstract:**

The purpose of the project is to develop a program of Master studies in the Institute of Classical Studies, Faculty of Philosophy, University St Cyril and Methodius, Skopje, Republic of Macedonia. It will focus on the didactics of Latin and Ancient Greek. Because of the lack of teachers and of practical training in the field of Classical Languages, the project will contribute to the development of specific methods aimed at improving the quality of teaching in secondary schools in the Republic of Macedonia, using advanced technology and more dynamic educational techniques.

The project is made of three components:

- Development of curricula for master studies in Classical Studies and their didactics;
- Organization and implementation of Master courses in didactics;
- Evaluation of the results.

The program will contribute to improving the quality of teaching, increase the competitiveness of the Institute of Classical Studies of the University of Skopje, and facilitate its integration in the international network of Ancient Studies and Classical Philology.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111072 – Kundig Ernst Peter

**Title:** Design of multifunctional organic compounds towards new materials and asymmetric catalysis

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**Keywords:**

planar chirality, asymmetric catalysis, devices

**Abstract:**

The project focuses on new routes of access and new applications of planar chiral ligands and transition metal catalyzed asymmetric reactions. Ligands will be based on chiral ferrocenes, ruthenocenes as well as on arene complexes of chromium and ruthenium. The static and dynamic photophysical characteristics of newly synthesized compounds will be investigated in view of their potential application as molecular devices.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111073 – Hoffmann Patrik

**Title:** DECHIR-CHALFILI - Deposition - characterization - irradiation of of chalcogenide films for lithography

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**Keywords:**

PVD, PLD, chemical beam deposition CBD, chalcogenide glass, Exposure of resists by excimer laser -, E-beam -, and EUV- lithography

**Abstract:**

For future active and passive electronical, optical, and optoelectronical nano-devices and nano-structures of dimensions smaller than 10nm novel technologies are needed to guarantee the producibility. The main aim of the proposed joint research project DECHIR-CHAFILI is the investigation of the potentialities of inorganic photoresists for nanostructuring of minimal size elements. As inorganic photoresists, chalcogenide glasses and metal oxides, are proposed. Exposure of the irradiation sensitive photoresist layers will be carried out with shortest wavelength sources: excimer lasers (248 nm, 193 nm), focused electron, and ion beams, and extreme ultra violet (EUV) light (13nm). Future light weight electronics, will be more powerful as present laptop computers, consuming less energy (longer lasting batteries) and being multifunctional. The improved performances depend on the further miniaturization of electronics, optics, and optoelectronics. The latter will be achieved by further reduction of the dimensions of functional materials and connections. In this context the obtainable smallest feature size that can be “written” depends on one hand on the wavelength of the irradiation used, (smallest irradiation spot) and on the resist in which the structures are written by changing the solubility in a solvent (developer). The resist has to be composed of sufficiently small subunits so that nano-structures with smooth edges can be obtained. Therefore amorphous materials like organic polymers or glasses have to be used. Furthermore the interaction with the incoming photons or charged particles has to be efficient, but also remain very localized. The project aims in gaining general understanding in how chalcogenide glasses change their solubility after irradiation with different doses of different types of irradiation. The transfer into electronics and optoelectronics production will be spurred in the partner countries and the impact of miniaturization into our daily life has been impressively shown since the introduction of the first computer.

The partners, Ecole Polytechnique Fédérale de Lausanne, EPFL, IOFFE-Institute, St. Petersburg, Russia, National Institute for Lasers, Plasma and Radiation Physics, Bucharest, Romania will carry out the following tasks: - Investigate deposition processes of inorganic photoresist layers by different techniques: physical vapor deposition (PVD), pulsed laser deposition (PLD), chemical beam deposition (CBD). The effect of deposition parameters on the properties of the sensitive layers will be compared. - In-depth structural and compositional characterization of the inorganic materials before, and after exposure by Electron Microscopy (SEM, TEM), Atomic Force Microscopy (AFM), micro-spectrophotometry, X-ray diffraction experiments (GI-XRD), and Rutherford Backscattering spectrometry (RBS). - Exposure of photoresists by excimer laser -, E-beam -, and EUV- lithography to determine sensitivity and optimal dose. - Investigation of dry and wet developing processes.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111074 – Boesch Martin

**Title: Development of a Certification System for Sustainable Tourism and its Application to Practical Conditions of Pilot Destinations in Bulgaria**

### Co-ordinator:

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### Keywords:

Sustainable tourism, certification, regional development, Bulgaria

### Abstract:

The project intends to develop a Certification System for Sustainable Tourism, aiming to stimulate stability of the tourist process, in the context of sustainable development of Bulgaria. The evaluation and awarding of tourist destinations with certificates for sustainable tourism guarantees: quality for the consumers, image and economic effectiveness for the companies, employment and socio-economic prosperity for local population, sustainable management of the tourist process for the State, and preserving the recreation-tourist resource potential for Society. The general objective of the project is the completion of a scientific-theoretical base of certification system for sustainable tourism and its implementation for practical use in real conditions of different tourist destinations in Bulgaria. A certification procedure will be approved in pilot tourist destinations, which are representative for different landscapes and forms of tourism in the country. The starting of a certification procedure for sustainable tourism in pilot tourist destinations in Bulgaria would be a first step to further dissemination of the results towards launching of a National Certification System, approved by the Ministry of Economics (tourism branch). Actuality & novelty of this project proposal follows directly from the Recommendations of the World Tourism Organization for establishing of National Certification Systems for Sustainable Tourism. The Recommendations aim at enhancing awareness among Governments about the opportunities, which certification systems may provide as part of their sustainable development policy goals.

Such a certification activity would be of great importance for East-European countries, and especially for Bulgaria because of the priority role of tourist branch in the National economy, during the current transition of Bulgaria to European standards. The project results would be of a great economic and social significance because sustainable tourism becomes more and more important section of total sustainable development. This JRP proposal is based on the results of a Swiss-Bulgarian Institutional project (SNSF/SCOPES No 7 IP 65 696, 2001 - 2004), coordinated by Prof. Martin Boesch, Research Institute of Economic Geography and Regional Policy, University of St. Gallen. The Expert Group, established in the Institute of Geography at the Bulgarian Academy of Sciences, in the frame of IP, has used know-how from the best Swiss practices in the field of sustainable tourism and eco-tourism. The experience obtained during the Swiss-Bulgarian IP provides a very good base for extending of research results to the practice, for successful realization of the purposes of this JR project and for strengthening of collaboration between Switzerland and East-European countries, on their way to Europe.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111076 – Danuser Brigitta

**Title: Development of core curriculums in occupational health**

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**Keywords:**

occupational health, training curriculum, situation analyses, needs assessment, case studies

**Abstract:**

The goal of the project is to identify the common core competencies required for occupational specialists (physicians, hygienists, inspectors) in Eastern Europe, and to develop a core curriculum for education and training in occupational health as well as elaborating one specific training module and a collection of case studies for training. Across the EU fundamental principles of harmonization and free movement of labor and capital have led to a common basis for occupational health and safety legislation. The evolving definition of occupational health includes a complex group of stakeholders, such as employers, employees, inspection service, occupational specialists, medical practitioners, etc., which imposes an establishment of different education and training levels and development of appropriate modern and up-to-date didactic methods. The Eastern European countries participating in this project have been going through a similar process of economic and political transition, which affected strongly the once existing occupational medicine system. The Swiss concept for occupational safety and health is one of the most progressive in Europe and is based on the responsibilities of the employers. Companies have to develop and realize a Health and Safety concept within a given framework depending strongly on risk analyses and risk management principles. The occupational health knowledge transfer is viewed as a central part of the occupational health concept representing a solid ground for cooperation in this project. Intended and potential impacts of this project are: a) capacity building in the participating institutions for improving work conditions, b) national networking such as increasing sensibility towards work and health topics and better access to policy- and decision making authorities, c) economic impact on partner countries, preparing them for a European market. The activities are divided into two groups. First as a condensing nucleus the health care sector was chosen.

In order to assess and improve work and health problems the needs of the different stakeholders in this sector will be evaluated and an appropriate teaching and training module will be developed and extrapolated into other industrial fields. The second set of activities includes preparations of guidelines for case studies, collection, review and publishing of the case studies. The database is seen as a dynamic, searchable and up-datable tool for training in occupational health.



SCOPES 2005-2008: Joint Research Project

## Project no.: 111079 – Gander Walter

**Title:** New Methods for Quadrature

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**Keywords:**

numerical integration, quadrature

**Abstract:**

We plan to investigate and develop several types of standard and nonstandard quadratures (one and multidimensional), as well as many applications of numerical integration in other areas.

1. Our main objective is to develop numerical quadratures of nonstandard type. It is well known that the classical Gaussian quadratures exhibit poor behavior when applied to the integration of functions with singularities or to functions having oscillatory behaviour. Constructing numerical quadratures having better convergence properties in the integration of the aforementioned functions is challenging and an attractive task. We plan to construct quadratures for functions with singularities using Muntz systems. For the integration of oscillatory functions we plan to investigate new methods proposed in recent years.
2. In recent years there has been much interest in nonstandard numerical quadrature rules, using values of certain linear functionals of the integrand rather than values of the integrand itself. However, this branch of investigation is rather new and there is a lack of both theoretical results granting existence and numerical algorithms for the actual construction. We plan to develop theoretical results as well as numerical algorithms for the corresponding numerical construction. The theoretical considerations will result in the high quality software we are planning to develop.
3. The problems of error estimates and convergence are very important, and they will be considered in detail for different kinds of quadratures and cubatures, including multiple nodes.
4. The trapezoidal rule is one of the simplest algorithms for numerical quadrature. Surprisingly, this simple algorithm is the most efficient and most accurate method for numerically approximating integrals of analytic functions. In order to fully exploit the power of the trapezoidal rule it must be combined with analytic transformations of the integration parameter. In the simple case of integrands analytic in a strip the error theory is well known; exponential convergence with respect to the step size has been proven. The goal of the proposed study is to extend these results to the more complicated cases resulting from transformations of the integration parameter. Experiments show that the trapezoidal rule is still very powerful in many cases, yet the convergence is sometimes slowed down.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111081 – Lipp Hanspeter

**Title: Anchoring European Integration of Behavioral Brain Research at Moscow State University**

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**Partner:**

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**Keywords:**

ecology, brain research, GPS, EEG, neurophysiology, education, summer school

**Abstract:**

This proposal is based on two consecutive and successfully operating institutional partnerships (IP) that have been established with the laboratories of Physiology and Genetics of Behavior (PBG) and Neurophysiology (NP) at the Chair (Dept) of Higher Nervous System Activity (CHNS) at Moscow State University. During this period, animal facilities have been restored and the equipment of the behavioral laboratories has been modernized, and joint projects were carried out on a field station established by the IP partners. Owing to this support, both laboratories have realized and continue to realize joint publications with the Swiss partner in high quality western journals, research projects being financed from other sources. Two very well accepted international summer schools for ecological brain research in a field station operated by the Swiss and Russian partner have spawned new collaborative links with European partners. The prolongation of the IP, in combination with contributions from cooperating Swiss and Dutch laboratories, would permit to realize the following objectives:

- Preserving the capacity of the PBG and NP to maintain and use a unique field station permitting experimental natural selection of mice and outdoor neurophysiology in freely moving animals, in cooperation with European networks of the FP6
- Organizing a third summer school for ecological brain research in the Russian province as a meeting point both for European and Russian students and their teachers
- Cross-linking the expertise of the PBG in mouse behavioral genetics with European laboratories seeking partners for phenotypic analysis of genetically modified mice
- Complementing modestly the equipment of the laboratory and animal facilities of the CHNS with IP support, but adding new high-tech apparatus for automated testing (INTELLICAGE) and advanced neurophysiologic data logging systems sponsored through other channels.
- Sponsoring two PhD fellowships in ecological brain research at the CHNS in order to attract bright PhD students to the partner institution One can expect that this IP will receive, as before, coverage in press and television, increase the international standing of the Russian partner, give visiting scientists a view of both the center and the Russian periphery, and establish new networks across Europe. As a novelty, the PhD sponsoring will permit to test the feasibility of European-type PhD stipends in the Russian system. If successful, this strategy might help to combat effectively the loss of bright young students

devoted to a scientific career. Thus, we believe that this application matches exactly the goals as set for a SCOPES institutional partnership.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111082 – Wüest Alfred

**Title: Sub-aquatic Springs in Ancient Lake Ohrid – Assessment of Ecological Importance and Anthropogenic Change**

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**Partner:**

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**Keywords:**

Karst spring, lake, biodiversity, water quality, limnology, oligotrophic

**Abstract:**

Lake Ohrid, located between Macedonia and Albania, is the only ancient, long-lived lake in Europe representing a global hotspot of biodiversity with more than 200 endemic species. More than half of its water input is from karst springs, which supply the lake sub-aquatically with cool and oxygen-rich water. Several endemic organisms are found exclusively close to the springs, indicating that their water may have been important for the evolution of the unique aquatic ecosystem of Lake Ohrid. Particularly the sub-aquatic springs seem to have a large potential as specific habitats for endemic species. Despite their unique role, very little is known about the underwater springs. Thus the first goal of the project is to achieve an inventory of these sub-aquatic springs (discharge, depth, location, size, etc). Once they are located, differences of the physical and geochemical properties of the water can be determined and the different species composition can be analysed. Temperatures as well as major ions are measured for all sources and in addition, at selected sites temperature and conductivity will be recorded continuously in order to estimate the long-term stability. Biological samples will be collected by divers (shallower locations) and with grab-sampler (deeper sites) and subsequently analysed under the microscope. For selected samples, genetic analysis will be performed. The biological survey will resolve whether the sub-aquatic spring sites are indeed major hosts for verified or even unknown endemic species. Knowledge of the spring properties will potentially enable the assessment on how the springs could or already do react to human impacts, such as water abstraction, pollution or climate change. The results of the proposed project will provide a valuable status quo of the sub-aquatic spring characteristics and a reference point for future studies. If indeed the springs are found to be important habitats for endemic species, a follow-up project is envisaged, regarding the genetic distinction of these species for assessing the evolutionary role of the spring areas. Finally, lake management consequences will be formulated in discussion with experts and representatives of the local Ministry of Environment.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111086 – Seeck Margitta

**Title:** Transition to modern epilepsy care in Moldova

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**Keywords:**

Epilepsy, epidemiology, adults, children, women

**Abstract:**

Epilepsy is one of the most frequent neurological disorders and affect 0.5-1% of all inhabitants of Western societies. The frequency in most Eastern countries is not well known, but appear to be higher due to cultural and economic factors. Epilepsy care in most Eastern countries, including Moldova, are still influenced by old Soviet standards, i.e. epilepsy is considered a psychiatric disease. Thus, not neurologist but psychiatrists take care of epileptic patients, which ultimately result in an even greater stigmatization of these patients. Psychiatric care and treatment cannot be considered appropriate for epileptic patients, since it usually includes different utilization of diagnostic tools and treatment options. The present institutional partnership intends to change this situation in Moldova, a country, which became independent from Russia in 1991 and comprises approximately 4.3 Mio people. In several steps during the 3 years of funding, we try to change gradually the hospital route for epilepsy patients in creating an epilepsy center in the university hospital of Moldova. First, a functioning out-patient clinics needs to be established making optimal use of the existing facilities, i.e. EEG system and training of technicians. Second, in-patient monitoring facilities need to be set up in order to provide additional diagnostic resources and the possibility of presurgical evaluation. In an emerging country such as Moldova, with a limited economic scope, surgical treatment is an important alternative to life-long medical treatment. Transfer of 3D-EEG localization programs and software allow to carry out modern focus identification, since other rather expensive technologies, such as nuclear imaging, are not yet present. The familiarization of comprehensive epilepsy care will be achieved by mutual visits of both partners and their collaborators. Along the creation of the center, epidemiological groundwork will be done, which will give a better idea of the needs of Moldovian society. In particular the needs of children and women should be addressed who suffer probably even more from the marginalization when the diagnosis "epilepsy" is posed. At the end of an intensive working and learning period, the transition to modern epilepsy care is achieved, providing improved facilities for the patients as well as for research.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111087 – Commarmot Brigitte

**Title: Strengthening research in virgin and managed forests as basis for biodiversity conservation and sustainable use of forest resources in the Ukrainian Carpathians**

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### Keywords:

virgin forest research, biodiversity, close-to-nature silviculture, sustainable forest use

### Abstract:

The forests of the Ukrainian Carpathians are of high ecological and economic value. Almost 20'000 ha of virgin forests remain in the Ukrainian Carpathians; some of them are considered as unique for Europe. They are most valuable for nature conservation and constitute most important study sites for forest ecosystem research. Timber is an important income factor for the Transcarpathian region where forests cover more than 50% of the area. Economic pressure and current logging practices, however, do not sufficiently take into account the various functions of the forests. Changes towards a multi-purpose forest management and a sustainable nature-friendly use of the natural resources are necessary. The general aim of this Institutional Partnership is to strengthen scientific institutions which play an important role in nature conservation, forestry and forest ecosystem research and to support them in developing a scientific basis for the conservation of biodiversity and for a sustainable and ecologically safe utilisation of the natural forest resources. In several joint research projects structures, dynamics and biodiversity of virgin forests are studied and compared to those of managed forests. An inventory concept for monitoring the structure and dynamics of virgin forests will be elaborated and tested and a database for monitoring and experimental plots created. A long-term silvicultural experiment to harvest and to naturally regenerate secondary Norway spruce forests without clear-cuts and to transform them in the long run into mixed, structured forests is initiated in collaboration with the Swiss-Ukrainian Forest Development Project FORZA. An excursion guide to the unique virgin beech forest Uholka will be published and a project web site about the Swiss-Ukrainian partnership established. Ukrainian and Swiss scientists will have the opportunity for mutual study visits.

The research results shall contribute to optimise management strategies for the conservation of forest biodiversity and for a sustainable, close-to-nature use of the forest resources.

The harmonisation of research and monitoring methods shall facilitate the exchange and comparability of data and results and help to integrate the Ukrainian partners in international networks. Scientists participating in joint research projects, study visits and trainings will improve their scientific and language skills and enhance their competitiveness. The international co-operation will raise the national and international image and reputation of the institutions. Diverse publications shall increase national and international public awareness of the rich natural heritage of the Ukrainian Carpathians and contribute to its long-term conservation.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111089 – Rigling Daniel

**Title: Epidemiology and population structure of *Cryphonectria parasitica* and associated *Cryphonectria hypoviruses* in the Balkans**

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**Keywords:**

Phytopathology, Epidemiology, Population biology, Biological control, Mycovirus

**Abstract:**

European chestnut is an important multipurpose tree species in many rural areas in the Balkans. Wood is used for fuel, timber, poles, stakes, and as a natural source of tannins, while fruits are used for food – directly or manufactured. Tanning and food industry depend on the supply of these raw materials from chestnut trees.

Chestnut blight is responsible for a widespread decline of chestnut trees across the Balkans. This disease is caused by the introduced, highly pathogenic fungus *Cryphonectria parasitica*, which causes bark lesions and cankers on infected trees. Because *C. parasitica* is recognised as a quarantine organism in Europe, its presence in the Balkans also affects trading of chestnut plants and wood. Transmissible hypovirulence, a viral disease of *C. parasitica* has the potential for biological control of chestnut blight. Infection by the hypovirus causes a reduction in fungal virulence and its reproductive capacities. The invasion of *C. parasitica* populations by the hypovirus appears to be highly influenced by the population biology of the fungus. Spread is favoured by low diversity of vegetative compatibility (vc) types and limited sexual reproduction.

Therefore, the information and understanding of the population structure and epidemiology of *C. parasitica* and the hypovirus is important for the success of biological control of chestnut blight.

We will conduct population studies in order to obtain the distribution map of vc types, mating types and SCARs markers of *C. parasitica* across the Balkans. Concurrently, the incidence and genetic variation of naturally occurring hypoviruses will be studied. Phylogenetic analyses will be conducted to investigate the relationships among *C. parasitica* and hypovirus populations in the Balkans and in Europe. Hypoviruses will be tested for variation in symptom expression in different fungal host strains both in situ and in vitro. These results will form the basis for selection of fungal host strains and hypovirus isolates to be used for biocontrol in the region. In addition, novel application methods to improve hypovirus dissemination will be evaluated.



The cooperation of scientific institutions from 3 countries will enable a more complete insight into the population structure of *Cryphonectria parasitica* and CHV-1 in the Balkans.

We also expect to answer questions about the epidemiology of hypovirulence and the relationships between genetic diversity of the fungal host population and the incidence of virus infections. From a practical point of view, the results will provide the basis for biological control of chestnut blight in this region to improve health condition and productivity of Balkan's chestnut forests. Further it will be used for risk analysis in respect to the spread of *C. parasitica* genotypes by trading of chestnut timber and plants among the Balkan countries and between the Balkans and other European countries.

This project will allow the continuation and strengthening of research activities on an important tree disease in the partner countries (Croatia and Macedonia), purchase of equipment and consumables, and will also provide training for young scientists.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111091 – Neubauer Wolfram

**Title: Launching a central publication platform for grey literature for Romanian universities**

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**Keywords:**

scientific communication, open access, publication platform, grey literature, academic library, ETH E-Collection, CDSware, ETH Zurich, Romanian Universities

**Abstract:**

The aim of the project “RomDoc” is to implement a publication platform for scientists in Romania for recording and long-term storage of selected digital born and scanned scientific material. Publications from the scientists of 16 Romanian Universities not published within the traditional publishing industry will be stored centrally on a dedicated server at University “Politehnica” of Bucharest. The electronic documents will be indexed by librarians according to international standards and made available worldwide through a central user interface. ETH-Bibliothek and the Center for Technology Transfer in the Process Industries (CTTPI) at University “Politehnica” in Bucharest (UPB), in close collaboration with the Central University Library, will be the main collaboration partners. Selected documents held at the University Libraries in printed format, mainly dissertations, will be scanned centrally and made available online as well.

Document servers play an important role in the worldwide movement for open access, the demand for free availability of scientific material on the internet. The RomDoc project fits well into these global developments.

A substantial number of leading universities worldwide are making commitments to implement document servers. These services offer direct benefits to the authors and to the institutions. The author benefits of immediate online open access worldwide to his research. RomDoc can facilitate greatly enhanced access and visibility to scholarly content by empowering faculty to effectively use the new dissemination capabilities. RomDoc, once established and containing a critical mass of material, will improve scientific communication among Romanian scientists as well as communication with other scientists worldwide.

The ETH-Bibliothek, one of the five major science libraries in Europe, has successfully met the challenges to develop innovative electronic information services and has already made substantial experiences with running a document server, the “ETH E-Collection”.

The Romanian partner institution, the Center for Technology Transfer in the Process Industries (CTTPI) at University “Politehnica” in Bucharest (UPB) plays already today an important role for improving scientific communication in Romania. The institute works close together with the Central University Library.

The project team will have to manage technical, organisational and legal issues. CDSware will be recommended as document management tool. This software was developed at CERN in Switzerland and is designated to accommodate content submission, quality control and dissemination requirements of multiple research units. A policy has to be developed which defines the quality standards for each document type, the file formats, the metadata standard as well as the long term availability of the documents.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111096 – Wehrli Bernhard

**Title: Assessing the impact of environmental change on aquatic ecosystems in the Danube delta (ECAQUDAN)**

**Co-ordinator:**

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**Keywords:**

nutrients, lakes, budgets, limnology, delta

**Abstract:**

The Danube Delta Biosphere Reserve is a sensitive ecosystem crossing the Romanian and Ukrainian borders. Many studies have been performed separately, in the Romanian or the Ukrainian part of the delta, without a common coordination. This integrated project reunites two teams of hydrobiologists from both countries in a joint effort to assess the impact of environmental change upon different types of aquatic ecosystems. The project will assess the ecological impact of environmental changes regarding water quantity and quality of the Danube River upon aquatic communities of plankton, benthic organisms and macrophytes. Comparing regulated and natural channels as well as lakes with larger and smaller nutrient load is a key topic of the study. For the first time such a comparison will be possible between the Romanian and Ukrainian parts of the delta.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111101 – Klotz Ulrich E.

**Title: Influence of atomic arrangement changes on phase equilibria near the liquidus curve in Cu-Sn-based alloys**

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**Keywords:**

liquid metal, thermodynamic properties, physical properties, CALPHAD modelling, joining technology, active brazing

**Abstract:**

The main goal of the project "Influence of atomic arrangement changes on phase equilibria near the liquidus curve in Cu-Sn based alloys" is to find indications for new Cu-Sn based materials such as brazing filler metals by the interrelationship between structure and thermodynamic and physical properties of liquid and solid alloys.

The project is organised in five tasks. The first task is to determine thermo-chemical parameters (enthalpy of mixing, phase diagram), electronic properties (electrical conductivity, thermoelectric power, temperature coefficient of electrical conductivity) combined with structure (X-ray diffraction) and structure-sensitive properties (viscosity, surface tension) of binary, ternary and quaternary Cu-Sn-Ti-Zr alloys. Most of the measurements are to be performed in the liquid and some in the solid state of the alloys covering a wide temperature interval.

In the second task the so determined data will be used as input data for the modelling of phase diagrams of the Cu-Sn-Ti-Zr system. They will serve to develop a thermodynamic database of active brazing filler metals in combination with literature data. Phase diagram calculations based on such a database will allow determining promising compositions for brazing filler metals for diamond or boron nitride.

The third task will be dedicated to the determination of the crystal structure of newly found or known intermetallic phases using x-ray diffraction methods. These data will be valuable input data for CALPHAD modelling of solubility ranges of intermetallic phases.

In the fourth task all the above determined information, which will be comprised in the thermodynamic database of Task II, will be used to evaluate suitable filler metal compositions and process parameters for diamond brazing. The reliability of the modelling results will be cross-examined by brazing experiments in a vacuum furnace and microstructural characterisation of such samples. Finally, Task V contains reporting of research work and dissemination of the results in scientific publications and presentation at international conferences.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111103 – Meessen Heino

**Title: Sustainable development of mountain regions for countries in transition (SMD-T): an appraisal of options for sustainable development with case studies in Caucasus mountain villages**

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**Keywords:**

SD in mountain regions, transition context of CIS, participation of mountain communities, village projects, dissemination of results

**Abstract:**

Main objective of JRP proposed by the Russian Academy of Science (Institute of Geography - Moscow) and the Centre for Development and Environment (CDE , Institute of Geography - University of Berne) is to contribute to Sustainable Mountain Development in the Transition context (SMD-T). Rethinking of existing academic and mostly disciplinary oriented approaches and identifying potentials of mountains in their new economic, social and environmental context are the two challenging methodological "transition" objectives of the JRP. Key questions: - In which priority fields and how to move from the economically insufficient transition situation to better living conditions? - How can local conditions and processes be assessed to gain an in-depth impression of livelihoods and resource management? Research topics Main research topic of the JRP will be the development of an adapted methodology on SMD-T and of participatory tools which will be tested in these selected mountain communities and will be focused on the following issues:- Defining the current state of the livelihoods & communities- Identifying processes, presses and potentials- Developing responses and options Field work will be carried out in Caucasus mountain regions of Russia. Research within at least two case studies will focus on the needs of local communities. The case studies will be combined with priority activities in order to enhance economic opportunities for the mountain population. Methodology and tools for this integrated analysis of socio-economic and environmental post-soviet changes at the local scale will be developed using the experience of CDE and of international partners of the centre's research networks. Special attention will be devoted to understand the latent or hidden processes (mechanisms) that could determine the economic and social life of mountain societies, and to revealing the self-assessment of population as main economic actor. Small scale priority pilot activities and projects (PP) on the village level will be developed and implemented jointly with the communities. Dissemination of the tested "transition" approach for SMD-T will be a major and integrated part of the JRP using the networks of RAS in Caucasus and other Russian and NIS mountain regions and of CDE for international mountain networks and donor contacts.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111104 – Morari Manfred

**Title: Advanced Process Engineering for Master and Joint PhD Education**

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**Keywords:**

Education, Bologna, Integration of Europe, Process Engineering, PhD & Master degree, Mobility

**Abstract:**

Goal of the IP project

The main objective of the project is to assist the education of Romanian young engineers for the Master degree and PhD studies in the Advanced Process Engineering field, according to the needs of the modern information society in view of integration of European education starting with Bologna agreements. The second main objection of the project is to support of mobility of PhD students across Europe to attend conferences, workshops and scientific visits to learn more about the west Europe systems and to obtain possibility to compare and deepen they education.

Context of the project

It is aimed to respond to the needs of the society situated on three levels of education and research. They are:

The background level

The scientific targets related to the methods of performing the education are addressed at this main level.

They may be briefly presented by the capital objectives:

1. Developing new courses and updating existing ones
2. Strengthening the multidisciplinary character of the education process
3. Assuring curricula compatibility with western university education system
4. Creating a regional center for computer aided process engineering

The intermediate level

At this level, the economic and society objectives are being considered.

The improved education quality may lead to formation of young engineers capable to perform high skilled tasks. This development is able to respond to the demand of the jobs market. It may also lead to saving material and energy resources, by increasing the efficiency of the industrial processes using mathematical modeling and advanced control algorithms.

At the same time a straight environmental objective is tracked by creating specialists capable to monitor and control the safety of the ecosystems.

The upper level

At this level, the objectives are of integrating the Romanian education and scientific community in the family of the European education system.

The Institutional Partnership performed by the proposed project may become an important means for developing (supporting) a center for education young engineers. This center complemented by an already established as excellence scientific center may serve for stopping brain drain and creating a stable intellectual infrastructure that can directly contribute to the economic development in the East European region. At the same time the hi-tech education in Eastern Europe creates the possibility of an increased mobility of the specialist on the European labor market.



SCOPES 2005-2008: Joint Research Project

## Project no.: 111105 – Zaharko Oksana

**Title:** Sparsely connected antiferromagnets: Ground states, clusters and domains

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**Keywords:**

magnetism, magnetic order, susceptibility, neutron diffraction

**Abstract:**

The aim of this project is the experimental investigation of magnetic ground state and spin dynamics of the selected novel magnetic systems characterized by structurally imposed magnetic rarefaction.

The selected magnetic systems are new transition metal oxides in which the intentional rarefaction of magnetic connectivity introduces deviations from classical long-range order. The sparsely connected magnetic structure relies either on weak super-exchange paths between the distant magnetic ions, specific nearest neighbour topology, or on the presence of quasi-isolated magnetic clusters ('chemical scissor' strategy). The ground states of our sparsely connected magnets, belonging to either classical or quantum systems, are complex, which might rely on the competition between the two possible ground states, magnetically ordered and the spin-liquid one. Moreover, the ground state might evolve into their coexistence in some of the systems. The objective of this project is then a profound understanding of the ground states stabilized in all of the selected quantum and classical magnetic systems and spin dynamic.

Methodologically, this project employs high-resolution ac susceptibility, dc susceptibility, torque magnetometry and neutron scattering techniques enabling insight into bulk and microscopic magnetism.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111111 – Krähenbühl Lukas

**Title: Transforming Pius Branzeu Center of Laparoscopic Surgery and Micro-surgery (PBCLSM) Timisoara into Eastern European Zonal Center of Development and Research in Laparoscopic Surgery**

**Co-ordinator:**

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**Keywords:**

Laparoscopy, Research, Education

**Abstract:**

After 1990, the University of Medicine and Pharmacy Timisoara had rebuilt and modernized with its own funds. In 1999, its Center of Experimental Surgery became “PIUS BRANZEU Center of Laparoscopic Surgery and Microsurgery” (PBCLSM). Beside a small modern animal house, a Microsurgical Laboratory equipped with 10 working stations and a 60 persons Multimedia Conference Room, this center owns a Laparoscopic Surgery Room with 5 modern operating stations (a smaller copy of The Laparoscopic Surgery Room from IRCAD, Strasbourg - see Appendics). This Center has organised 13 regional laparoscopic surgery courses (see appendics) with international participation (basic and advanced courses) , since it was founded in 2004. All trainer surgeons in the center’s staff were trained in IRCAD Strasbourg (Pr. Jacques Marescaux - see Diplomas in Appendics). The partnership with S.A.L.T.S. and Swissendofribourg will allow the achievement of the following objectives:

- the transformation of PCLSM from a regional center in Romania into a zonal center of training for R, H, MD, SM, HR. Each course will be held in English and coordinated by a European personality in the field;
- the development of research activities on small animals by involving procedures of laparoscopic surgical instruments, following the Swissendofribourg research model;
- the tight cooperation with the microsurgery laboratory in the research area, some operations, which may contain laparoscopic surgical intervals, preceded or followed by specific microsurgery intervals. Three international laparoscopic courses will be organised each year for east europeans surgeons, in english, with participation of west-european trainers. Laparoscopic research in small animals performed by young PhD students will be started, following Swissendofribourg model.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111114 - Quade Michael (formerly Schubert)

**Title:** Research and competency e-government and e-business lab development – REGEBLab

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**Keywords:**

e-business, knowledge transfer, e-government

**Abstract:**

The goal of the project is to exchange knowledge, carry out research activities, and disseminate state of the art know-how to SMEs and other relevant parties in the areas of e-business and e-government. More specifically, for the domain of e-business and e-government, the project targets:

- the transfer of knowledge between Switzerland and Bulgaria;
- the elaboration of Bulgarian case studies standards and methodology;
- the dissemination of case studies practices in Bulgaria;
- the improvement of competitiveness in SMEs;
- focus on problems with information technology.

In order to achieve these objectives, the project will:

- integrate and co-ordinate research activities among both partners;
- design and create mechanisms for the collection, analysis, and presentation of leading e-business/e-government practice in both countries;
- establish and maintain a web-based platform in order to make the knowledge base widely available and facilitate research achievements into good practice issues;
- develop training materials for exploitation of both partners, SMEs and other relevant parties;
- disseminate project results through online and offline activities, involving well established dissemination platforms such as eXperience (Swiss e-business case study database)
- support the development of CIST as Centre of Excellence (CoE) which will serve to conduct high quality research and to ensure the high quality of the case studies, compare and analyse cases, identify market developments and trends, and drive the conceptual advancement of the network;
- transfer know-how to SMEs through various events;

The overall performance of the project will be underpinned by the project management and research activities, which are structured in the following tasks:

- Task 1. Analysis of specific demand, methodology and didactical concepts definition
- Task 2. Jointly prepared courses for professionals and management
- Task 3. Joint programme for researcher qualification, e.g. joint programmes for Ph.D. students
- Task 4. Dissemination and publications on best practice in e-business and e-government
- Task 5. Develop and maintain a Web-based platform

The project will contribute the e-business and e-government research to be grounded in practice, as well as for transferring of Swiss knowledge and experience to Bulgaria. It will also strengthen the Bulgarian partner in business, economy and information systems research, knowledge intensive business services such as management and IT consulting and software engineering, as well as in the management of education and training.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111116 – Pescia Danilo

**Title: Improvement of teaching methods and development of new curricula of the course of general physics and the course of physics at schools.**

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**Keywords:**

education, science, pedagogy, condensed matter physics, material science

**Abstract:**

The present project is dedicated to the improvement and modernisation of teaching methods and the development of new curricula for physics courses.

Also some renewal of the teaching infrastructure at the St. Petersburg Technical University is planned as well as an exchange program for students and scientists. The Herzen State Pedagogical University of Russia, the St. Petersburg Technical University and the ETH-Zürich take part in these activities.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111124 – de Jong Willemijn

**Title: New Reproductive Technologies and the Making of Bodies, Persons, and Families in Russia and Switzerland**

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**Keywords:**

human reproduction, kinship/family, citizenship, gender, discourse

**Abstract:**

The goal of the project is to investigate the impacts of New Reproductive Technologies (NRT) on ideas and practices related to bodies, persons, and families – a new field of research in the social sciences in Russia and Switzerland. In doing so, we will take into account the importance of categories of gender, age, ethnicity, nationality, and sexual orientation with regard to social hierarchies and exclusions. The main research questions are: 1) What are the processes of development and distribution of reproductive technologies in Russia and Switzerland? Who are the agents involved in the production of the discourse on NRT? What are the discursive fields and the main narratives through which the social knowledge on NRT is created? 2) How have the meanings and practices related to the body, the person, family and kinship changed under the influence of NRT? To what extent do issues of citizenship (subnational, national, transnational) and religion come into play (although at a first glance NRT just seems to deal with the making of intimate relationships of family and kinship)? 3) What is the role of NRT, the body, the person and the family in the context of “enterprise culture”, both from the producers’ and consumers’ perspectives? In which economic and political contexts is the development of NRT embedded, nationally and transnationally? The main research methodology in this stage of research is discourse analysis. Besides generating empirical and theoretical results in social science we aim at creating scientific networks with scholars working in similar fields. Our research contributes to the understanding of basic social relationships and current changes in Russia and Switzerland, which also concerns issues of social security. Moreover, it can provide perspectives for the development of civil society and healthcare.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111130 – Heinrich Christoph A.

**Title: Metal transport and ore deposition: the geology, geochemistry and geodynamic setting of mineral resources in Bulgaria, Serbia-Montenegro and Romania**

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### Keywords:

Cu-Au deposits, porphyry, epithermal, magmas, ore fluid, geochronology, Bulgaria, Romania, Serbia

### Abstract:

The research proposed here aims at understanding the geological processes controlling the origin and distribution of Europe's most important copper and gold deposits, which are located in Bulgaria, Romania and Serbia-Montenegro. On the regional scale, we want to understand the geodynamic environment and the generation of mineralising magmas, whereby radiometric age dating and igneous geochemistry will play a major role. On the scale of ore-forming magmatic-hydrothermal systems, we want to quantify the processes leading to the generation of ore-forming fluids from hydrous magmas and apply new microanalytical techniques to directly trace the dissolved metals in magmatic fluids to diverse types of mineral deposits. Three major tasks are planned in a manner that allows a clear division of responsibilities to the teams in the three collaborating countries: 1) Fluid processes at the magmatic to hydrothermal transition leading to the formation of epithermal and porphyry-style Cu-Au-(-PGE) deposits 2) Geochronology, calcalkaline magmatism and large-scale metallogeny of the Cretaceous Apuseni – Banat – Timok – Srednegorie Belt 3) Miocene magma generation and ore fluid evolution in the Apuseni Mountains. This research is part of an ongoing collaboration including the core program of ETH-Zurich's Fluids and Mineral Deposits Group (supported by regular funds from SNF, ESF and a previous SCOPES-JRP to Ch. Heinrich) and is also coordinated with concurrent SCOPES projects led by R. Moritz at University of Geneva. The SCOPES funding enables a mutual transfer of scientific knowledge as well as cultural understanding within the countries of southeastern Europe. It also helps our Bulgarian, Romanian and Serbian partners to establish new contacts in research, education and industry in western Europe and worldwide.

Specifically we expect:

- to offer collaborators a chance to present their existing knowledge to the international scientific community, in order to establish their own international contacts,
- to offer collaborators the chance to work with cutting-edge technologies, with an opportunity for them to demonstrate their capabilities in international collaborations,
- to actively support the best scientists in universities and research organizations in their collaboration across these traditionally separate institutions,
- to aid the interaction of scientists between traditionally rather isolated eastern countries, notably including long-isolated Serbia-Montenegro.

The specific information obtained in this research initiative will make existing as well as new geological data more easily accessible for potential investors in the primary industries sector. The contacts and the new training can give enterprising Bulgarian, Romanian and Serbian-Montenegro scientists an opportunity to provide high-quality services to the presently booming international resource markets, both within and outside their home countries.



SCOPES 2005-2008: Institutional Partnership

## Project no.: 111133 – Hauser Martin

**Title: Are there essential differences between East and West? Southeastern and Western Europe in a comparative framework**

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**Keywords:**

Europeanisation, transition, comparative studies, identity, conflict

**Abstract:**

The project is designed to continue and deepen an incipient collaboration between Fribourg University and Moldova State University. It is focused primarily on introducing new methods of teaching, modernization of curricula, and sustaining independent research activities. Both teaching and research activities have the corollary of fostering comparative approaches in various fields of social sciences and covering the wider European continent. In the longue durée, the project aims at helping to modernize European area studies in the most prestigious and biggest Moldavian university. In the medium perspective, the project aims at sustaining Moldavian academia in transition to fully fledged democratic society and market economy. Besides teaching, the projects aims also at strengthening research capabilities of the Moldavian partner in topical issues related to the wider Europe. The main objectives of the project will involve: initiation of a mobility scheme program; modernization of curriculum; designing readers for new courses; improving teaching and research methods; sustaining the publication of a scholar journal; updating the specialized library; renewal of equipment. Major activities will include visits of Eastern partners to Fribourg and other Swiss specialized institutions in order to collect data for new courses and scientific articles; delivering courses to Moldavian students by Swiss professors; design of new syllabi and courses in a comparative framework; creation of readers; preparation and publication of a collective volume focusing on methodological issues.

Evaluation will include elaboration of questionnaires on courses of invited and local professors, as well as other activities involved in the project like introduction of new syllabi, course contents and readers, reviewing publications edited throughout the project like courses, readers and methodological volume by independent local and foreign experts. Expected results: one of the most dynamic and youngest multidisciplinary unit of Moldova State University would galvanize the efforts of designing various scenarios for the solving of a wide range of problems existing in the present day Republic of Moldova Besides, Romania's admittance in EU due 2007 would make Moldova an important Eastern neighbour of the Union and a very important actor for European security.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111134 – Saurer Matthias

**Title: Climatic changes, tree-ring growth and C- and O-isotope variations along longitudinal transects in Siberia and in the Urals**

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### **Keywords:**

Isotopes, Siberia, climatic changes, tree-ring structure, longitudinal transect

### **Abstract:**

Global climate change will alter the species composition of boreal forests with tremendous consequences for biogeochemistry of carbon and nitrogen cycles, sustainability of economic development and even human health. One of the ways to predict future shifts in spatial distribution of tree species is to evaluate the response of vegetation to climate changes in the past. We propose to investigate the climate effect on tree-radial growth along the Siberian IGBP-transect (IGBP – International Geosphere-Biosphere Program) and longitudinal transect in the Urals using novel approaches and techniques of dendroecology. Tree-ring structure variability of conifers will be studied in different vegetation zones of Middle Siberia (from the forest-tundra zone in the north through northern, middle and south taiga regions to the forest-steppe zone in the south). In addition to tree-ring width and maximum latewood density widely used in dendro-science, cell structure parameters and isotope data will be used. This innovative approach of combining several tree-ring parameters will result in a deeper understanding of past processes and the response of the trees to the changing environment. All the data will be analyzed in the context of recent regional and global changes. The project will a) enhance our understanding of the dependence of radial growth in different conifers growing under different conditions along the temperature gradient, b) facilitate more realistic predictions of the shift in species composition of forests in response to Global Climate Change and c) strengthen the collaboration between Swiss and Russian researchers in forest and tree-ring sciences.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111135 – Dissertori Günther

**Title:** Preparation and exploitation of the first data taking at the Large Hadron Collider

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**Keywords:**

particle physics, LHC, CMS, data analysis, detector controls

**Abstract:**

The Institute for Particle Physics (IPP) of ETH Zurich is one of the leading institutes participating in the Compact Muon Solenoid (CMS) experiment at CERN's Large Hadron Collider (LHC), which will provide proton-proton collisions at an unprecedented centre-of-mass energy of 14000 GeV. CMS is presently under construction and shall be ready for data taking in 2007. It has a unique prospective for important discoveries in Elementary Particle Physics for the next decade. One of the most important detector systems of the CMS is the high precision Electromagnetic Calorimeter (ECAL), consisting of about 76000 Lead-Tungstate crystals.

This system is crucial for a large spectrum of measurements and its performance is essential for the success of the CMS experiment. Among other responsibilities within ECAL, the IPP carries the project leadership for the development and construction of the Detector Control System (DCS) of ECAL. This project is realized in collaboration with scientists from the VINCA Institute and the Faculty of Physics of the University of Belgrade (Serbia-Montenegro), as well as with scientists from IHEP Protvino and from CERN. Our Joint Research Project (JRP) is intended to strengthen the already existing and very successful collaboration with our colleagues from Belgrade. For small institutes such as those from Belgrade it is difficult to gain visibility in a very large collaboration like CMS (close to 2000 scientists from about 150 institutes). Therefore it is important for them to have a strong presence at CERN and a close collaboration with larger institutes such as the IPP of ETH Zurich. The research topics of this JRP concern on the one hand the construction of the CMS ECAL, with in particular the ECAL Safety System, for which the Serbian groups carry full responsibility, and on the other hand the commissioning of this controls system as well as of the full detector and finally its exploitation in terms of first data analyses. These activities should result in a fully operational safety system for the CMS ECAL, an in-depth understanding of the first data from the calorimeter, as well as in first physics results from the initial LHC running. The improved international contacts will allow the Serbian groups to (a) strengthen their scientific capabilities, (b) improve the efficiency of their work and participation within large international collaborations, (c) enhance their national as well as international reputation and thus (d) to attract students, funding agencies and industries in their home countries, with evident long-term benefits.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 111136- Fuchs Michel

**Title:** Sauvetage et gestion d'un patrimoine menacé

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**Keywords:**

Crimée, Antiquité, Peinture murale

**Abstract:**

In this project we will study variability and long-term trends of tropospheric ozone at high mountain sites in the Caucasus and in the Alps. Ozone is not only a key pollutant of photochemical air pollution but also a strong greenhouse gas and its changes have significantly contributed to the changes in radiative forcing and therefore to the anthropogenic climate changes. In our project we will study ozone measurements of two mountain sites of Caucasus (Kislovodsk (43.7°N, 42.7°E, 2070 asl., measurements available since 1989) and Terskol Observatory (43°N, 42°E, 3100 asl, available since 2003) and Switzerland (Jungfrauoch, 46.5°N, 7.9°E, 3580m asl, available since the early 1990s). Neither the long term ozone increase at Jungfrauoch nor the remarkable decrease at Kislovodsk is well understood at the present time. Three dimensional 10 day backward trajectories arriving at the mountain sites will be calculated in order to determine the most important processes for tropospheric ozone trends in the two mountain sites. In addition other background measurements such as Mace Head (Western coast of Ireland), Arosa (2100 asl (Switzerland) and Zugspitze (Germany), high mountain sites of EMEP network might be included as additional stations in the analysis as well as other trace gas concentrations and meteorological information. Changes in anthropogenic ozone precursor emissions and changes in transport of ozone from the stratosphere into the troposphere and transport patterns changes are expected to be the most dominating factors explaining the observed long-term ozone trends. The trajectories will be calculated using the trajectory tool LAGRANTO based on fields of the ERA-40 data which is a homogenized data set of meteorological analyses generated by the European Centre for Medium Range Weather Forecasts (ECMWF). The individual trajectories are first tested for homogeneity of the flow by calculating clusters of trajectories.

In order to distinguish between different contributing factors the trajectories will be classified into the following groups: Class A trajectories include those air parcels with stratospheric origin. For identification we will use an algorithm recently developed (and tested) at ETHZ which can distinguish between reversible and irreversible transport across the tropopause based on potential vorticity (PV) and a residence time criterion.

The time after irreversible entrance in the troposphere and the evolution of PV will be further used to estimate the effect of mixing of stratospheric with tropospheric air. Class B trajectories are those with recent contact of the air parcel with (polluted) planetary boundary layer air of Europe or Asia. For that purpose we will use boundary layer height (BLH) stored in ERA-40. In order to characterize the ozone formation we will store the time after contact with planetary boundary layer air and solar radiation. Class C trajectories include those trajectories with contact with planetary boundary layer emissions of another continent which can describe the effect of intercontinental transport, derived in the same way as class B trajectories. The ozone measurements at the receptor points of the individual trajectories will be subsequently compared with the time evolution of ozone in the lower-most stratosphere (class A) and the temporal evolution of the anthropogenic ozone precursor emissions over different continents. This will enable us to compare the different factors for the individual continents. This comparison is particularly important for the term of import of ozone from the stratosphere to the troposphere which is not adequately described by present numerical simulations. The results are also expected to elucidate why background ozone at European background sites have increased during the 1990s while European anthropogenic ozone precursors have substantially decreased.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111137 – Scheidegger Christoph

**Title:** Genetic diversity, ecotype differentiation and population biology of *Lobaria pulmonaria*

**Co-ordinator:**

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**Keywords:**

phylogeography, lichen forming fungi, conservation biology, Ural Mountains

**Abstract:**

Lichen conservation biology is often faced with widely distributed, but strongly fragmented taxa. If in a global Red List assessment such a taxon is treated as one single unit, one large and stable population may result in a low conservation status of the global population, despite the fact that most populations face a strong decline. In case the global population of a taxon is subdivided into evolutionary significant units (ESU), an individual Red List status might be assigned to each ESU. However, the complex life cycles and long generation times make it very difficult to identify ESU for lichens if ecological differentiation is the crucial criterion for their distinction. As an alternative approach to delimit ESU, genetic differentiation of regional populations has been suggested.

Recent developments of molecular markers demonstrated considerable levels of regional genetic differentiation among populations within species and during our first Scopes project we found high levels of genetic differentiation within *L. pulmonaria* between biogeographic regions in Russia. We identified a broad suture zone of two different evolutionary lineages in the Ural Mountains. The western lineage, as identified by ITS sequences is widely distributed in Africa and Western, Northern and Central Europe. The eastern lineage was found so far in Russia East of the Urals and in North America. Concerning the differentiation within the two ITS types it is likely that these genetically differentiated populations of *L. pulmonaria* developed independently over considerable evolutionary periods rather than became demographically autonomous through recent isolation, e.g. during anthropogenic deforestation. In this project we will sample additional populations along this suture zone, as well as east and west of it to study possible gene flow between the two distinct evolutionary lineages.

In order to test if the genetic differentiation found in regional populations parallel ecological adaptation, we had established a provenance clone test during our first Scopes project. We expect that during the coming three years the growth of the transplants will have reached an optimal level, which will then allow to test if survival and growth rate, diaspore production and degree of parasite attack differ between the provenances from the Carpathians, the Ural Mountains, The Komi Republic and Sakhalin.

A differentiation between the studied *L. pulmonaria* population into regional ecotypes would have a significant impact on the conservation status of this species, because its global population could be subdivided into regional ESU.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111142 – Feller Urs

**Title: Drought-induced leaf protein alterations in wheat (DILPA)**

**Co-ordinator:**

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**Keywords:**

climate, drought, extreme events, global change, protein metabolism, reactive oxygen species, wheat

**Abstract:**

Climate models predict more frequent and more severe extreme events in Europe during the next decades. The potential impact of extended drought periods on agricultural production represents a key aspect in this context. Drought causes metabolic changes in cereals related to protein metabolism (alterations in protein synthesis and adaptation of the protein pattern, protein degradation). The relation of these changes to yield quantity and quality is not yet well understood. Plant exposure to various environmental stresses often leads to the synthesis of stress-inducible proteins with chaperonine functions, dehydrins or proteases. The relationship among the stress-inducible proteins is very important for the survival of plants during drought stress and for the subsequent recovery phase. One of the major signals to be considered during drought stress is the plant hormone abscisic acid (ABA). Drought triggers the production of ABA which induces various genes involved in a signaling cascade for the regulation of downstream biochemical protective mechanisms. Wheat (*Triticum aestivum* L.) is a widely cultivated crop plant with high sensitivity to water deprivation. In view of this, it is important for agricultural practice to understand the relation between the stress-inducible proteins and the growth of wheat varieties differing in their drought sensitivity. The comparison of selected wheat genotypes may be relevant for basic research on one hand (identification of mechanisms and of potentials in wheat lines differing in their drought tolerance) and may be relevant for agronomy on the other hand (selection of wheat lines for agronomic use in a changing climate). A team from the Bulgarian Academy of Sciences (leader: Professor Klimentina Demirevska-Kepova) and a team from the Institute of Plant Sciences of the University of Bern (leader: Prof. Urs Feller) will collaborate in this project. Successful interactions between the two institutions started several years ago. Initially the contacts were restricted to correspondence and the exchange of reprints. In 2002 a direct collaboration started, when Prof. Klimentina Demirevska-Kepova was as a guest researcher for three months at the Institute of Plant Sciences of the University of Bern. Antibodies previously raised by her team in Bulgaria were helpful tools for the joint experiments. This project will allow to intensify the interactions between the two institutions and to involve more scientists from the Bulgarian Academy of Sciences in this collaboration.



SCOPES 2005-2008: Joint Research Partnership

## Project no.: 111146 – Moser Eva Maria

**Title: Surface Engineering of Nanostructured Coatings on Aluminium for Environmentally Friendly Anticorrosion Protection**

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**Keywords:**

aluminium, corrosion, nanocoating

**Abstract:**

The primary objectives of the project are to develop scientific bases of surface engineering of protective nanocoatings on aluminium by Atomic Layer Deposition (ALD) of metal acetylacetonates and phosphorus/boron ethers, to arrive at a fundamental understanding of their structure - anticorrosion performance relationships and to apply the developed nanocoatings for environmentally friendly corrosion protection of aluminium and its alloys. The technological objective of the project is to demonstrate applicability of ALD nanocoatings in "green" technology for corrosion protection of aluminium exploited in construction and aerospace industries. The environmental and social goals are to meet the European Union's environmental commitments in accord with the Directive 2000/53/EC that limits application of carcinogenic hexavalent chromium in the products on market after 1 July 2003. The originality of the work is in surface nanotailoring of aluminium on a molecular level by application of sophisticated sequential ALD of metal acetylacetonates and phosphorus/boron ethers whose role in the rational design of nanocoatings on the surface of aluminium is two-fold: (i) to ensure optimum thickness and uniform distribution of ALD nanocoatings on the surface of aluminium in view of their maximum corrosion protection performance; (ii) to ensure the optimum adhesion properties of ALD nanocoatings at aluminium-coating and coating-topcoat interface. The research programme is focused on the following activities: (i) optimisation and unification of aluminium surface cleaning procedures for further surface tailoring with corrosion-inhibiting ALD nanocoatings; (ii) development of novel synthesis routes for surface engineering of anticorrosion coatings (thickness 20-200 nm) on aluminium substrates by ALD; (iii) physico-chemical characterisation of anticorrosion nanocoatings on aluminium substrates (XPS, SIMS, TEM, SEM, AFM, electrochemical methods); (iv) optimisation and unification of testing procedures for evaluation of anticorrosion performance of nanocoated aluminium; (v) application of polymeric protective top-coats on the surface of nanocoated aluminium; (vi) evaluation of anticorrosion performance and adhesion properties of the developed initial and top-coated nanocoatings on aluminium after exposition in humid exploitation environment; (vii) optimisation of the most promising anticorrosion nanocoatings on aluminium and its alloys for further commercialisation.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111150 – Kenis Marc

**Title: Non-indigenous insects and their threat to biodiversity and economy in the Balkans**

**Co-ordinator:**

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**Keywords:**

Biological invasions, non-indigenous insects, biodiversity, Bulgaria, Macedonia, Albania, *Cameraria ohridella*

**Abstract:**

Invasive alien species are recognized as one of the leading threats to biodiversity. They also impose enormous costs on agriculture, forestry and human health. In Europe and elsewhere, most countries are presently developing national and international strategies to assess the full scope of the danger represented by invasive non-indigenous species, and to take the necessary measures to prevent and manage the threat effectively. The initial step in a national programme against non-indigenous species must be a survey of the species already established in the country, as well as those species which are likely to invade the country in the near future, together with their perceived, actual and potential economic and environmental impact. In this project, we propose to carry out an inventory of non-indigenous insects in Bulgaria, Macedonia and Albania. The general objective of the project is to provide these three countries with information on invasive alien insects in the Balkans and to develop local expertise in the field of invasive alien species management. This will allow the development of national strategies against alien insects, and non-indigenous organisms in general. Firstly, a database on non-indigenous insects established in Bulgaria, Macedonia and Albania will be set up. Then, we will provide informative fact sheets for the 30-40 main invasive, or potentially invasive, insects in the region. Finally, we will analyse the data to extract information on pathways, species or ecosystems traits that make them prone to invasion, and we will incorporate these analyses into similar studies carried out as part of on-going European projects on risk and impact assessment. In addition, as a case study, we are assessing the impact of the horse-chestnut leaf miner, *Cameraria ohridella*, an invasive moth which first appeared in the Balkans in the 1980s before spreading to the whole of Europe, and which is suspected to threaten the few remaining endemic stands of horse-chestnut (*Aesculus hippocastanum*) in the Balkans.

SCOPES 2005-2008: Joint Research Project

## Project no.: 111151 – Wandrey Christina

**Title: Stimuli-responsive and self-organizing polymers : Molecular and functionality design for medical, pharmaceutical and biotechnological applications**

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**Keywords:**

micro/nano-sized materials; stimuli-responsive polymers; self-organizing systems; hydrogels; drug and cell carrier

**Abstract:**

The development of micro- and nano-structured materials is one of the most important challenges of modern polymer materials science. Nano-materials are systems of well-defined nano-meter scale morphology whose properties can be finely adjusted on molecular and even on atomic level.

The objective of the Joint Research Project is the effective development and evaluation of novel micro- and nano-structured polymer materials combining the expertise of the two participating teams. The Bulgarian team intends to continue research dedicated to stimuli-responsive polymer materials ranging from linear copolymers to network hydrogels suitable for biotechnological, pharmaceutical, and medical applications, which will partially be based on well-known lower critical solution temperature (LCST) polymers, but also consider recently developed constitutions. The Swiss team will contribute experience from structure and hydrogel formation induced by electrostatic interaction and molecular self-assembly. The common research of both will mainly focus on the design of novel copolymer structures by introducing blocks or segments that can impart thermo-sensitivity and/or pH-sensitivity in addition to modification of hydrophilicity/hydrophobicity and/or specific binding ability of the final polymer material.

The research will be organized at three levels:

1. Novel stimuli-responsive, self-organizing and targeted complexing copolymers will be developed by elaboration of new synthetic methods or by applying known methods and/or known LCST-building blocks in order to obtain novel structures of targeted performance. This task will focus on searching for (co)polymers of defined molecular architectures able to react to small changes in the environment such as temperature, pH, solvent quality.
2. Micro- and nano-structured materials, namely segmented copolymer network hydrogels, interpenetrating polymer network (IPN), as well as self-assembled geometries in form of micro-spheres, nano-gels and nano-capsules will be developed on the basis of level 1, and studied in order to elucidate the factors influencing the morphology of the materials.
3. The most promising of the new polymer materials developed will be selected for screening directed to potential practical applications in controlled drug delivery and/or drug/cell/DNA immobilization.

The research will contribute to the accumulation of fundamental and applicable knowledge in the field of functional nano-structured polymer materials, which have proven to have a significant impact upon the quality of life and are expected to grow considerably in the next decade. As a result of the implementation of the project, "smart" polymers of a variety of structures – random, block, graft and cross-linked, will become available. The structure-composition-properties relationships for the developed materials will be established and methodologies for tailoring their properties in view of specific biomedical applications will be proposed.

SCOPES 2005-2008: Institutional Partnership

## Project no.: 115187 – Hayoz Nicolas

**Title:** Social Sciences in Changing Contexts: The Georgian Case

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**Keywords:**

Georgia, social sciences, rose revolution, transformation, social scientists, centre for social research, sociology, philosophy, political science

**Abstract:**

The development of social sciences in Georgia was for decades hampered by the ideological pressure from the state. Study of social phenomena without ideological bias became possible in Georgian academia only fifteen years ago and their present situation reflects this recent history – Social sciences, as they are practiced today in Georgia, are in need of radical institutional and intellectual changes.

This need is determined not only by the internal logic of the development of social sciences, but also by the requirements of the society undergoing profound changes after the Rose Revolution of November 2003. Social sciences are to emerge as an important source for self-interpretation of the Georgian society. For this process of capacity building the help of Western colleagues cannot be underestimated. But the present IP is to form a framework within which not only issues relevant to Georgia will be addressed, but also theoretical and methodological problems which transitional countries such as Georgia represent for the political, sociological and cultural analysis.

The main achievement of the project on the institutional level will be the establishment of an Interdisciplinary Centre for Social Research. This centre will serve as a facilitator for problem-oriented and cross-disciplinary research. It will serve for an intense exchange of research carried out locally. Monthly colloquia and an international conference entitled “Social Sciences in a Changing Context: The Georgian Case”, the creation of a web-site for the centre and the publication of the proceedings of the conference in Georgian and English languages will contribute to the establishment of the centre as a research institution in Georgian academia as well as in the international community of social scientists. The initial swiss aid shall be the first step of this centre to become a centre of competence for social sciences, its methodology and the change management for the concerned Georgian institutes and scientists. Based on the grounds set by this IP the centre should be able to continue based on various national and international grants.