

Swiss - Croatian
Cooperation Programme

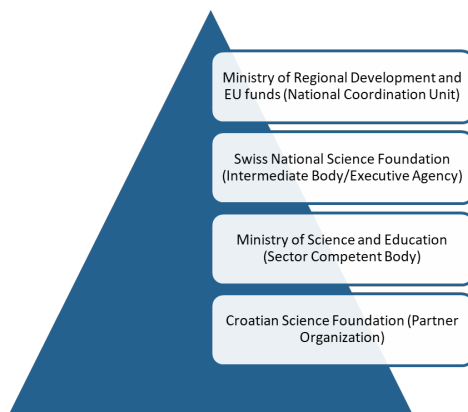
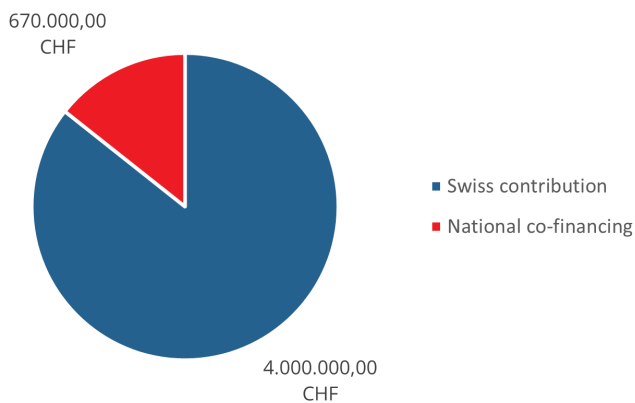
Croatian-Swiss Research Programme 2017-2023

Project brochure

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Programme in brief



Organizational structure of CSRP

Project objective: strengthening cooperation between Croatian and Swiss researchers through exchange of knowledge, skills and technologies.

Call CSRP-2018-01

Application period: 9 October 2017 – 19 January 2018

Maximum budget per project: 400.000 CHF (to be split between Swiss and Croatian research teams)

118 submitted project proposals

11 projects selected for funding following joint evaluation procedure by SNSF and HRZZ



Educated search for high-temperature superconductivity in novel electronic materials

Croatian team	<i>PI: Prof. Neven Barišić, Ph.D., University of Zagreb Faculty of Science</i>
	<i>Pryanka Reddy, PhD student, University of Zagreb Faculty of Science</i>
Swiss team	PI: Professor Henrik M. Rønnow, EPFL
	<i>Davor Tolj, PhD student, EPFL</i>
Implementation period	<i>01.01.2019 – 31.12.2022.</i>



Superconductivity is a fascinating and technologically very interesting feature of some materials to conduct electricity with no resistivity. In classical superconductors, this feature is only able to appear at temperatures as low as 10°K, while only two families of materials – copper oxides and iron oxides – exhibit this feature at around 100°K. the aim of this project was to explore new classes of materials, primarily murunskite, which can be considered an interesting interpolation of structural and electrical features of these two families of high-temperature superconductors.

Scientific outputs:

1 Scientific publications
1 Collaboration

(Source: <https://data.snf.ch/grants/grant/180652>)

Probabilistic and Analytical Aspects of Generalised Regular Variation

Croatian team	PI: Prof. Bojan Basrak, Ph.D., University of Zagreb Faculty of Science University of Zagreb Faculty of Science: <i>Nikolina Milinčević, PhD student; Hrvoje Planinić, Postdoctoral researcher</i> University of Split Faculty of Science: <i>Marina Dajaković, Vesna Gotovac Đogaš</i>
Swiss team	PI: Professor Ilya Molchanov, University of Bern <i>Jorge Yslas Altamirano, University of Bern</i>
Implementation period	01.02.2019 – 30.11.2023

Even though the occurrence of extreme observations such as in climatology or seismology is, in theory, unpredictable, scientists frequently try to at least determine the probability of a certain extreme occurring in a future period and, if possible, estimate their geographical and temporal reach. Even though extremes can appear in various locations, their effect is mostly localised. Therefore, if a certain extreme event does occur – for example, a heatwave over a part of a continent – we should know something about its duration and overall effect over the given region. Problems of this kind are studied by mathematical theory of extreme values. However, it is bound to experience problems in its real-life application as real extremes are rarely witnessed in recorded data or are not recorded at all.

The questions asked are quite complex, but mathematical theory tells us that, with relatively simple assumptions, distribution of extreme events is more-or-less regular despite its unpredictability. this observation is based almost entirely on the theory of regularly varying functions and divisions, which is also the topic of this project.

Scientific outputs

9 Scientific publications

5 Collaborations

8 Academic events

(Source: <https://data.snf.ch/grants/grant/180549>)

Project website:

<https://web.math.pmf.unizg.hr/paagr/>



Investigation of substrate and editing specificity in tRNA synthetases and the mechanism of antibiotic action

Croatian team	PI: Prof. Ita Gruić Sovulj, Ph.D., University of Zagreb Faculty of Science <i>University of Zagreb, Faculty of Science: Alojzije Brkić (PhD student), Vladimir Zanki, Igor Živković, Petra Kozulić, Aleksandra Maršavelski, Bartol Božić</i>
Swiss team	PI: Professor Nenad Ban, ETH Zurich <i>Marc Leibundgut, ETH Zurich</i> <i>Ingrid Mignot, University of Zurich</i>
Implementation period	01.03.2019 – 31.08.2023



Aminoacyl-tRNA-synthetases are crucial enzymes in translation of the genetic information and are, as such, essential for the survival of every cell. This makes them a very attractive object of fundamental scientific studies but also a target for developing new medication. The results obtained within this project suggest that antibiotic resistance developed

at the expense of the speed at which these enzymes operate, a finding that explains why the non-resistant forms of enzymes are still in existence. Importantly, the mechanism of antibiotic hyper-resistance is further discovered and shown to operate through the mutation of the key catalytic motif, which serves as a signature motif, of these enzymes. Finally, the investigation of the editing domain, which is responsible for keeping these enzymes accurate, unravelled that negative catalysis contributes to broad selectivity towards various inaccurate products and exquisite specificity in rejecting only the cognate product

Scientific outputs

4 Scientific publications

2 Collaborations

12 Academic events

5 Awards

(Source: <https://data.snf.ch/grants/grant/180567>)

Project website:

https://www.pmf.unizg.hr/chem/znanost/trna_synthetases



Integrating refugee children in schools: a mixed-method study on the efficacy of contact-in-school interventions for building positive intergroup relations among refugee and host-society children (IRCiS)

<i>Croatian team</i>	<i>PI: Assoc. Prof. Margareta Jelić, Ph.D., University of Zagreb Faculty of Social Sciences and Humanities</i>
	<i>University of Zagreb Faculty of Social Sciences and Humanities: Prof Dinka Čorkalo Biruški, Nikolina Stanković (PhD student), Antonija Vrdoljak (PhD student),</i>
<i>Swiss team</i>	PI: Professor Fabrizio Butera, University of Lausanne
	<i>Rachel Fasel Hunziker, University of Lausanne</i>
<i>Implementation period</i>	01.09.2019 – 31.08.2023.



IRCiS project dealt with the integration of refugee children in primary schools as well as with programmes of stimulating tolerance and preparing domicile children for accepting refugee children in schools which hosted no refugees. We designed two intervention programmes based on theory and research of inter-group contact. The first, preparatory programme, was intended for schools

which are yet to host refugees so that the domicile children would support and accept their newly arrived peers. The second, integration programme, was intended for schools which already have refugees among their pupils, with the aim of developing mutual learning strategies that would assist both domicile

and refugee children in developing cooperation and positive attitudes and lead to more successful integration. Since the language barrier was identified as the strongest obstacle for integrating refugee children, the integration programme includes workshops that require no knowledge of Croatian and an implementation manual has also been prepared. The mentioned programmes were included in the Catalogue of Innovations and Patents of the University of Zagreb and were awarded a silver medal at the 19th ARCA International Exhibition of Innovations. They were implemented in 24 schools in four Croatian cities, and quantitative research before and after the implementation of the program examined their effectiveness. Interviews and focus groups with children and teachers were also conducted after the intervention to check the effectiveness of the program and examine the experience of the participants. After the program, interviews were conducted with refugee children and focus groups with their Croatian peers in order to find out the students' impressions of the programs and their application in school. Project results will lead to the development of guidelines and specific activities that could be implemented in schools attended by refugee children as well as activities for preparing children in schools which are yet to welcome refugee children, not only in Croatia but also in other European countries.

Scientific outputs

- 1 Scientific publication**
- 15 Academic events**
- 4 Knowledge-transfer events**
- 8 Collaborations**
- 1 Awards**
- 4 Public communications**
- 4 Use-inspired outputs**

(Source: <https://data.snf.ch/grants/grant/180568>)

Project website:

<http://psihologija.ffzg.unizg.hr/projekti/ircis/novosti>

Dynamics of virus infection in mycovirus-mediated biological control of a fungal pathogen (DynaMyco)

Croatian team	PI: Assoc. Prof. Marin Ježić, Ph.D., University of Zagreb Faculty of Science
	<i>University of Zagreb Faculty of Science: Prof. Mirna Ćurković Perica, Karla Gregov (PhD student), Maja Morić (Postdoctoral researcher), Lucija Nuskern Karaica</i>
Swiss team	PI: Dr. Daniel Rigling, Swiss Federal Research Institute WSL
	<i>WSL: Simone Prospero, Deborah Leigh, Wajeeha Shamsi</i>
Implementation period	01.04.2019 – 31.03.2023



RNA viruses exhibit extremely quick mutation potential, which adds to their variability. This phenomenon is yet to be explored with mycoviruses, which is what this project aims to do – by studying genetic mutations of virus populations through the method of next generation sequencing and the effect of the infection on the host through using biochemical parameters as

oxidative stress indicators. The project saw the collaboration of scientists from Zagreb, Osijek and Zurich and enabled us to employ three young researchers.

Scientific outputs

- 12 Scientific publications**
- 7 Collaborations**
- 11 Academic events**
- 1 Knowledge transfer events**
- 5 Public communications**

(Source: <https://data.snf.ch/grants/grant/180651>)



Heterogeneous Computing Systems with Customized Accelerators

<i>Croatian team</i>	<i>PI: Prof. Mario Kovač, Ph.D., University of Zagreb Faculty of Electrical Engineering and Computing</i>
	<i>Faculty of Electrical Engineering and Computing: Igor Piljić, Leon Dragić (postdoctoral researchers)</i>
<i>Swiss team</i>	PI: Professor Luca Benini, ETH Zurich
	<i>ETH Zurich: Matheus De Araujo Cavalcante, Samuel Riedel</i>
Implementation period	01.07.2019 – 30.06.2022

The primary objective of the project was to research the most important architectural blocks of future heterogeneous computing systems, with special emphasis on customised accelerators and integration of such systems into future highly efficient exa-scalar computers. We researched new technologies that interfere with existing classical approaches to development: RISC-V processing architecture with Non-Von Neumann accelerators for deep learning applications, crypto applications and algorithms for processing high-resolution video material and implementing such technologies on microchips.

Scientific outputs

5 Scientific publications

1 Collaboration

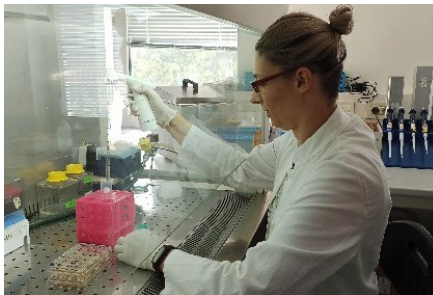
2 Public communication

(Source: <https://data.snf.ch/grants/grant/180625>)



Clonal dynamics of memory CD8 T cell inflation

Croatian team	PI: Prof. Astrid Krmpotić, Ph.D., University of Rijeka Faculty of Medicine
	<i>University of Rijeka Faculty of Medicine: Maja Cokarić Brdovčak (postdoctoral researcher), Anita Gaberščik (PhD student)</i>
Swiss team	PI: Professor Annette Oxenius, ETH Zurich
	<i>ETH Zurich: Suzane Welten, Nathan Zangger</i>
Implementation period	01.02.2019 – 31.01.2023



Cytomegalovirus (CMV) infection can lead to accumulation of a large number of effector memory CD8 T lymphocytes at the periphery (memory inflation). Parameters that control inflational T lymphocytes are not yet completely clear. The research hypothesis was that inflational T cells with proliferation capabilities are located in the lymph nodes and are activated when exposed to viral antigens presented at latently infected non-hematopoietic cells in the lymph nodes. By using the mouse CMV infection model, we analysed the role of co-stimulation molecules in expanding CMV-specific CD8 T lymphocytes during viral latency and spatio-temporal clonal composition of inflational CD8 T lymphocytes.

Scientific outputs

8 Scientific publications

1 Datasets

2 Collaboration

4 Academic events

1 Awards

(Source: <https://data.snf.ch/grants/grant/180552>)

Project website:

<http://capri.com.hr/clonal-dynamics-of-memory-cd8-t-cell-inflation.html>

Advanced Low CO2 Cementitious Materials

Croatian team	PI: Assoc. Prof. Marijana Serdar, Ph.D., University of Zagreb Faculty of Civil Engineering
	<i>University of Zagreb Faculty of Civil Engineering: Matea Flegar, Kiran Ram Poll (PhD students)</i>
Swiss team	PI: Professor Karen Scrivener, EPFL
	<i>Diana Londono Zuluaga</i>
Implementation period	01.04.2019 – 31.03.2023

We are currently faced with two major challenges for sustainable and inclusive development. On the one hand, rapid urbanization increases the demand for building materials, which, on the other hand, produces substantial environmental impact. The ACT project deals with these challenges through collaboration between EPFL and the Faculty of Civil Engineering in Zagreb with the aim of developing cement and concrete by using locally available materials. The project was focused on two quite different aspects of advanced sustainable cement through the work of two doctoral students. One of them is developing low-demand composites with high application potential, while the other is working on high-demand composites with application in high-demand constructions.

Scientific outputs

21 Scientific publications

1 Collaboration

1 doctoral dissertation defended

1 doctoral dissertation in progress

3 Academic events

2 Knowledge transfer events

(Source: <https://data.snf.ch/grants/grant/180590>)

Project website:

<http://www.grad.hr/latom/>



*Doctoral dissertation defence and industrial workshop
June 2023, Zagreb, Croatia – Professor Karen Scriver (EPFL), Associate Professor Marijana Serdar (UNIZG FCE), Kiran Ram and Matea Flegar (doctoral students on ACT project) and representatives of cement industry in Croatia.*

Exploring Homelessness and Pathways to Social Inclusion: A Comparative Study of Contexts and Challenges in Swiss and Croatian Cities

Croatian team	<i>PI: Dr. Lynette Šikić-Mičanović, Institute of Social Science Ivo Pilar, Zagreb</i>
	<i>Ivo Pilar Institute: Dr Jadranka Rebeka Anić, Marica Marinović-Golubić, Paula Greiner (PhD student), Suzana Sakić, Stephanie Stelko, Filip Trbojević, Matija Krizmanić</i>
Swiss team	PI: Professor Matthias Drilling, University of Applied Sciences and Arts Northwestern Switzerland (FHNW)
	<i>FHNW: Jörg Dittman, Gosalya Iyadurai, Esther Mühlethaler</i>
Implementation period	01.05.2019 – 31.12.2023

The objective of this qualitative research was to use ethnographic methods to reach an understanding of homelessness in various cultural contexts and to gain insights into the everyday life of people with experiences of homelessness. An additional objective was to propose various inclusion models to stimulate changes in social policies. Finally, this project promotes collaboration between researchers in Croatia and Switzerland and integrates them into the wider European scientific community dedicated to researching homelessness.

Scientific outputs

- 14 Scientific publications**
- 15 Collaborations**
- 23 Academic events**
- 10 Knowledge transfer events**
- 6 Public communication**
- 5 Use-inspired outputs**

(Source: <https://data.snf.ch/grants/grant/180631>)

Project website:

<https://homelessness.eu/>



Severe Weather over the Alpine-Adriatic region in a Changing Climate (SWALDRIC)

Croatian team	PI: Prof. Maja Telišman Prtenjak, Ph.D., University of Zagreb Faculty of Science
	<i>University of Zagreb Faculty of Science: Dr Branko Grisogono, Damjan Jelić (PhD Student), Barbara Malečić (PhD student), Bruno Omazić (PhD student)</i>
Swiss team	PI: Prof. Christian Schär, ETH Zurich
	<i>Oliver Fuhrer, MeteoSchweiz</i>
Implementation period	01.03.2019 – 30.11.2022



The overall objective of the SWALDRIC project was to research severe weather conditions in Europe, with special focus on the Alpine-Adriatic region. Severe weather conditions are researched by using available measurements and high-resolution climate model. The project used a unique dataset on hail (collected through networks collecting hail-related data) in Croatia and lightning over Europe and applied climate simulations for two periods that cover present and future climate conditions. the project was organised in three sections, i.e. three doctoral theses focused on: i) analysis and climatology of hail and lightning measurements, implementation of two algorithms for forecasting hail and potential for lightning development in the ii) forecasting and iii) climate models.

Scientific outputs

10 Scientific papers published (additional 1 in press)

6 Collaborations

14 Academic events

2 Doctoral dissertations

(Source: <https://data.snf.ch/grants/grant/180587>)

Project website:

<https://www.pmf.unizg.hr/geof/znanost/meteorologija/swaldric>

Phagocytosis and Macropinocytosis, a mechanistic view

Croatian team	PI: Prof. Igor Weber, Ph.D, Ruđer Bošković Institute
	<i>Ruđer Bošković Institute: Vedrana Filić Mileta; Darija Putar (PhD student), Lucija Mijanović (PhD student), Željka Majić</i>
Swiss team	PI: Professor Pierre Cosson, University of Geneva
	<i>Imen Ayadi, Tania Jauslin</i>
Implementation period	01.03.2019 – 28.02.2023



*The intake of particles (phagocytosis) and liquids (macropinocytosis) in cells play a vital role for, among other things, the immune response and tumour growth. In order to explain the molecular base of these processes, we research the role of several proteins that are key for different intake stages – starting from the attachment of the cell to the particles and finishing with the decomposition of the internalised material. We gained valuable insight on the role of the studied proteins by using protist *Dictyostelium* cells, thus avoiding the use of animal models.*

Scientific outputs

- 4 Scientific papers published (additional 2 in preparation)**
- 1 Doctoral dissertation**
- 1 Collaboration**
- 1 Academic events**

(Source: <https://data.snf.ch/grants/grant/180584>)







Swiss - Croatian Cooperation Programme

