

**Host organization: Jagiellonian University in Krakow**

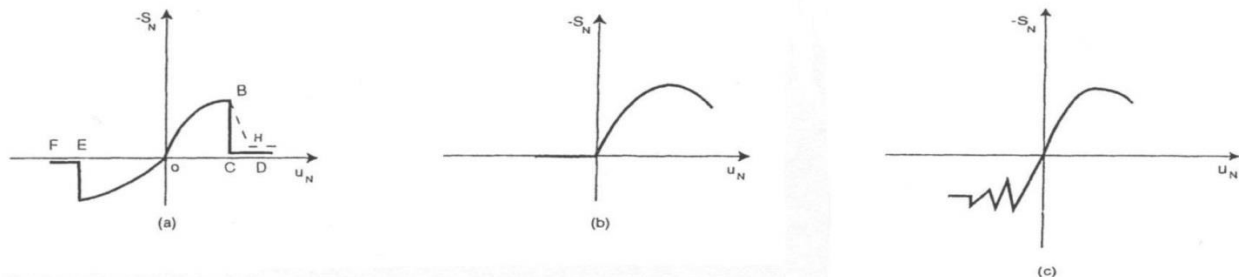
**Country: Poland**

**Organization role: Coordinator**

**Project Acronym: CONMECH**

**Project start and end date: 1 January 2019 – 31 December 2022**

**Type of MSC action, H2020: RISE**



Nonconvex multivalued laws in Contact Mechanics

### Project objectives and research field:

Contact Mechanics is a fascinating field concerned with the use of computational methods to study phenomena governed by principles of mechanics. In the language of mathematics those phenomena are represented by initial and boundary value problems for partial differential equations. This field is based on the interdisciplinary interplay of Mechanics, Applied Mathematics and Computer Science.

### Tell us why the topic is important and/ or how it brings to advancement in your research field:

The project is located at the cutting edge of an area of Contact Mechanics being significant and growing interest in computational mechanics. It covers the theoretical background, discusses modern numerical simulation methods and relates them to many practical applications. The motivation of the project comes from the fact that open real-life problems of mechanics are nonsmooth and our conviction that the use of techniques of nonsmooth analysis and hemivariational inequalities in methods of mechanics is insufficient. Project brings the following progress in the field: develop a new unified framework for modeling open nonsmooth problems present in various mechanical models, provide a new rigorous and exhaustive research of models from elasticity, viscoelasticity, viscoplasticity, thermoviscoelasticity, piezoelectricity, etc., treat control and optimisation problems of mechanical systems, and build a software platform for many practical applications in mechanical and civil engineering.

### What are the benefits of participating in a MSC action?

Our project stems from the areas of new numerical developments rendering the methods more attractive for industrial design and extensions of the general methodology to new horizons of application, variational approaches and concrete

technological applications. The accurate prediction of the evaluation of frictional contact processes and their control is of major economic importance. Project is focused on development of conceptual methods and computational tools concerning Nonsmooth Mechanics applicable to various fields such as building sciences, mechanical engineering, medicine, biomechanics, industry and biology. Some concrete examples are: model of the effectivity and attrition of the brake shoes or brake pads in drum and disc brakes; model of adhesion of surfaces joined by various glues or welds; action of various lubricants influencing the changing of friction parameters between surfaces; models of piezoelectric devices like piezoelectric lighters, USG, and ECG devices.

**Did you encounter any challenges during application/ implementation and did you get any help?**

We represent a small group of mathematicians and computer scientists who is well recognized in the world by their publication record, editorial works, international collaboration projects, monographs, conference organisation, etc. We have also coordinated the former IRSES project with six universities in China, Europe and USA, and several bilateral international grants. For these reasons, exploiting the experience of the PI, it is a relatively easy task for us to prepare an application. We have obtained extensive help from the administration units of JU, no help from NCP was needed. On the other hand, during project implementation, our institution is not providing any help to find accommodation for seconded researchers visiting JU. This is the biggest challenge and time consumable issue in the implementation of RISE.

**Would you recommend others to apply? What useful advice/ tips can you give them?**

We recommend to start writing the proposal in advance, 3-4 months are enough. Prepare longer description than needed, it is easier to cut than to add a new material. Do not ask partners to write the application together, write it quickly and correct it all the time. Have in mind that the coordinator should be a dynamic research team, internationally recognized for the quality of its scientific production. Be sure that the collaboration helps all partners who will be able to solve new and challenging problems. Do not include in the consortium new partners just because they are your friends.

**What strategies did your organization use to attract the fellow/s? Are they in line with national strategies supporting the widening EC policy?**

There are numerous institution associated with UJ which aim is to help scientists successfully complete their projects:

- the Centre for Technology Transfer CITTRU and patent attorney providing administrative and managerial help in transfer of know-how from academia to industry;

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- the Centre for Project Administrative Support of the Jagiellonian University providing administrative assistance in the field of fundraising and general management of the projects;
  - the Welcome Center providing support for all contractual, insurance and visa issues.

Moreover, prior to MSCA IF call the Jagiellonian University is preparing the base of supervisors and posts the advertisement at EURAXESS portal encouraging to apply for MSCA IF together with the JU.