


Hosting offers

for

Marie Skłodowska-Curie Actions Postdocotral Fellowships
at the Institute of Fundamental Technological Reseach,
Polish Academy of Sciences (IPPT PAN)

evaluation panels

CHE, ENG

keywords:

hydrogel

electrospun nanofibers

3D printing

smart materials

conductive polymers

biomaterials

Filippo Pierini

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Pierini Research Group is playing, keeping in mind that we are experts in the field of biomaterial development using hydrogels, electrospun nanofibers, 3d-printing, conductive polymers, and smart materials.

evaluation panels

ENG

Katarzyna Kowalczyk-Gajewska

keywords:

mechanics of materials

micromechanics

multiscale modelling

crystal plasticity and fracture

anisotropy

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area, however within the general scope of Mechanics of Materials. Previous projects conducted within our group were dealing with micromechanical modelling of metals and alloys with high specific strength, optimization of heterogeneous material microstructure concerning composites and metals, description of the void growth in the anisotropic metallic materials, all combined with the experimental validation.

evaluation panels

ENG, LIF

keywords:

host pathogen interactions

innate immunity

bacterial pathogens

signalling pathways

single-cell heterogeneity

stochastic regulation

live-cell microscopy

mathematical modelling

systems biology

Paweł Paszek

Potential project topics

The work in our group focuses on understanding infection biology at the single-cell level with particular focus on innate immune signalling networks and responses to bacterial pathogens. We use interdisciplinary systems biology approaches combining live-cell imaging with single-cell genomics to develop novel insight into the infection process. This involves applications of mathematical and statistical modelling to understand and predict outcomes of single-cell host-pathogen interactions. Current projects focus on innate immune macrophages and the food-borne bacteria L. monocytogenes, an important pathogen of man. We use live-cell imaging approaches to understand how robust immune responses emerge from the noisy single-cell NF-B/STAT/IRF and cytokine signalling. We also monitor fate and virulence of individual bacteria to understand pathogen invasion strategies.
We welcome candidates with different experimental and theoretical skills to propose projects in related area. Training in novel and topical imaging and single-cell biology approaches as well as mathematical modelling will be provided to fit candidate's interests and complement their existing skills.

evaluation panels

ENG

keywords:

molecular dynamics

EMS and NEMS

composite materials

mechanical modeling

analytical analysis

structures

Hossein Darban

Potential project topics

The proposed project welcomes topics suggested by the applicant, provided they are aligned with my expertise. I have experience in the mechanical modeling of materials and structures, encompassing composites, MEMS, and NEMS, across a range of scales from macro to micro, and down to nano levels. My methodology includes the use of numerical methods such as Molecular Dynamics and Finite Element Analysis, as well as analytical modeling like nonlocal models and advanced structural theories, complemented by experimental techniques.

evaluation panels

CHE, ENG, LIF, PHY

keywords:

microfluidics

experimental fluid mechanics

droplets

chemical and biological applications of microfluidic systems

Piotr Korczyk

Potential project topics

Our laboratory aims to develop microfluidic techniques to increase their precision and applicability.
Our group's primary expertise is experimental fluid mechanics, focusing on microfluidics. The other important area of interest is developing microfluidic devices that can be customized to particular biological or chemical research requirements.

We welcome proposals in line with these topics:

- microfluidics,
- experimental fluid mechanics,
- applications of microfluidics in biological or chemical research.

evaluation panels

CHE, LIF, PHY

keywords:

IDP

MD

coarse-grained simulation

GōMartini 3

α-synuclein

Parkinson Disease

Adolfo Poma Bernaola

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Poma Research Lab is mostly focused on, keeping in mind that his team is the main developer of the GōMartini approach for the sampling of large conformational changes in protein complexes with active interest in disease related applications and the role of mechanical forces in virus-cell interactions.

evaluation panels

CHE, ENG

Marcin Krajewski

keywords:

composite materials

electrochemistry

nanotechnology

materials for energy storage

oxides

Potential project topics

All topics related to the application of electrochemical methods in energy storage devices (lithium-ion batteries, supercapacitors), sensors or corrosion protection films are welcome. Moreover, the candidate can work on the synthesis of electroactive materials as well as the polymeric membranes suitable for energy storage applications, desalination of water and infrared or electromagnetic shielding.

evaluation panels

ENG, PHY

keywords:

cryogenic tests

advanced materials

thermo-mechanical properties

physically-based modelling

digital imaging correlation

3-D printed materials

Jakub Tabin

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Tabin Research Group is playing, keeping in mind that we are experts in the field of experimental identification of mechanical properties and modelling of advanced materials at a wide range of temperatures (4K-300K).

evaluation panels

MAT, ENG, PHY

Paweł Dłużewski

keywords:

dislocations

atomistic models

distortion tensor fields

visual editor of crystal defects

Potential project topics

Atomistic models of dislocation networks are often obtained by means of elastic-plastic relaxation of a perfect crystal lattice subjected to external loading. Another method is based on inserting of single dislocations into the perfect lattice. In such a case the analytic formulas for the glide of a single dislocation in elastic continuum are used. The methods mentioned above do not give possibility for emerging atomistic model of an arbitrary chosen network of dislocations. A method proposed here is based on the use of symbolic algebra of elemental lattice distortion tensor fields. Contrary to the linear strain and rotation measures, the lattice distortion tensor is the correct measure of finite deformation. This enables generation of atomistic models in terms of finite deformation approach. The method links: (i) analytic formulas for lattice distortions derived from the linear theory of dislocations, (ii) finite deformation algebra of distortion fields, and (iii) atom-by-atom reconstruction of dislocations including their core structures. This method has been implemented in a visual editor of dislocations. Configurations of atoms obtained in this way satisfy the stress equilibrium equations in terms of linear elasticity. On the other hand, the spatial Burgers vectors of dislocations are stretched and rotated to each other according to the finite deformation theory. The resultant net of atoms can used next as the input data to ab-initio and/or molecular dynamics programs to find a low energy configuration corresponding to the given interatomic potential.

evaluation panels

ENG, LIF, MAT, PHY

Eligiusz Postek

keywords:

ceramics

failure

molecular dynamics

numerical methods

cell models

tensegrity

Potential project topics

1. Brittle materials dynamic failure taking into account the interphase zones.
Multiphase composites, and especially ceramics, are used in all industries that are crucial for the functioning of the world economy. The aim of the study is to determine how the brittle materials are fragmenting under impact loads, sudden pressure, and temperature increase, considering the interfaces between the various phases of the composite. Numerical methods such as the finite element method, meshless and molecular dynamics methods will be used. High performance computers (HPC) will be used in the calculations. The reason for this approach is the desire to initially define the phenomena that may occur, and whose experimental analysis is still impossible. Hypotheses are created that enable the design of experimental research.

2. Stress development in growing tissue.
The physical environment of living cells and tissues, and more particularly their mechanical interaction with it, plays a crucial regulatory role in their biological behaviour such as cell differentiation, apoptosis, proliferation, tissue growth, remodelling, etc. However, the way that mechanical forces at the cellular level (i) influence the cell functions and (ii) govern the behaviour of cell assemblies, as well as their development, remains unclear. An agent-based methodology will be used.
There are still questions (i) how to evaluate mechanical stress in growing tissue, (ii) how the mechanical stress influences the tissue growth.

evaluation panels

ENG, PHY

Dorota Kołbuk-Konieczny

keywords:

3D printing

hydrogel

nanofibers

regenerative medicine

tissue engineering

drug delivery

biomaterials

smart materials for food packaging

Potential project topics

Themain scientific interests of the Ligamed Research Group are polymers, the molecular structure of polymers/biopolymers and tissue engineering - developing wound dressings and scaffolds for the regeneration of ligaments, neural tissue, cartilage and bones.
The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Ligamed Research Group is playing, keeping in mind that we are experts in the field of materials for regenerative medicine (eg. orthophedy), tissue engineering and drug delivery development using 3D printing, hydrogel, electrospinning (indluding Yanus fibres and triaxial fibres), biomaterials.
We are open on applications with fundamental knowledge in smart materials for food packaging also.

evaluation panels

CHE, ENG, PHY

Arkadiusz Gradys

keywords:

electrospinning

electrospun fiberss

confinement effects

polyelectrolytes

piezoelectric polymers

biomaterials

Potential project topics

The applicant may feel free to propose a project according to her/his interest in the scope of the expertise provided by the keywords, keeping in mind that we are biased toward fundamental research.