

Proposal for Research Cluster

Joint Research and Education Program "Palestinian-German Science Bridge PGSB"
Forschungszentrum Jülich GmbH & Palestine Academy for Science and Technology

Topic of research cluster

Structural Biology

Proposed participants

Cluster representative at Forschungszentrum Jülich (if applicable)

Title	Degree	First name	Surname
Mr.	Prof.	Jörg	Labahn
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Institute		Job title	
IBI-7		Group Leader	
University affiliation			
Heinrich-Heine-Universität Düsseldorf			

Cluster representative at Palestinian university (if applicable)

Title	Degree	First name	Surname
Mr.	Prof.	Hilal	Zaid
Telephone number		Email Address	
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Home university and faculty/department		Job title	
Arab-American University Palestine		Professor	

Proposed cluster participants in Jülich/German universities:

- Prof D. Willbold, director (IBI-7), Heinrich-Heine-Universität Düsseldorf, topics: NMR, prion/Abeta, M. Alzheimer
- PD O. Weiergräber, group leader (IBI-7), Heinrich-Heine-Universität Düsseldorf, topics: Crystallography, autophagy
- Prof G. Schröder, group leader (IBI-7), Heinrich-Heine-Universität Düsseldorf, topics: electron microscopy, integrative structural biology
- Prof J. Labahn, head outstation at CSSB (IBI-7), Heinrich-Heine-Universität Düsseldorf, topics: Crystallography, membrane proteins

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Proposed cluster participants at Palestinian universities

- Prof H. Zaid, group leader, Arab-American University Palestine, topics: Cell biology, diabetes, cancer
- Prof. Siba Shanak, group leader, Arab-American University Palestine, topics: Bioinformatics, apoptosis
- Prof. Fuad Al-Rimawi, group leader, Al-Quds university, Abu-Dies, Palestine topics: Chromatographic separation techniques, Natural products
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Scientific content of proposal (max. 5 pages)

Which fields/research topics can/should be included in this cluster, how do they fit together?

The cluster Structural Biology allows for any biological topic that is assisted by structural information obtainable by methods of structural biology: X-ray crystallography, NMR or electron microscopy. Its scope is extended by non- experimental methods in structural biology e.g. Modelling, algorithm development for data processing, and integrative structural biology.

Partners in the cluster should provide or use structural information. The research should generally be compatible with JuStruct.

Collaboration partners from the Research Center Jülich can provide training of students, expertise for structural biology project planning and access to facilities: NMR center at ICS-6, The Jülich Centre for Neutron Sciences, Ruska Electron Microscopy Center, Core facilities at the CSSB in Hamburg (electron microscopy and advanced light and fluorescence microscopy), and privileged access to the Helmholtz beamline P11 at DESY.

Biological topics included must be a common interest of at least one partner from research center Jülich and one partner from Palestine. In general the extent of biological topics will be limited by the expertise provided by the partnering research groups.

Biological topics relevant to the Jülich partners center on health related biological processes e.g.: Morbus Alzheimer and similar diseases, Abeta/prions, autophagy, apoptosis, cancer, infection biology.

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Current activities in this field / results achieved from already existing cooperation projects

The partners, respectively interested partners, are well established with the structural biology approaches that they represent in the proposed cluster.

Currently a joint research project by Prof Labahn, Prof Zaid and Prof Shanak in the field cancer and apoptosis targets the structure of SAC (selectively apoptosis inducing in cancer) domain of Par-4 and the identification of effectors:

Apoptosis induction and related pathways regulation by phytochemicals

(Start January 30th, 2020):

Par-4(PAWR) is a 332 amino-acid proapoptotic protein with tumor suppressor activity. It is predominantly unstructured and contains two important domains. It is well known for its selective induction of apoptosis in cancer cells, which is attributed to the N-terminal SAC domain. The structure of the C-terminal coiled coil (CC) domain, which is mainly involved in many of its interactions, has been determined. Par-4 is a nucleo-cytoplasmic shuttling protein containing a nuclear localizing sequence (NLS) in the SAC domain and a nuclear export sequence (NES) in the CC domain. The current project is aimed at determining the structure of the extended region from CC-domain to SAC domain. This may require including interacting proteins like autophagy receptor p62/SQSTM1 or nuclear export receptor CRM1 to induce structure and stability of Par-4 upon complex formation.

Several apoptosis-inducing phytochemicals were identified and some were isolated. Yet, the potential interaction between these phytochemicals and the proapoptotic protein, Par-4, was not yet examined. By applying protein-ligand docking methods, several apoptosis-inducing phytochemicals will be docked with Par-4 using the available solved parts of the protein: PAR4: (PDB ID:5FIY). Successfully docked molecules are then tested in the laboratory with par-4. In parallel, the potential apoptotic induction will be examined also in vitro, in models of cancer cell lines. Molecules that form complexes with par-4 are targeted for structural investigation.

Please prepare a sketch/model of how this cluster would help toward creating a scientific infrastructure in Palestine, as well as lasting cooperation between researchers in Jülich and Palestine. Please address all points in the call text. If possible, please include a graphic representing your idea.

- Short term

Palestinian research groups will have the possibility to obtain structural information on their topic of interest by placing a Palestinian student with their German partner(s) who can provide instrumental access and training.

The projects aim to combine activities in Germany and Palestine. The embedded PhD students are supposed to continue working in the field in Palestine after finishing the thesis project, primarily transferring biophysical approaches.

German research groups expand and complement their topics by collaborating with a Palestinian partner(s) and receiving the students.

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The students experience exposure to and use of advanced methods that expands their scope of employment internationally and helps overcoming the career restriction imposed by the particular situation of Palestine.

- **Medium Term**

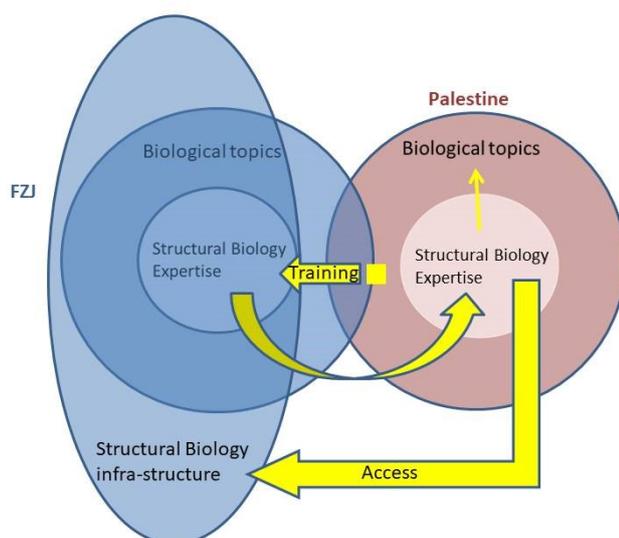
Medium term research partnerships may evolve independently of the integration of the returning student into a Palestinian research group, if a complementarity in approaches with regard to the topics of mutual interest develops.

Palestinian research groups reintegrating the trained student can pursue further crystallographic projects with small investments (mainly a computer for data processing), even outside the collaborations with the German partners, if they can produce the target proteins. The instrumentation for data acquisition in crystallography and in future for electron microscopy is typically organized in large centers which grant measurement time on the base of proposals.

Upon placing some of the trainees in teaching positions, the scientific infrastructure in Palestine will be quickly enriched by the structural biology perspective and an expansion of scientific topics that can be addressed.

- **Long Term**

Currently structural biology is developing into integrated structural biology which aims to integrate the strengths of the different approaches (X-ray crystallography, NMR spectroscopy, electron microscopy with mass spectrometry (native and cross-linking, CD-spectroscopy and computational approaches). Even under the most favorable conditions the scientific community of Palestine appears too small to warrant the required investments in instrumentation. The Helmholtz Society is committed to provide this infrastructure for Germany. Therefore a long term stability of a cluster Structural Biology can be expected, that exceeds the life time of individual topic based research interests of participating groups.



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Please share any ideas for possible funding sources for the cluster, including any joint funding proposals that are being planned/submitted.

Funding of students exchange and training with the specific targets of reintegration of students into the research and education of their home countries is provided by the DAAD. Especially the Sandwich model and the Coutelle procedure for PhD stipends applies. The latter requires the involvement of the universities of the partner countries. Furthermore the Alexander von Humboldt foundation offers sponsorship programs for researchers at all career levels without limitations of countries or topics. No funding dedicated to joined research programs of German and Palestinian researchers is available currently apart from the PGSB.

Signatures

Representative of research cluster in Jülich (if applicable)

Date	Name	Signature
28.02.20	Jörg Labahn	

Representative of research cluster at Palestinian University (if applicable)

Date	Name	Signature
28.02.20	Hilal Zaid	

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