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New Cross-Border Doctoral Networks at Universität Heidelberg

Five new cross-border and inter-institutional doctoral networks at Heidelberg University are to be funded by the European Commission in the context of the Marie Skłodowska-Curie Actions (MSCA). The networks aim to link up doctoral candidates from different European countries; they will collaborate on current scientific topics with a high potential for innovation.

Ruperto Carola is coordinating an MSCA doctoral network on the topic of artificial intelligence in physics. In addition, researchers at Heidelberg University are involved in two doctoral networks in medicine and one each in the life sciences and in the engineering sciences. These five MSCA doctoral networks can avail themselves of funding totaling approximately 16.4 million euros for a period of four years each.

The potential for using artificial intelligence to answer open questions in elementary particle physics is the topic of the doctoral network "Challenging AI with Challenges from Physics: How to solve fundamental problems in Physics by AI and vice versa" (AIPHY). The goal is to develop optimum methods for the AI-supported analysis of complex physical data that has been collected with the Large Hadron Collider at the European research center CERN (Switzerland). Conversely, the research aims to gain novel insights into AI-based predictions. The doctoral network will be coordinated by Dr Anja Butter, a group leader at the Institute for Theoretical Physics at Heidelberg University and at the Laboratoire de physique nucléaire et des hautes énergies (LPNHE), which belongs to the Centre national de la recherche scientifique (CNRS) and Sorbonne University (France). Participating on the Heidelberg side are also Prof. Dr Tilman Plehn (Theoretical Physics) and Prof. Dr Jürgen Hesser, a scientist at the Mannheim Institute for Intelligent Systems in Medicine, which is located at the Medical Faulty Mannheim of Heidelberg University. Partners at the European level are, besides the CNRS and the Sorbonne, the universities of Milan (Italy), Geneva (Switzerland) and Copenhagen (Denmark). All five universities are members of the 4EU+ European University Alliance. Funding of around 1.9 million euros is available to establish the doctoral network, which will start its work in October this year.

The question of how the activity of cellular cilia impacts on health and illness of organisms is the focus of the doctoral network "European Training Program for Deconvolution of Multi-scale Cilia Function in Health and Disease by Integrating Machine Learning-AI Approaches" (CILIA-AI). The primary cilia – microtubule projections of the cell membrane that resemble microscopic hairs – are of special significance for cellular signal transmission and for physiological functions such as hearing, smell, respiration or reproduction. The aim of the research studies is to achieve a better understanding of the organization and regulation of cilia in health and disease. Accordingly, super-resolution datasets are to be gained with advanced imaging techniques, then analyzed and combined with machine-learning approaches. The doctoral network CILIA-AI is being coordinated at the Stichting Radboud Universitair Medisch Centrum in Nijmegen (Netherlands). Directing the studies on the Heidelberg side is Prof. Dr Robert Russell, who investigates the evolution of proteins with his research group at Heidelberg University's BioQuant Center and at the Heidelberg University Biochemistry Center. The doctoral network CILIA-AI, funded to the tune of approximately 3.9 million euros, will start work in January 2025.

Testing a mechanistic approach to non-medicinal treatment of chronic pain is the topic of the doctoral network "Frontier RESearch COmpetences for Neuro-modulation and Oscillations in Pain" (FRESCO4NoPain). Its focus is neuronal oscillations generated by the human brain that also influence perception. The researchers hypothesize that many types of persistent pain are due to maladaptive brain oscillatory activity. In the interplay between basic research, experimental tests and clinical studies, the study aims to discover whether non-invasive neuromodulation is suited to treating pain. The coordinating institution for the MSCA doctoral network is Aalborg Universitet (Denmark). Leading the work at Heidelberg University is Prof. Dr Rohini Kuner, Executive Director of the Institute of Pharmacology, which is located at the Medical Faculty Heidelberg of Heidelberg University. The doctoral network FRESCO4NoPain will start up in February 2025 and receive funding of around 4.2 million euros.

Making the product cycle of micro- and nanorobots more sustainable is the goal of the doctoral network "A Training Programme on 5R's implementation in the design, manufacturing and application of micro and nanorobotic platforms" (GREENS). To date, research on such micro- and nano-scale robots has concentrated on techniques to produce and deploy as many of them as possible in a cost-efficient manner, for example to be able, in future, to transport active substances in the human body. The GREENS doctoral network aims to investigate how the whole process – from manufacture and production to application, right up to the disposal of micro and nano robots – can be designed sustainably and minimize their impact on the environment. The network is coordinated at the University of Barcelona (Spain). The Heidelberg project is led by Prof. Dr Eva

Blasco. Her group does research at the interface of macromolecular chemistry, materials science and nanofabrication at the Institute for Molecular Systems Engineering and Advanced Materials of Heidelberg University. The European Commission is funding the MSCA doctoral network with approximately 3.7 million euros. It will begin its work in February 2025.

Personalized medical approaches to treating chronic kidney diseases are the focus of the doctoral network "Personallzed medicine in Chronic KidnEy Disease" (PICKED). Despite the vast number of people worldwide with chronic kidney disease, the socio-economic impacts of this condition have so far been largely overlooked, which is leading to shortfalls in the development of personalized medical options. The doctoral candidates of the PICKED network will work in an interdisciplinary and cross-sectoral way to develop individualized strategies to meet patients' needs in the fields of detection, progression and treatment. The institution coordinating the PICKED doctoral network is the Institut national de la santé et de la recherche médicale in Paris (France). The lead supervisor on the Heidelberg side is Prof. Dr Franz Schaefer, head of the division for Pediatric Nephrology at the Center for Child and Adolescent Medicine of Heidelberg University Hospital. Approximately 2.7 million euros have been allocated to fund the research work, which is to start in October.

Through the networks funded in the Marie Skłodowska-Curie Actions, the European Commission intends to contribute to training highly qualified doctoral candidates in Europe. This way, they are to receive the best possible preparation for a career in academia and industry. Current issues are explored with actors from business and society in a consortium of universities and non-university research institutions. The funding is generally for four years. In addition to the five newly approved MSCA Doctoral Networks, the European Commission is currently supporting another 13 doctoral networks with participation by Heidelberg University.

Press release

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Source: Heidelberg University

Further information

- University of Heidelberg