



Press Release

Five European Research Council Consolidator Grants for University of Tübingen and University Hospitals

Two women and three men earn prestigious grants for outstanding projects in medicine, microbiology, and machine learning in Tübingen

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Five researchers at the University of Tübingen and University Hospital of Tübingen are to receive Consolidator Grants from the European Research Council (ERC). The awards come with generous project funding, usually of two million euros over a five-year period. In this funding round, the ERC approved 349 of the 3,121 applications submitted for Consolidator Grants across the EU - around 11 percent.

“Five applications from Tübingen have prevailed in the tough Europe-wide competition for Consolidator Grants - a remarkable success. These researchers have shown great inventiveness, with the potential for real innovation in medicine and machine learning,” said University President, Professor Dr. Dr. h.c. (Dōshisha) Karla Pollmann

The new Consolidator Grants:

- Professor Jan Böttcher, Institute for Immunology und M3 Research Center
Project: EICO-CODE investigates how chemical signals in the body can influence the immune system to strengthen the body's own defenses against infections and cancer
- Assistant professor Ana Brochado, Interfaculty Institute of Microbiology and Infection Medicine
Project: BacImmune-Decode focuses on the bacterial immune system to better combat pathogenic bacteria
- Professor Andreas Geiger, Department of Informatics
Project: CASIDO to accelerate scientific progress using artificial intelligence
- Professor Tobias Hauser, General Psychiatry and Psychotherapy
Project: CiBbl-OCD seeks better understanding and treatment of obsessive-compulsive disorders

**University of Tübingen
Public Relations Department
Christfried Dornis**

Director
Phone +49 7071 29-76788
Fax +49 7071 29-5566
christfried.dornis[at]uni-tuebingen.de

Janna Eberhardt
Research reporter
Phone +49 7071 29-77853
presse[at]uni-tuebingen.de

www.uni-tuebingen.de/aktuell

**Tübingen University Hospitals
Communication and Media
Bianca Hermle**

Director
Phone +49 7071 29-81032
Fax +49 7071 29-25024
bianca.hermle[at]med.uni-tuebingen.de

Steven Pohl
Research Communication Team
Leader
Phone no +49 7071 29-88494
steven.patrick.pohl[at]med.uni-tuebingen.de

www.medizin.uni-tuebingen.de/presse

- Dr. Madhuri Salker, Center for Women's Health, Department of Gynecology and Obstetrics
Projekt: babyRADAR is deciphering the basics of reproductive medicine

Consolidator Grants are awarded to experienced researchers in any discipline, seven to twelve years after completing their doctorates. The associated project funding is usually up to two million euros over a period of five years.

Jan Böttcher – How chemical signals control the immune system and open up new avenues in cancer defense



Jan Böttcher

Photo: Andreas Heddergott/TU München

The immune system is an amazing defense network that protects us from infection and helps fight cancer cells. Key to this process are CD8+ T cells. These immune cells can recognize, target and destroy viruses and tumor cells. Many modern immunotherapies aim to strengthen these cells to improve treatment for patients. Researchers know these T cells are regulated by signals from various tissues in the body; yet exactly how remains one of the major unanswered questions in immunology.

Jan Böttcher, a member of the Institute of Immunology, the M3 Research Center, and the iFIT excellence cluster, is seeking to find out how certain molecules - eicosanoids - influence the behavior and protective power of CD8+ T cells. Böttcher's project is called EICO-CODE (Unlocking the tissue code: Understanding organ-specific regulation of CD8+ T cell immunity by eicosanoids). Under the Consolidator Grant, it is to receive around two million euros over five years. Using state-of-the-art technologies such as single-cell sequencing, gene editing, and detailed mapping of eicosanoids, which are a type of lipid, in various organs, the team is investigating how local tissue factors control the immune response to cancer and viral infections.

"Our goal is to understand how chemical signals in the body control the immune system," Böttcher says. "If we can discover how eicosanoids influence the activity of T cells in various organs, this will open up new options for targeted strengthening of the body's own defenses against infections and cancer."

By combining organ biology and immune defense, EICO-CODE provides important new insights into what customized immunotherapies could look like in the future, paving the way for more precise and effective treatments that support the body's inherent healing powers.

Contact:

Professor Dr. Jan Böttcher
University of Tübingen and University Hospitals
Institute for Immunology – Experimental Immunology

M3 Research Center

Image-guided and Functionally Instructed Tumor Therapies (iFIT) cluster of excellence

jan.boettcher[at]uni-tuebingen.de

Ana Rita Brochado – Beating bacterial pathogens at their own game



Ana Rita Brochado.

Photo: Friedhelm Albrecht/University of Tübingen

The increase in antibiotic resistance requires new strategies to combat bacterial infections. In her project, BacImmuneDecode – Decoding bacterial immunity to enhance antimicrobial action, Ana Rita Brochado will investigate the regulation and function of bacterial immune defense systems to find novel approaches to combating bacterial infections. Her Consolidator Grant project receives two million euros from the ERC over five years.

Ana Rita Brochado's team recently tested a hundred substances using an automated high-throughput

method and made a surprising discovery: antifolate antibiotics activate the bacterial defense system CBASS in the cholera pathogen *Vibrio cholerae*. CBASS normally initiates the self-destruction of bacteria that have been infected by bacterial viruses, known as bacteriophages, to protect the remaining bacterial population. The team discovered that treatment with antifolate antibiotics and the absence of phages causes the bacteria to be damaged by its own immune response – rather like an autoimmune disease. This was a previously unknown function of antifolates, which could now be used to make antibiotics more effective and prevent further resistance.

Recently, more than a hundred additional phage defense systems have been identified in bacteria. Some of them, similar to CBASS from *V. cholerae*, protect bacteria from phages by harming the bacteria. Such defense systems are primarily encoded on mobile genetic elements and are common in bacteria. However, key aspects of their regulation remain unclear.

“In a large-scale screening, we will examine hundreds of bioactive molecules that have the potential to regulate the activity of different phage defense systems. We will experimentally map genetic and environmental triggers of the bacterial immune system of *E. coli*. In the long term, these triggers could be combined with phages to develop new therapeutic approaches against bacterial infections,” says Ana Rita Brochado.

Contact:

Professor Dr. Ana Rita Brochado

University of Tübingen

Interfaculty Institute of Microbiology and Infection Medicine (IMIT)

Cluster of Excellence: Control of Microorganisms to Combat Infection (CMFI)

Andreas Geiger – Artificial intelligence as an assistant for scientific innovation



Andreas Geiger Photo: Tübingen AI Center/Elia Schmid

In his project, Computational Assistants for Scientific Discovery (CASIDO), Andreas Geiger aims to develop new methods in artificial intelligence (AI) that will support researchers in making new discoveries and accelerate the progress of their work. His project will receive two million euros over five years.

“In certain fields, such as biology, chemistry, and materials science, AI has already proven its great potential for developing solutions,” says Andreas Geiger. “I want to use AI as a kind of general research assistant.” Geiger points out that the output of scientific publications is growing rapidly; researchers have to sift through thousands of new publica-

tions every day to identify relevant developments and understand complex relationships between subjects. “This flood of information overwhelms people. As a result, interesting connections in texts or patterns in databases are overlooked, opportunities are missed, and scientific innovation slows down,” Geiger says.

This is where his CASIDO project comes in: an AI assistant designed to support researchers in their daily work, for example, in reviewing and comparing research papers, identifying crucial gaps in research, and developing new and creative approaches. “We don’t want AI that replaces researchers, but rather AI that expands their capabilities,” says Geiger. “Our vision is a new generation of intelligent tools that help researchers better organize the existing knowledge.” He adds that it is about cooperation between humans and AI - in which humans contribute their strengths of creativity, intuition, and critical thinking to the scientific discovery process.

Andreas Geiger's Consolidator Grant follows directly on from an ERC Starting Grant. Over the past five years, he has been working on the LEGO-3D project, developing models that enable machines such as autonomous vehicles to learn to perceive their surroundings in three dimensions.

Contact:

Professor Dr. Andreas Geiger
University of Tübingen – Department of Informatics
Excellence cluster: Machine Learning: New Perspectives for Science
Tübingen AI Center
a.geiger[at]uni-tuebingen.de

Tobias Hauser – Tackling obsessive-compulsive disorders with personalized treatment



Tobias Hauser Photo: University Hospitals/Beate Armbruster

Mental illness affects millions of people worldwide and is one of the greatest challenges facing our society today. Yet many approaches to treatment have remained largely unchanged for many years and rarely take into account how different the brains and symptoms of individual patients can be. A typical example is obsessive-compulsive disorder (OCD): it is widespread and can severely impair everyday life, but existing treatments do not work equally well for everyone.

Tobias Hauser, of Computational Psychiatry at the Faculty of Medicine and fellow of the German Center for Mental Health (DZPG) in Tübingen is seeking to change this with his new project, CoNbl-OCD (Computational Neuroscience-based Interventions for OCD). Under the Consolidator Grant, he will receive two million euros for his research over five years. Hauser says we need to fundamentally rethink the treatment of obsessive-compulsive disorders, and enlist the help of the latest findings from neuroscience and artificial intelligence (AI). The goal is to develop state-of-the-art, personalized treatments that combine classic psychotherapy with innovative technologies such as brain scans, computer models of thinking, and generative AI. This should make it possible to better understand what happens in the brain during obsessive thoughts and to offer individually tailored support.

“We are at a turning point in the treatment of mental illness,” says Hauser. “In the CoNbl-OCD project, we aim to use the findings from modern brain research and AI to finally offer those affected more effective therapies that are better tailored to their personal needs.” Through close collaboration with people who have personal experience of OCD, as well as with mental health professionals, CoNbl-OCD ensures that the new methods are practical, safe, and suitable for everyday use. The goal is to develop modern, more effective treatments tailored to individuals affected by for obsessive-compulsive disorders.

Contact:

Professor Dr. Tobias Hauser
Tübingen University Hospitals
General Psychiatry and Psychotherapy Clinic
Developmental Computational Psychiatry Lab
tobias.hauser[at]uni-tuebingen.de

Madhuri Salker – Uncovering the mystery of how life gets started



Madhuri Salker Photo: University Hospitals Tübingen/Britt Moulien

Every year, millions of couples around the world struggle with the painful experience of not being able to carry a pregnancy to term or even conceive in the first place. In fact, about one in six couples is affected by unwanted childlessness, a problem that not only causes great personal suffering but also poses a significant health and socioeconomic challenge. For pregnancy to occur, an embryo must implant itself in the lining of the uterus. However, many of the biological signals that control this crucial step are still unknown. Since implantation takes place deep within the body and within a very short time frame, it is considered one of the great mysteries of biology.

Madhuri Salker from the Department of Gynecology and Obstetrics in Tübingen and assistant professor at the University of British Columbia, Canada, seeks to solve this mystery in her research project, babyRADAR (name derived from the use of “reconstructed assembloids, multimodal single cell sequencing and nanosensor development to study human implantation and pregnancy loss”). Her Consolidator Grant will be funded with two million euros over five years. Together with her team, she is researching how the uterus itself recognizes, selects, and supports embryos in the first days of pregnancy. Salker’s team has developed three-dimensional “sensing organoids” that replicate how the human uterus communicates with embryos – making it possible for the first time to directly observe implantation. Using state-of-the-art technologies such as multi-ome sequencing, CRISPR-based gene editing, and a tiny “micro-cradle” nanosensor that measures the health of embryos, the team aims to uncover why implantations sometimes fail and miscarriages occur.

“Our research brings us a decisive step closer to understanding how the very first communication between mother and embryo occurs,” Salker says, “If we understand why implantation fails, we can develop new diagnostic procedures, improve fertility treatments, and give new hope to affected families.” With the findings from babyRADAR, the team hopes to change the fundamentals of reproductive medicine and to give more families the chance to have a healthy child.

Contact:

Dr. Madhuri Salker

Tübingen University Hospitals

Department of Gynecology and Obstetrics – Margarete von Wrangell group leader

University of British Columbia, Canada

madhuri.salker[at]med.uni-tuebingen.de