Newsletter of the University Research Priority Program Adaptive Brain Circuits in Development and Learning

Dear Reader,

After an intense spring semester, we are happy to be back with our latest newsletter and exciting news: the evaluation of our research priority program has been a success. Many thanks to everyone who contributed! We are now ready to launch the second phase at full power and are currently opening several scientific and administrative positions.

Additionally, we are pleased to announce that we successfully founded a new platform for learning and learning disorders. Read the interview with founders Silvia Brem and Karin Kucian and have a look at their new website. Our own website also has a lot of new content, including an "AdaBD made easy" section with valuable information for laypersons.

And, mark your calendars: next year, we will be hosting an exciting international conference on Monte Verità in Ascona!

A new platform for research and outreach on learning and learning disorders

Developmental delay and learning disorders can significantly impact the development and well-being of affected children and their social environment. There is a great need for more research on learning disorders and on how to address them in school and everyday life. AdaBD members Silvia Brem and Karin Kucian - who lead research on language development and numerical cognition, respectively - have joined forces and found a platform for research and outreach on learning and learning disorders.

The URPP AdaBD runs this platform and is happy to welcome Leonie Holste as its coordinator! Since starting in May 2024, she designed a website (in German) for the platform with lots of interesting material on learning disorders. Further, she interviewed Silvia Brem and Karin Kucian on their research and their motivation behind this exciting project. Read the full interview on our website or a short version below.

Prof. Dr. sc. nat. Silvia Brem, PD Dr. sc. nat. Karin Kucian, and Leonie Holste (from left to right) manage and coordinate the platform on learning and learning disorders. Silvia Brem is head of the Developmental Cognitive Neuroscience Team at the University of Zurich in the Department of Child and Adolescent Psychiatry and Psychotherapy of the University Hospital of Psychiatry. Karin Kucian is head of the research group on Dyscalculia at the University Children's Hospital in Zurich. To carry out their research, they both use non-invasive, child-friendly imaging techniques such as EEG and MRI, alongside behavioral assessments.

Which are your research topics and how did the idea of the platform for learning and learning disorders arise?

Silvia's research explores how neuronal networks develop in healthy children and adolescents and in those with neurodevelopmental and psychiatric disorders. A significant part of Silvia's work is dedicated to studying the process of learning to read in children with or without reading difficulties. Karin investigates the neural and behavioral characteristics of numerical cognition in children with and without developmental dyscalculia, a specific learning disorder affecting numerical understanding and mathematics.

Reading and math challenges, however, are rarely isolated; they often co-occur with each other or alongside other developmental or psychological issues. Children with combined difficulties in reading and math face additional challenges on top of that and may be confronted with comorbidities such as ADHD. Therefore, it is crucial to harmonize research on these disorders rather than studying them in isolation. With AdaBD, we now have the opportunity to create this platform, ensuring inclusive research and effectively combining research and practice.

What are the goals of the platform?

The platform aims to increase awareness and knowledge of learning disorders to best support children, families, and teachers. We also aim to be an advisory and teaching service on the topic of diagnostics, since institutions such as schools and therapy centers that already work on learning disorders often have a need for guidance in this area. Additionally the platform will coordinate research efforts, foster collaborations with various institutions and establish a network at national and international levels. Since it is embedded in the URPP AdaBD, the platform receives the necessary structural and financial support in the first five years of existence to advance research in this interdisciplinary field. New research projects will for example focus on the behavioral and neural foundations of combined math, reading, and possibly other developmental disorders. We will develop a research database of existing data and give young researchers from different disciplines support in planning and conducting studies on learning and learning disorders. Through public relations efforts, ongoing studies and their results will be made more visible to various stakeholders, including the general public. This approach ensures that meaningful research findings can be more effectively integrated into everyday practice.

What is your biggest ambition in your work on learning disorders?

Our key goal is to de-stigmatize learning disorders and acknowledge that many people are affected. For this, it is essential to increase awareness and knowledge about learning disorders. We would love to see more emphasis on teaching learning disorders in teacher training programs, as teachers have a direct impact and are often the first point of contact for families. Learning disorders accompany a person throughout their life, and early detection and support for affected children can help them reach their full potential and prevent further behavioral and emotional problems. Also, post-diagnosis support must be improved with more therapy options and trained professionals to assist affected children. With the right support, effective management of learning disorders is possible.

To the website of the Platform (currently available in German).

AdaBD made easy

How does our brain change when we learn? Why are some people affected by learning disorders or developmental delays? Are you also interested in these questions?
Or are you an AdaBD researcher and you would like to explain what the AdaBD is doing to your children, your family or friends? Now we have a new section on our website that might help you with that! The illustrations are created by Marco Garbelli.

To AdaBD made easy (in English).
To AdaBD made easy (in German).

Upcoming Event

International Conference on Monte Verità, Ascona: May 25 - 28, 2025

"The Adaptive Brain: Development, Learning, and Learning Disabilities"

View from Monte Verità (Picture: www.monteverita.org)

In May 2025 we are organizing an international conference at Monte Verità with the aim of exploring latest research on neurobiological mechanisms underlying brain development, circuit adaptations during learning, and mechanisms behind learning disabilities. By bridging disciplines and examining these topics from diverse perspectives, we aim to inspire new insights into learning mechanisms and advance tools for diagnosing and treating neurodevelopmental disorders. Sessions are planned on genetics and circuit development, computational modelling, multisensory learning, memory consolidation, learning disabilities, and the assessment and promotion of cognitive abilities and brain function in children.

Abstract submission from November, 2024. More information will be found soon on our website.

New AdaBD Group leaders and open positions

We are pleased to announce that we are welcoming four new AdaBD Group leaders starting January 2025. They are internationally recognized researchers and will complement our network with their expertise. We are looking forward to starting collaborations.

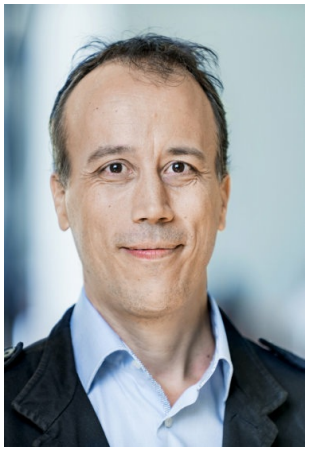
We are hiring! We have several positions to fill in the next months. If you are interested, check our website regularly.

To the open positions.

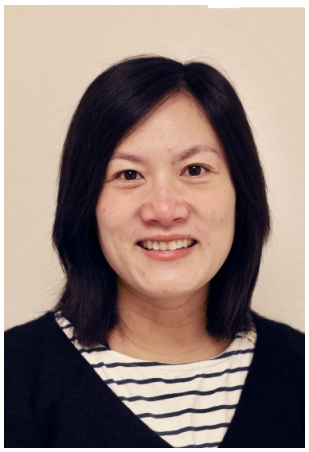
New Group leaders

Shuting Han
Cortical dynamics underlying sensory processing and memory
Brain Research Institute
University of Zurich
Website

Reto Huber
Sleep and development processes
University Children's Hospital Zurich
Website
and Department of Child and Adolescent Psychiatry, University of Zurich
Website



Philippe Tobler
Neural mechanisms of decision making and reward learning
Zurich Center for Neuroeconomics
University of Zurich
Website



Xiaomin Zhang
Laboratory of memory consolidation
Brain Research Institute
University of Zurich
Website

New Publications

2024

Bonte M, Brem S (2024), Unraveling individual differences in learning potential: A dynamic framework for the case of reading development, Developmental Cognitive Neuroscience 66, 101362

Cai L, Argunşah AÖ, Damilou A, Karayannis T (2024), A nasal chemosensation-dependent critical window for somatosensory development, Science 384, 652-660

Damilou A, Cai L, Argunşah AÖ, Han S, Kanatouris G, Karatsoli M, Hanley O, Gesuita L, Kollmorgen S, Helmchen F, Karayannis T (2024), Developmental Cajal-Retzius cell death contributes to the maturation of layer 1 cortical inhibition and somatosensory processing, Nature Communications 15, 6501

Holfeld A, Schuster D, Sesterhenn F, Stalder P, Haenseler W, ..., Picotti P (2024) Systematic identification of structure-specific protein–protein interactions , Mol Syst Biol

Nair AG*, Bollmohr N*, Schökle L, Keim J, Melero JMM, Müller M (2024) Presynaptic quantal size enhancement counteracts post-tetanic release depression, J Physiol.

Speckert A, Ji H, Payette K, ..., SPINA BIFIDA STUDY GROUP ZURICH, Jakab A (2024) OSBA: An open neonatal neuroimaging atlas and template for spina bifida aperta, bioRxiv

Vladimirov N, Voigt FF, Naert T, ..., Ziegler U, Stoeckli E, Baudis L, Lienkamp SS, Helmchen F (2024) The Benchtop mesoSPIM: a next-generation open-source light-sheet microscope for large cleared samples, Nature Communications 15, 2679

New Preprints

Bürgi N, Aydogan G, Konovalov A, Ruff CC (2024) A neural fingerprint of adaptive mentalization, PsyArXiv

Han S, Helmchen F (2024) Coordinated multi-level adaptations across neocortical areas during task learning, bioRxiv

Speckert A, Payette K, Knirsch W, von Rhein M, ...,SPINA BIFIDA STUDY GROUP ZURICH, Latal B, Jakab A (2024) Altered connectome topology in newborns at risk for cognitive developmental delay: a cross-etiologic study, bioRxiv

Yusifov E, Schaettin M, Dumoulin A, Stoeckli E, Bachmann-Gagescu R (2024)The Primary Cilium Gene Cplane1 is Required for Peripheral Nervous System Development, available at SSRN

See our website for a list of all publications.

* equal contribution

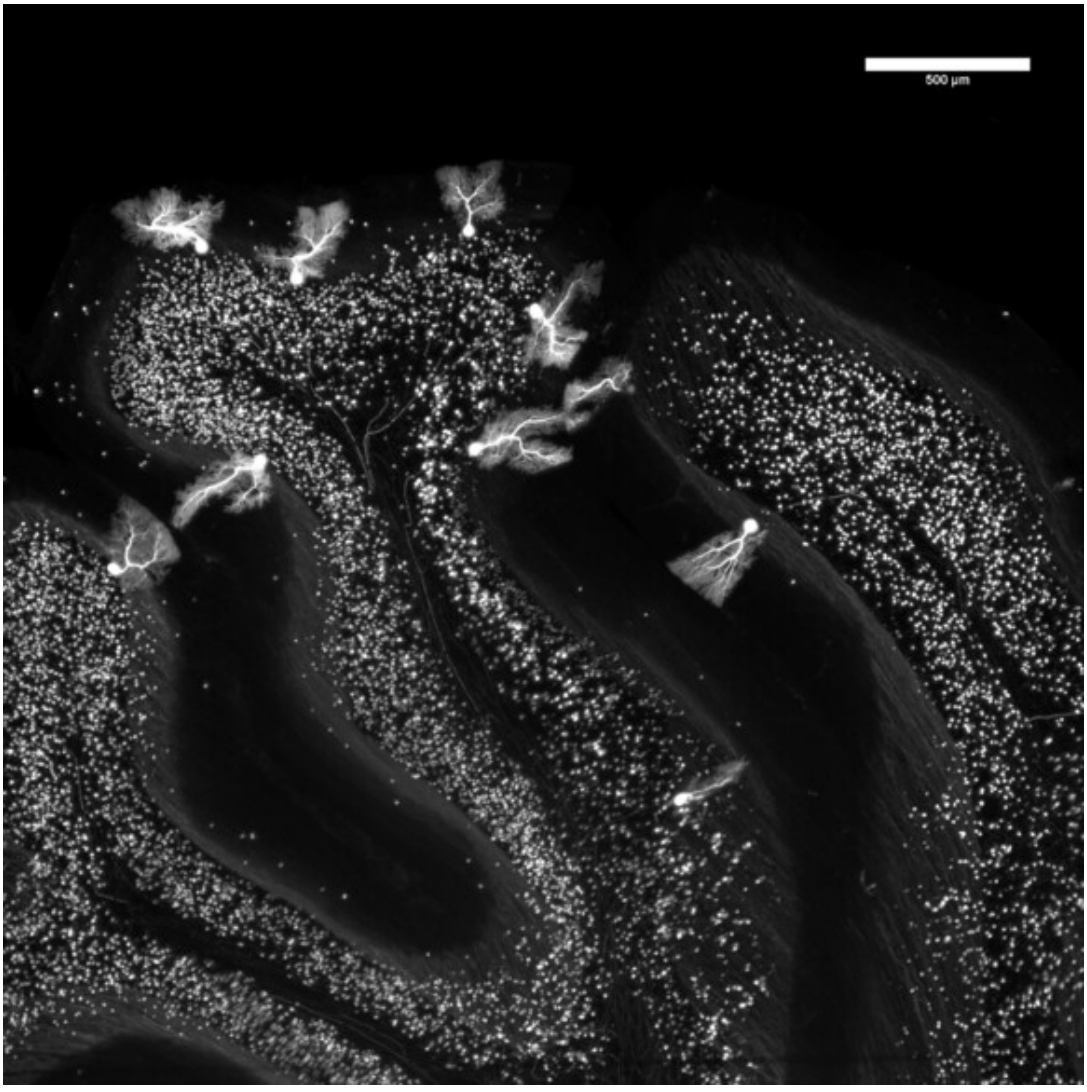
Awards and Appointments

We are happy to inform you that **Carmen Providoli** won the poster prize for her poster from the ChildBrainCircuits project at the last Burghölzli Psychiatry Meeting on February 2, 2024. Congratulations!

Progress report 2023

The progress report 2023 of the URPP AdaBD can be downloaded on our website.

Universität Zürich[UZH]



The mesoSPIM gallery - mesospim.org: Purkinje neurons in the cerebellum of a TPH2Cre-tdTomato mouse brain cleared using passive CLARITY.