



10 Questions

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How did you get involved in developmental neuroscience?

I have always been fascinated by how the human brain is associated with our behaviors, well-being and personalities. How it allows us to learn, how it enables our interactions and understanding, and how it is unique to every one of us. My masters and PhD studies were shaped by the people I met and the places I was able to travel to. I first studied Neuropsychology at UZH (Lutz Jäncke). I was able to visit different laboratories around the world and following my master's degree, I had the privilege to become a doctoral student in the Laboratories of Cognitive Neuroscience at Children's Hospital and Harvard Medical School in Boston (USA). Together with Nadine Gaab and her team, we developed pediatric neuroimaging protocols and tasks for neuroimaging research which also included younger children. Involving children in research requires a whole different way of storytelling, and this is where all my passion comes into play: I have always loved the arts, reading, and creative work as much as natural sciences. Thus, developmental neuroscience was the perfect place for me to be and combine it all. Studying how the human brain develops, grows, and learns through innovative and creative research techniques suitable to young children and families is to this day my dream job.

Could you name books or articles that have profoundly influenced your own thinking about the field?

I have always loved to read, from fictions to novels to biographies. My fascination about the human brain thus comes from various books and authors, including both scientists such as Oliver Sacks, Vilayanur Ramachandran, Erich Fromm, Maryanne Wolf, and classical authors such as Margaret Atwood, Haruki Murakami, or Javier Marias. I read everything our small-town library had to offer. Besides reading lots of science-based articles (from which I would like to highlight the work from Dani Bassett, Uta Frith, Adele Diamond, Susan Bookheimer, or Ruth Feldman), I

still love good books. My recent favorite science-inspired book reads are: *The Social Instinct: How Cooperation Shaped the World* (Nichola Raihani), *Inventing Ourselves* (Sarah J. Blakemore), *How We Learn* (Stanislas Dehaene), *Against Empathy: The Case for Rational Compassion* (Paul Bloom), *Science Fictions* (Stuart Ritchie), and *Two Heads* (Uta, Chris, & Alex Frith).

Which do you consider the main current debate within the field?

For one, we may still be learning about what evidence and method, or combinations thereof, are best and adequate to describe change. Meaningful emergence, continuity, and discontinuity of behavior and their associated impact on children's development and well-being are part of ongoing discussions that let us infer the nature of change. Secondly, there is need for theory guiding the investigation of mechanisms relating to change and to typical or atypical development on an individualized basis.

What research topics have been neglected or have not received enough attention so far?

While we have succeeded in the description of typical or average human behavior, there is still a need for more studies reporting on individual variability and trajectories that may allow us to develop more tailored, personalized solutions. I appreciate the Open Science movement and endeavors that work towards reproducible and replicable research. Large-scale projects are increasingly providing open source data and code, thus furthering basic knowledge. While we have made huge advances, it cannot be underestimated that the description of developmental processes requires time. To describe development, we have to study development. And for the individual human brain, that takes at least 25 years (or longer when considering the fact that our development is influenced by the generations preceding us). Understanding non-normative trajectories requires understanding of the average course and behaviors first. Similarly, we may have gained much knowledge from studies looking at ex-

treme forms of behaviors or adverse influences. It remains important to consider normative variations and their impact on our everyday lives. And ultimately, we are facing global challenges affecting society, and the questions we scientists should be asking ourselves should also be: What is it that we can do? How can we translate our knowledge in meaningful ways? How can we reach impact through science?

One of your foci takes an intergenerational perspective on socioemotional brain development. Can you tell us more about this?

The human brain is a product of complex, dynamic, interacting processes. Humans, and their brains, grow, develop, and learn in relation to the individuals around them. They are influenced by genetic, non-genetic, or epigenetic influences. Intergenerational transfer describes the transmission of parental traits (i.e., genetic and non-genetic) which impact their children. Socioemotional abilities represent different skill sets for social and emotional functioning. By impacting our ability to cope with stressful life circumstances, socioemotional skills are further associated with an individual's present and future well-being. Neurally, socioemotional skills are associated with the corticolimbic brain network. An intact functioning and structure of corticolimbic brain regions has been linked to healthy social functioning. Disruptions, however, are reported for psychopathologies.

Our research project SMILIES aims to systematically test intergenerational transfer effects on children's socioemotional development. To do so, corticolimbic structure, function, and connectivity are investigated using magnetic resonance neuroimaging in parents and their children. This allows us to look at parent-child dyads, but also at links between siblings or couples. An increased knowledge about corticolimbic brain development and socioemotional functioning is relevant for everyday life and mental well-being. Our project highlights the importance of parent-child relationships on brain development and provides a foundation for the understanding of the positive and negative back-cycling effects of experiences on children's lives.

How can your research be applied to everyday life?

Humans are inherently social beings. We grow up in our families, communities, and social systems. No human brain ever acts, grows, or learns in isolation. An increase in knowledge on the mechanisms underlying intergenerational transfer effects reflected in biology and behavior through investigation of parent-child dyads promises to impact our understanding of the transmission of complex skills. During early childhood, caregivers play a crucial role in providing external support, which enables children to develop and display adequate socioemotional skills. Direct effects of parental practices on children's emotion regulation strategies, including reappraisal and suppression are known. Furthermore, socioemotional and cognitive skill development are highly interrelated (e.g., to executive functioning or language skills). Overall, parental predispositions and functioning are strongly intertwined with that of their children. Investigations must extend beyond the individual child to disentangle the influence of intergenerational back-cycling of positive or negative experiences on brain development and learning. Such knowledge may hold the potential to further our understanding of disorders of corticolimbic brain regions, ultimately supporting early detection efforts and guiding possible prevention strategies.

What are you currently working on?

My present and future research aims to provide inter- and intra-individual knowledge about human brain development, ultimately enabling us to support each individual child in reaching their own goals and potential. Our team studies typical and atypical brain development in relation to human behaviors such as skill acquisition, learning, but also social and emotional well-being. We investigate brain trajectories in dependence on the environment children grow up in and the genetic predispositions they bring along for specific times in life or across the lifespan. Ongoing current projects include the study of:

1. Socioemotional and cognitive brain development using an intergenerational perspective (neural concordance design including whole families);
2. Adaptive brain circuits in development and learning with a particular focus on multi-

sensory processing through the University Research Priority Program (URPP) Adaptive Brain Circuits in Development and Learning (AdaBD; <https://www.adabd.uzh.ch>), which informs about the genetic, molecular, and cellular processes that form the basis of learning in children's brains;

3. Risk and resilience of stress exposure across the lifespan through STRESS; <https://www.hochschulmedizin.uzh.ch/en/projekte/stress.html>, the 2022 flagship project of Hochschulmedizin Zurich including over 15 partner institutions.

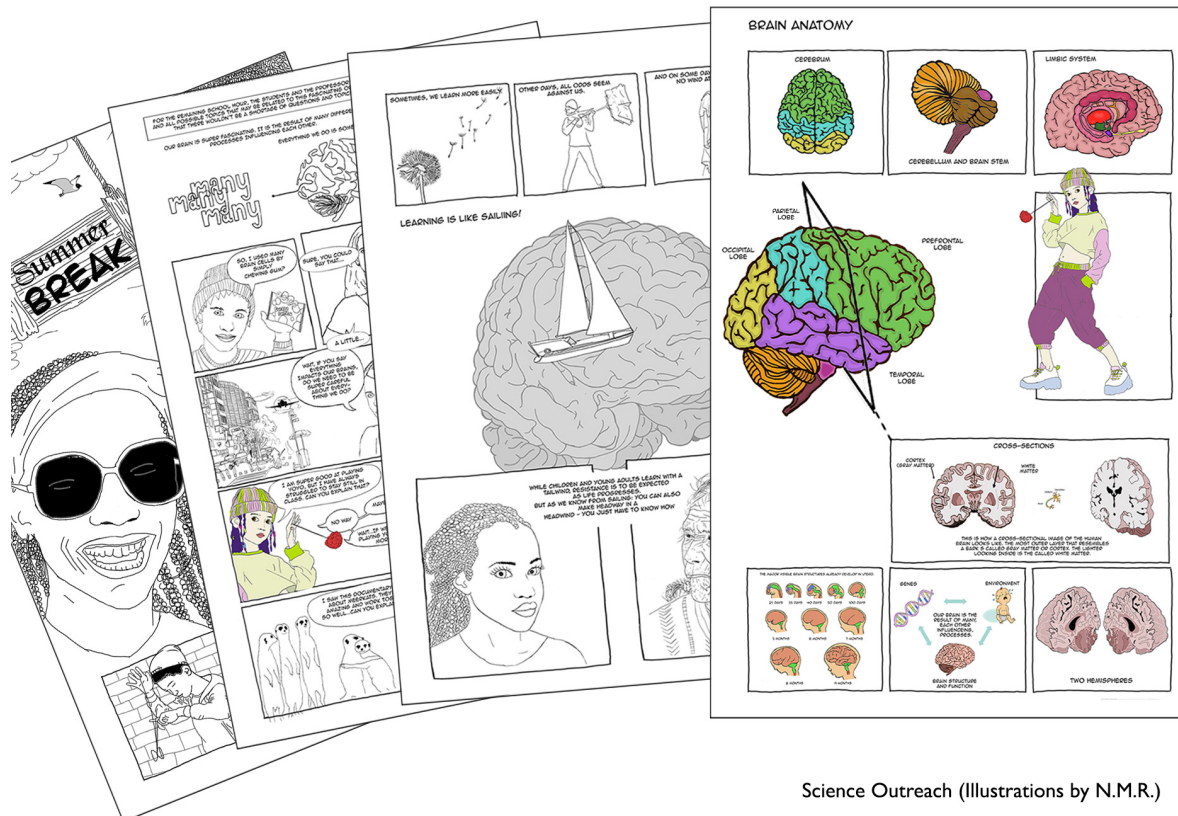
You are also particularly interested in science communication. Can you give us some examples of your activities in this domain?

Our laboratory strives to make science accessible beyond our institution and to reach educational systems, policy makers, and clinical practices. As part of this effort, we focus on science communication geared towards children, adolescents, and families who contribute to our research. I believe that if our research is not translated effectively to society, it loses value. I have participated in science outreach through various means, such as blogs, videos, or articles for children and

youth. At the moment, many of these are a bit slowed down as we are building up a larger science communication project talking about human brain development in health and disease. We aim to combine elements of science outreach, co-creation and dialogue to further public knowledge about brain and behavioral development, pointing out the connections to highly relatable topics such as mental health, learning, or the mysteries of the teenage brain. In addition, we guide our audience towards an increased understanding of the fundamental principles of the scientific process – how does science actually work? Thankfully, foundations such as the Swiss National Science Foundation or Cogito Foundation increasingly recognize science outreach efforts. Through their support, we plan to incorporate techniques such as dialogue or co-creation events in our outreach. One subgoal is also the development of a graphic novel entitled "Growing Brains." Therefore, beyond all the "science-ing," I am currently quite busy with writing and drawing (see below).

What is the added value of LIFE's internationality?

Many of our students have faced great challenges. The pandemic has paused many research agendas, required us to change routes, and pro-



Science Outreach (Illustrations by N.M.R.)

In their science communication and outreach efforts, my lab uses drawings, movie clips or podcasts to talk about science and all things relating to human brain development.

Illustrations by Nora M. Raschle

https://www.jacobscenter.uzh.ch/en/research/developmental_neuroscience/scicomm.html

hibited many from travelling and in-person networking. I appreciate that LIFE is an international network through which the students may connect with each other, find new mentors, and ideally build up new collaborations or become visiting scholars at one of our partner institutions. International collaborative efforts should be increasingly recognized, where data sharing and project coordination on an international level may be counted towards a student's track record. International programs are another means to gain new perspectives, learn about different lab cultures, and exchange ideas. I strongly believe that collaboration is key. In order to advance our understanding of the brain and its development in health and disease we have to cross borders, methodologies, and species. That's why I see the LIFE program as a unique opportunity to participate in a network of peers, collaborators, and mentors from within and outside one's own primary discipline.

Website:

https://www.jacobscenter.uzh.ch/en/research/developmental_neuroscience.html

Blog:

<https://bornascientist.com/>

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Image: Florian Moritz

New LIFE Faculty in Charlottesville

Patricia (Tish) Jennings is an internationally recognized leader in the fields of social and emotional learning and mindfulness in education and Professor of Education at the School of Education and Human Development at UVA. Her research places a specific emphasis on teacher stress and how it impacts the social and emotional context of the classroom, as articulated in her highly cited theoretical article “The Prosocial Classroom.” Jennings led the team that developed CARE, a mindfulness-based professional development program shown to significantly improve teacher well-being, classroom interactions, and student engagement in the largest randomized controlled trial of a mindfulness-based intervention designed specifically to address teacher occupational stress. She is a co-author of *Flourish: The Compassionate Schools Project* curriculum, an integrated health and physical education program, and is co-Investigator on a large randomized controlled trial to evaluate the curriculum’s efficacy. She is currently the Principal Investigator of Project CATALYZE, a study funded by the US Department of Education that is examining whether CARE enhances the effectiveness of a social and emotional learning curriculum. A member of the National Academy of Sciences Committee on Fostering Healthy Mental, Emotional, and Behavioral Development among Children and Youth, she was awarded the Cathy Kerr Award for Courageous and Compassionate Science by the Mind & Life Institute in 2018 and recognized by Mindful Magazine as one of “Ten Mindfulness Researchers You Should Know.” Earlier in her career, Jennings spent more than 22 years as a teacher, school director and teacher educator. She is the author numerous peer-reviewed journal articles and chapters and several books: *Mindfulness for Teachers: Simple Skills for Peace and Productiv-*



ity in the Classroom, The Trauma-Sensitive School: Building Resilience with Compassionate Teaching, Mindfulness in the Pre-K-5 Classroom: Helping Students Stress Less and Learn More, part of *Social and Emotional Learning Solutions*, a book series by WW Norton of which she is editor. Her latest book is *Teacher Burnout Turnaround: Strategies for Empowered Teachers*.

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CATALYZE: <https://www.catalyzeproject.org/>

Key publications

Jennings, P. A., & Greenberg, M. (2009). The prosocial classroom: Teacher social and emotional competence in relation to child and classroom outcomes. *Review of Educational Research*, 79(1), 491–525. <https://doi.org/10.3102/0034654308325693>

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