Reading and Manipulating the Neuronal Code After Brain Injury to Understand the Brain`s Self Repair Mechanisms

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Online Webinar

For Researchers

Speaker:

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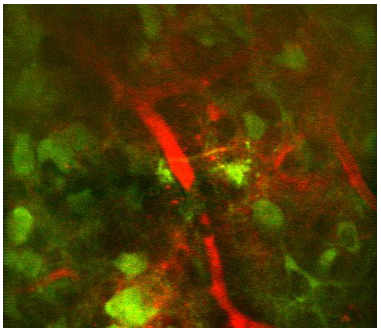
Abstract

My lab is interested in understanding fundamental principles of cellular physiology and pathophysiology which are part of the intrinsic repair machinery enabling forms of regeneration and recovery in the brain. However, why some nerve cells are chosen for regeneration while others maintain their old function, is not known. It is also not understood why and how some nerve cells form new connections, how old connections regrow, which neuronal circuits reorganize, stabilize or disintegrate and how neuronal remodeling contributes to the functional outcome. Our work focuses on revealing fundamental principles of individual nerve cell rewiring as well as the properties of nerve cell assembles to recode in response to damage and injury in order to regain lost or impaired functions. From networks to function: We use a combination of techniques, including 2-photon calcium imaging in the behaving animal, opto- and chemogenetics, sophisticated behavioral assessments for sensorimotor and cognitive functions as well as Deep Learning computer algorithms to explore causal relationships between neuronal rewiring- from a cellular resolution till a network level- and the behavioral phenotype. Our goal is to elucidate fundamental principles of the intrinsic repair machinery of the brain and how these intrinsic capacities can be further promoted by extrinsic treatment approaches to identify novel pharmacological targets, develop therapeutic approaches and optimize rehabilitative strategies for patients suffering e.g. from stroke and vascular dementia.



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2. Omlor W, Wahl AS, Sipilae P, Luetcke H, Laurenczy B, Chen IW, Sumanovski LT, van 't Hoff M, Bethge P, Voigt FF, Schwab ME, Helmchen F. Context-dependent limb movement encoding in neuronal populations of motor cortex. Nature Communications 2019 Oct 23.

3. Wahl AS, Büchler U, Brändli A, Brattoli B, Musall S, Kasper H, Ineichen BV, Helmchen F, Ommer B, Schwab ME, Optogenetic stimulation of the intact corticospinal tract after stroke restores motor control through regionalized functional circuit formation. Nature Communications 2017 Oct 30;8(1):1187.

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