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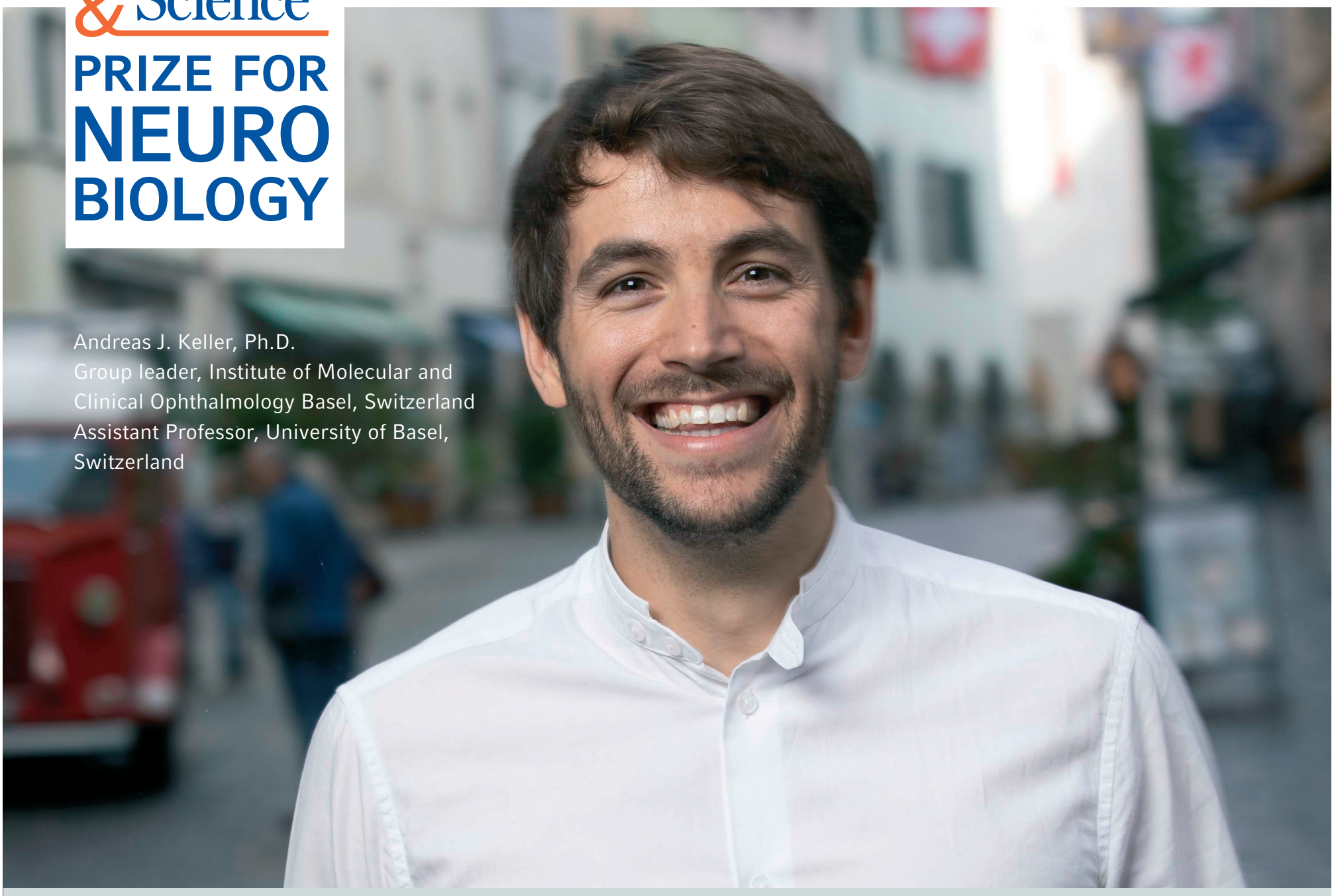
PRIZE FOR NEURO BIOLOGY



Andreas J. Keller, Ph.D.
Group leader, Institute of Molecular and Clinical Ophthalmology Basel, Switzerland
Assistant Professor, University of Basel, Switzerland

2021 Finalist: Andreas J. Keller, Ph.D.

Andreas Keller received his bachelor and master degrees in physics from ETH Zurich, where he completed his graduate education in the laboratory of Dr. Kevan Martin. During his Ph.D., Dr. Keller focused on rapid network state transitions in visual cortex, such as normalization and adaptation. For his postdoctoral work, he joined the laboratory of Dr. Massimo Scanziani at the University of San Francisco. Dr. Keller discovered that neurons in visual cortex have a second receptive field that is generated by feedback. After completing his postdoctoral fellowship, he started his laboratory at the Institute of Molecular and Clinical Ophthalmology Basel in 2021. His research focuses on mechanisms of cortical plasticity in feedforward and feedback circuits.

Hidden in Plain Sight – Context Controls the Activity of Sensory Neurons

We hardly notice when there is a speck on our glasses, the obstructed visual information seems to be magically filled in. The visual system uses visual context – the visual scene surrounding a stimulus – to predict the content of the stimulus. The mechanistic basis for this fundamental perceptual phenomenon has, however, remained obscure. What enables neurons in the visual system to respond to context when the stimulus is not available? In cortex, sensory processing is based on a combination of feedforward information arriving from sensory organs, and feedback information that originates in higher-order areas. Whereas feedforward information drives the activity in cortex, feedback information is thought to provide contextual signals that are merely modulatory. Dr. Andreas Keller, with his colleague Dr. Morgane Roth and under the mentorship of Dr. Massimo Scanziani, made the exciting discovery that mouse primary visual cortical neurons are strongly driven by feedback projections from higher visual areas, when their feedforward sensory input from the retina is missing. This drive is so strong that it makes visual cortical neurons fire as much as if they were receiving a direct sensory input! In other words – when there is nothing to see, we see what we expect to see based on the context.

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