In daily life central visual information processed in higher brain structures is associated with conscious sharp vision. Information from the visual periphery makes us aware of things which might happen, bringing those which our peripheral visual system will find enough important to the central visual processing, into the scope of further conscious and detailed analysis. The visual system is retinotopically organized, that is neighboring cortical regions respond to neighboring points in visual space. We undoubtedly now that these orderly maps are not static but instead remain malleable throughout life. Evidence for such plasticity in the mature sensory systems, comes from sensory deprivation or specific sensory stimulation of these systems. Such manipulations force the cortical neurons to deal with a specifically new sensory environment and cause changes of their molecular composition and, consequently, their signaling and functional properties. Till now, most of the visual plasticity models are exploring central vision, thereby overlooking peripheral vision. However, peripheral vision not only covers a large part of the visual field, but also actively participates in attentional selection of visual space to be processed by conscious central vision.We hypothesize that the peripheral visual system exhibits immature features, which would make it a favorable source of plasticity throughout life.

Can we hope for therapeutic strategies directed at engaging peripheral vision to compensate for impaired central vision processing? Macular degeneration is a common disorder of central human retina, it can be modeled by binocular lesions of central retina in animals. Our previous research showed plasticity of visual cortex following such treatment, whereby the region of cortex deprived of visual input by the retinal lesions is gradually filled by inputs from peripheral retina. Cats with retinal lesions will undergo visual discrimination training, leading to improvements in visual perception. To observe neuronal plasticity we shall perform electrophysiological experiments and register activity of single neurons in the visual cortex. With the new technique of Magnetic Resonance Imaging we shall investigate structure of white matter connections between visual regions of the brain and with magnetic resonance spectroscopy levels of excitatory and inhibitory neurotransmitters will be monitored in an intact brain.. This will help us to understand the plasticity in response to lesions, which in turn will increase our ability to influence the outcome of rehabilitation.