

## ABSTRACT

Microphthalmia has evolved in evolution many times independently within unrelated groups of mammals (e.g., subterranean rodents, insectivores, afrosericids and marsupials; echolocating bats, and shrews). Due to such extensive convergent evolution, investigation of mammals with reduced eyes provides a unique approach for understanding the adaptive significance of sensory regression and the impact of peripheral reduction on organization of central sensory structures. This thesis focuses on two issues.

In the first part of this thesis, a search for the primary visual cortex (V1) has been conducted in two bathyergid species, the Ansell's mole-rat, *Fukomys anelli* and the giant mole-rat *Fukomys mechowii*. Utilizing retrograde tracing and the technique of flattening and sectioning the cortex to visualize area boundaries, I have evidenced the presence of the V1 in the both species. It was small and, in comparison to other rodents, displaced laterally. Multiple injections of different tracers in different regions of the V1 resulted in retrograde labeling of distinct region of the dorsal lateral geniculate nucleus (DLG), implying conservation of the retinotopic organization within the geniculo-striate pathway. However, any injection into V1 resulted also in a robust retrograde labeling of the multimodal thalamic nuclei, namely lateral posterior thalamic nucleus (LP) and posterior thalamic nucleus (Po). Indeed, retrograde projections to the LP were always much stronger than those to the DLG. Thus, I conclude that only part of the cytochrome oxidase-dense region in the in far caudolateral cortex correspond to the V1, the rest of the area belongs to associative cortex processing multimodal information.

In the second part, I estimated the upper limits of visual acuity from peak density of ganglion cells and eye size in tree echolocating bats differing in hunting strategy: the common noctule *Nyctalus noctula* – a specialist in aerial insectivory, the brown long-eared bat *Plecotus auritus* – foliage gleaner and the mouse-eared bat *Myotis myotis* – a ground gleaner specialized for a large prey. In contrast to our expectation, all studied species features similarly low visual acuity ranging between 0.66 and 0.88 cy/°. Nevertheless, *P. auritus*, the smallest species possessing the smallest eyes, compensated a low retinal magnification factor by the highest ganglion cell density.