

Symposium 21 Visual behavior in birds: linking brain and behavior

Introduction

Lesley J. ROGERS¹, WANG Shu-Rong²

1. School of Biological Sciences, University of New England, Armidale, NSW 2351, Australia; lrogers@metz.une.edu.au

2. Laboratory for Visual Information Processing, Center of Brain and Cognitive Sciences, Institute of Biophysics, Chinese Academy of Sciences, Beijing 100101, China

Many aspects of avian behavior essential for adaptation and survival — foraging, selection of mates, territorial defense and detection of predators — depend on a well-developed visual system. No other class of animals, in fact, depends as much on vision as do birds. This symposium explores visual function in birds in the framework of the neuroanatomy and neurophysiology of visual systems and visual behavior. A number of recent findings make this topic timely. One of the most important advances in understanding visual processing and development in birds is the recognition that the avian visual system is lateralized at both midbrain and forebrain levels. The papers presented in this symposium address this characteristic, each from a different perspective.

The tectofugal visual pathway in birds is particularly complex; it transforms retinotopic place coding to a functionotopic coding system. Onur Güntürkün discusses complementary functional specializations of the forebrain hemispheres for processing visual information, and how they are affected by light stimulation of the embryo. As we have no detailed knowledge of the organizing principles of the equivalent visual pathway in humans, studies on birds are providing us with unique information. This paper also presents new information on neurochemical asymmetries that develop in the optic tecta as a consequence exposure of the embryo to light.

Contrary to earlier assumptions, there are many vi-

sual projections that cross the midline of the avian brain, as Chao Deng has shown and discussed here. This has consequences for processing visual information. In particular, it has significance for the ways in which the two forebrain-linked visual pathways are differentially involved in controlling pecking at food and social approach behavior.

The development of visual behavior in birds is discussed by Lesley Rogers. In particular, exposure of the egg to light over a particular range of intensities leads to the development of asymmetry in the visual pathways and lateralized feeding and agonistic behavior. Hormonal condition of the embryo interacts with the influence of light, and the ecological significance of both factors are discussed.

Shifts in hemispheric dominance and eye preferences to view stimuli take place during development in birds. Richard Andrew discusses his research on the domestic chicken showing how these shifts ensure that behavior is appropriate at each phase of development. The role of the shifts in hemispheric dominance in constraining and guiding learning is also considered.

In a fourth paper given orally, Shu-Rong Wang discussed the function of subtectal and centrifugal visual structures in the pigeon, concluding that the centrifugal system alerts ground-foraging birds to predators seen in the upper field. A full abstract of this paper is published in the Abstract Volume for the Congress.