



# The Neuroethology of Predation and Escape

By Keith T. Sillar, Laurence D. Picton, William J. Heitler

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The forces of natural selection have been a primary driver in the evolution of adaptive animal behaviours. On the one hand animals must evade predation in order to survive and pass on their genes; on other hand, and for the same underlying reasons, animals must also be capable of successfully capturing prey. This situation has led to an evolutionary arms race in which predator and prey are locked in the battle to survive. A common strategy in each situation is to enhance the speed of response, resulting in the evolution of neural, muscular and biomechanical designs that produce supremely fast and eye-catching behavioral responses.

The aim of this book is to illuminate the design principles of escape and predatory behaviours using a series of case histories from different animal groups and to emphasize the convergent evolution of neural circuitry that optimizes the chances of survival. Using these case histories the authors describe sensory mechanisms that aid prey and predator detection, central neural circuit designs that increase speed of response and neuromuscular and biomechanical properties that aid the performance of escape and predatory movements.

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### Editorial Review

#### Review

"The book is a terrific read for anyone who has some basic familiarity with the nervous system and already knows what neurons, synapses, and action potentials are. It describes how these basic elements are shaped and organized to give each predator or prey their unique abilities for predation or escape. It's written in an informal, story-telling style that still conveys all the technical information needed to understand sensory and motor mechanisms from the molecular to the behavioral level. It is appropriate for advanced undergraduates, and care has been taken to explain the oddities of English to non-native speakers." - Professor Donald H. Edwards, Georgia State University, USA "Frankly, the book is a gem and any self-respecting academic library aiming to offer a resource for up-to-date literature on forefront scientific research should carry this tome on its shelves." - John Simmers, University of Bordeaux, France

#### From the Back Cover

To eat and not get eaten is key to animal survival, and the arms race between predators and prey has driven the evolution of many rapid and spectacular behaviours. This book explores the neural mechanisms controlling predation and escape, where specializations in afferent pathways, central circuits, motor control and biomechanics can be traced through to natural animal behaviour. Each chapter provides an integrated and comparative review of case studies in neuroethology. Ranging from the classic studies on bat biosonar and insect counter-measures, through to fish-eating snails armed with powerful neurotoxins, the book covers a diverse and fascinating range of adaptations. Common principles of biological design and organization are highlighted throughout the text. The book is aimed at several audiences - for lecturers and students This synthesis will help underpin the curriculum in neuroscience and behavioural biology, especially for courses focussing on neuroethology - for postgraduate students The sections devoted to your area of specialism will give a flying start to your research reading, while the other chapters offer breadth and insights from comparative studies - for academic researchers The book will provide a valuable resource and an enjoyable read And, above all, we hope this book will inspire the next generation of neuroethologists.

#### About the Author

**Keith T. Sillar** is Professor and Head of the School of Psychology & Neuroscience at the University of St Andrews, in Scotland. His research interests include neurology, neuroscience and amphibian neurology. Along with Dr Heitler, he teaches an exchange course on neuroethology in the US.

**Dr William J Heitler** is a reader at the School of Biology, University of St Andrews in Scotland, where his research interests include the neurology of crayfish and other crustacea, and escape behavior as well as more general neurology and neuroscience. He teaches an exchange course on neuroethology in the US in conjunction with Professor Sillar.

**Laurence Picton** is at the School of Psychology and Neuroscience at University of St Andrews, Scotland.

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#### Joshua Lippert:

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