

# Preface

Although special flow-sensing abilities are absent in humans, countless aquatic (e.g., fish, cephalopods, crustaceans, some marine mammals), terrestrial (e.g., crickets, spiders and scorpions), and aerial (e.g., bats and perhaps birds) animals have flow sensing abilities that underlie remarkable behavioral feats. These include the ability to (1) identify and localize air or water borne prey signals, (2) follow silent hydrodynamic trails many seconds after the trail blazer has left the scene, (3) form hydrodynamic images of the environment in total darkness, and (4) swim or fly efficiently and effortlessly in the face of destabilizing currents and winds. In recognition of the increasing wealth of information on flow sensing systems in diverse species and the recent surge of engineering interest in biomimetics, an international conference on *Flow Sensing in Air and Water* was convened at the University of Bonn, Germany in July 2011. Leading scientists from all over the world and from different disciplines came together to share information on these fascinating systems so that basic principles of operation might be identified and applied to engineering applications involving autonomous control of underwater or aerial vehicles.

As the published proceedings of this unusual conference, this volume serves as a valuable reference for students and researchers alike in diverse disciplines. Each contribution provides a unique blend of literature review and current research from experts in the fields of sensory biology, neuroethology, computational neuroscience, and engineering. Thus, the entire volume provides a comprehensive survey of flow sensing systems in a variety of different animals over a wide range of topics, including the morphological and functional diversity of flow sensors, spatial and temporal characteristics of air and water flows encountered by animals in their natural environments, mechanosensory transduction mechanisms, processing of flow stimuli by the peripheral and central nervous system, signal analysis, neuronal modeling, and the engineered design of artificial flow sensors and processing algorithms for guiding autonomous vehicles.

Our hope is that this book will serve not only as a reference volume for those interested in flow sensing systems, but also as a source of bioinspiration for engineers and others interested in how behavior is guided by flow.

Flow Sensing in Air and Water

Behavioral, Neural and Engineering Principles of  
Operation

Bleckmann, H.; Mogdans, J.; Coombs, S.L. (Eds.)

2014, XIII, 562 p. 200 illus., 77 illus. in color., Hardcover

ISBN: 978-3-642-41445-9