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978-0-521-89497-5 - Evolution of Sleep: Phylogenetic and Functional Perspectives

Edited by Patrick McNamara, Robert A. Barton and Charles L. Nunn

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Evolution of Sleep

Research during the past two decades has produced major advances in understanding sleep within particular species. Simultaneously, new analytical methods provide the tools to investigate questions concerning the evolution of distinctive sleep state characteristics and functions. This book synthesizes recent advances in our understanding of the evolutionary origins of sleep and its adaptive function, and it lays the groundwork for future evolutionary research by assessing sleep patterns in the major animal lineages.

DR. PATRICK MCNAMARA is an Associate Professor of Neurology at Boston University School of Medicine and Veterans Administration (VA) Boston Healthcare System. He is based in the Department of Neurology at Boston University School of Medicine. He is the director of the Evolutionary Neurobehavior Laboratory and was awarded a National Institutes of Health (NIH) grant to study the phylogeny of sleep. Dr. McNamara is the recipient of a Veterans Affairs Merit Review Award for the study of Parkinson's disease and several NIH awards for the study of sleep mechanisms. He is also the author of *Mind and Variability: Mental Darwinism, Memory and Self*; *An Evolutionary Psychology of Sleep and Dreams*; and *Nightmares: The Science and Solution of Those Frightening Visions During Sleep*.

DR. ROBERT A. BARTON is a Professor at Durham University and Director of the Evolutionary Anthropology Research Group. He has published numerous papers on the topic of brain evolution, and, in addition to an NIH-funded project on the phylogeny of sleep, he has collaborated with Dr. Charles L. Nunn on the application of comparative methods to questions in mammalian biology and physiology.

DR. CHARLES L. NUNN is an Associate Professor in the Department of Anthropology at Harvard University. Dr. Nunn completed his Ph.D. at Duke University in biological anthropology and anatomy, and he conducted postdoctoral research on primate disease ecology at the University of Virginia and University of California Davis. He has had academic appointments in the United States (University of California Berkeley) and Germany (The Max Planck Institute for Evolutionary Anthropology). He is an author of *Infectious Diseases in Primates: Behavior, Ecology, and Evolution*, and his current research focuses on phylogenetic methods, disease ecology, and the evolution of primate behavior.

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PATRICK MCNAMARA

Boston University

ROBERT A. BARTON

Durham University

CHARLES L. NUNN

Harvard University

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Frontmatter

[More information](#)

Contents

Contributors vii

Acknowledgments ix

Introduction 1

PATRICK MCNAMARA, CHARLES L. NUNN, AND ROBERT A. BARTON

1 Ecological constraints on mammalian sleep architecture 12

ISABELLA CAPELLINI, BRIAN T. PRESTON, PATRICK MCNAMARA, ROBERT A. BARTON, AND CHARLES L. NUNN

2 Sleep in insects 34

KRISTYNA M. HARTSE

3 Schooling by continuously active fishes: Clues to sleep's ultimate function 57

J. LEE KAVANAU

4 What exactly is it that sleeps? The evolution, regulation, and organization of an emergent network property 86

JAMES M. KRUEGER

5 Evolutionary medicine of sleep disorders: Toward a science of sleep duration 107

PATRICK MCNAMARA AND SANFORD AUERBACH

Cambridge University Press

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Edited by Patrick McNamara, Robert A. Barton and Charles L. Nunn

Frontmatter

[More information](#)

vi Contents

- 6 Primate sleep in phylogenetic perspective 123**
CHARLES L. NUNN, PATRICK MCNAMARA, ISABELLA CAPELLINI, BRIAN T. PRESTON, AND ROBERT A. BARTON
- 7 A bird's-eye view of the function of sleep 145**
NIELS C. RATTENBORG AND CHARLES J. AMLANER
- 8 The evolution of wakefulness: From reptiles to mammals 172**
RUBEN V. RIAL, MOURAD AKAËRIR, ANTONI GAMUNDÍ, M. CRISTINA NICOLAU, AND SUSANA ESTEBAN
- 9 The evolution of REM sleep 197**
MAHESH M. THAKKAR AND SUBIMAL DATTA
- 10 Toward an understanding of the function of sleep:
New insights from mouse genetics 218**
VALTER TUCCI AND PATRICK M. NOLAN
- 11 Fishing for sleep 238**
I. V. ZHDANOVA

Index 267

Color plates follow page 182

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Contributors

Mourad Akaârir

Institut Universitari de Ciències de la Salut

Universitat de les Illes Balears

Charles J. Amlaner

Department of Biology

Indiana State University

Sanford Auerbach

Sleep Disorders Center

Boston University School of Medicine

Robert A. Barton

Evolutionary Anthropology Research Group

Durham University

Isabella Capellini

Evolutionary Anthropology Research Group, Department of Anthropology

Durham University

Subimal Datta

Sleep and Cognitive Neuroscience Research Laboratory, Department of Psychiatry

Boston University School of Medicine

Susana Esteban

Institut Universitari de Ciències de la Salut

Universitat de les Illes Balears

Antoni Gamundí

Institut Universitari de Ciències de la Salut

Universitat de les Illes Balears

Kristyna M. Hartse

Sonno Sleep Centers

El Paso, Texas

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Frontmatter

[More information](#)

viii Contributors

J. Lee Kavanau

Department of Ecology and Evolutionary Biology

University of California

James M. Krueger

Programs in Neuroscience

Washington State University

Patrick McNamara

Department of Neurology

Boston University School of Medicine

M. Cristina Nicolau

Institut Universitari de Ciències de la Salut

Universitat de les Illes Balears

Patrick M. Nolan

Mammalian Genetics Unit

Medical Research Council, Harwell

Charles L. Nunn

Department of Anthropology

Harvard University

Brian T. Preston

Department of Primatology

Max Planck Institute for Evolutionary Anthropology, Leipzig

Niels C. Rattenborg

Sleep and Flight Group

Max Planck Institute for Ornithology

Ruben V. Rial

Institut Universitari de Ciències de la Salut

Universitat de les Illes Balears

Mahesh M. Thakkar

Department of Neurology University of Missouri

Harry Truman Memorial VA Hospital

Valter Tucci

Department of Neuroscience and Brain Technology

Italian Institute of Technology

I. V. Zhdanova

Laboratory of Sleep and Circadian Physiology

Department of Anatomy and Neurobiology

Boston University School of Medicine

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Acknowledgments

This book is a consequence of our recent phylogenetic comparative studies of mammalian sleep. As we learned more about variation in mammalian sleep, we were naturally drawn toward broader patterns of sleep across different organisms. Several questions formed in our minds, such as: Would patterns that we documented in mammals hold in other groups of organisms, and which other organisms should be studied? How would we be able to identify sleep, and thus test hypotheses comparatively, in fish, reptiles, and insects? And are the hypotheses that we focused on in mammals even relevant to nonmammals?

Mammalian sleep itself is remarkably variable, with aquatic mammals exhibiting specializations for sleep that are not found in terrestrial mammals, and marked variation in the expression of rapid-eye-movement (REM) and non-rapid-eye-movement (NREM) sleep, sleep cycles, and the organization of sleep into one or multiple bouts per 24-hour period. As we stepped outside the world of mammals, we found that sleep is pervasive phylogenetically, and we discovered that it is even more varied than we expected. This book summarizes what is currently known about variation in sleep patterns and presents some new data and analyses. We hope that the chapters herein will inspire others to collect datasets similar to those now available for birds and mammals. Further research along the lines described by the chapters in this volume will only deepen our understanding of this fundamental behavior, and is sure to lead to deeper understanding of the function—or functions—of sleep.

We have many people to thank for their time, encouragement, and inspiration. First, we would like to thank Chris Curcio from Cambridge University Press for his advocacy of this project. He played a key role in seeing this project through to the end, and we appreciate his guidance as we navigated the many hurdles of a book project. We would also like to thank our many collaborators who have played a role in our comparative research on mammals, especially Isabella Capellini, Brian Preston, Alberto Acerbi, and Patrik Lindenfors.

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Lastly, we would also like to thank all of the authors who contributed chapters to this volume. This book would have been impossible without their combined knowledge, and they all went the extra mile to provide up-to-date reviews of sleep expression in their target taxa and an evolutionarily informed evaluation of sleep characteristics in those species.