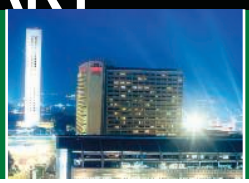

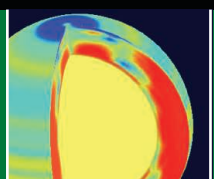

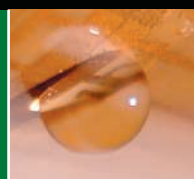

LETTERS

edited by Jennifer Sills

Sleepless in the Sea

IN THEIR RESEARCH ARTICLE "IDENTIFICATION of SLEEPLESS, a sleep-promoting factor" (18 July, p. 372), K. Koh *et al*. note that "[s]leep is an essential process conserved from flies to humans." This is not quite true. Many piscine species are active continuously without sleep (*1*), including species of marine and freshwater fishes in which schooling—swimming synchronously in polarized groups (*2*)—is fully developed (*3*).

Nonsleeping fishes achieve sleep's major benefits but completely bypass a need for sleep. By schooling, they greatly reduce the average school member's reception and processing of sensory input, so that it does not interfere with ongoing memory processing. Sleep, like schooling, seems to accommodate nonurgent memory processing, leaving the activity period free for critical waking functions and enabling the brain to operate efficiently at all times (*4*).

J. LEE KAVANAU

Emeritus Professor, Department of Ecology and Evolutionary Biology, University of California, Los Angeles, CA 90095–1606, USA. E-mail: mg_kavanau@yahoo.com

References

1. J. L. Kavanau, *Brain Res. Bull*. **46**, 269 (1998).
2. D. H. Cushing, F. R. H. Jones, *Nature* **218**, 918 (1970).
3. E. Shaw, in *Development of Behavior*, L. R. Aronson, E. Tobach, D. S. Lehrman, J. S. Rosenblatt, Eds. (W. H. Freeman, San Francisco, 1970), pp. 452–480.
4. J. L. Kavanau, *Sleep Med. Rev.* **9**, 141 (2005).

A Bird's Eye View of Sleep

IN THE NEWS FOCUS STORY "SIMPLE SLEEPers" (18 July, p. 334), E. Youngsteadt highlights recent advances, derived from genetic research in fruit flies and other "simple" animal models, in our understanding of sleep. The power of this genetic approach is undeniable, but the simplicity that renders such model animals amenable to genetic manipulation necessarily limits their ability to model all aspects of sleep in mammals. Most notably, simple animal models lack the changes in brain activity that define mammalian slow-wave sleep (SWS) and rapid eye movement (REM) sleep (*1*). Until we determine the functional relevance of the changes in brain activity that define these characteristics of mammalian sleep, our understanding of human sleep may be incomplete.

We contend that birds, as the only non-mammalian taxonomic group to exhibit SWS and REM sleep, provide a largely untapped opportunity to determine the functions of these states in mammals. Reptiles and amphibians lack comparable sleep states, indicating that SWS and REM sleep evolved independently in the respective ancestors of mammals and birds (*2*). Consequently, traits shared only by mammals and birds may be the functional targets of these states. Interestingly, mammals and birds also independently evolved complex brains capable of orchestrating complex cognition, unlike that observed in reptiles and amphibians (*3*). Given that complex brains, complex cognition, and SWS and REM sleep evolved in concert, these shared traits may be functionally interrelated (*2*, *4*). Indeed, the recent discovery of mammalian-like SWS homeostasis in birds suggests that functional hypotheses that posit a role for SWS homeostasis in maintaining adaptive brain function in mammals may also apply to birds (*4*).

We believe that comparative studies of sleep in mammals and birds offer the promise of revealing overriding principles directly tied to the function(s) of SWS and REM sleep that might remain obscure through an exclusively mammal-based or simple animal model approach.

NIELS C. RATTENBORG,*
DOLORES MARTINEZ-GONZALEZ,
JOHN A. LESKU, MADELEINE SCRIBA

Sleep and Flight Group, Max Planck Institute for Ornithology, Eberhard-Gwinner-Strasse, 82319 Seewiesen, Germany.

*To whom correspondence should be addressed. E-mail: rattenborg@orn.mpg.de

References

1. D. A. Nitz *et al*., *Curr. Biol*. **12**, 1934 (2002).
2. N. C. Rattenborg, *Brain Res. Bull*. **69**, 20 (2006).
3. E. D. Jarvis et al., *Nat. Rev. Neurosci*. **6**, 151 (2005).
4. D. Martinez-Gonzalez *et al*., *J. Sleep Res*. **17**, 140 (2008).

NSO's Environmental and Cultural Efforts

IN THE NEWS FOCUS STORY BY Y. BHATTACHARJEE "From atop a mountain, a deeper look at the Sun" (25 July, p. 478), the quote attributed to me next to my picture was used outside of the context of our discussion, leaving an unfavorable and highly inaccurate impression. Bhattacharjee and I were discussing the upcoming schedule for the construction of the Advanced Technology Solar Telescope (ATST) and the potential impact (on schedule) in the event of an impasse during mitigation negotiations. We do not expect this. It has been and remains the project's intention to support the National Science Foundation (NSF) in its plan to mitigate impacts that the ATST may have.

The impression that the National Solar Observatory (NSO), the ATST project office, or

Published by AAAS