

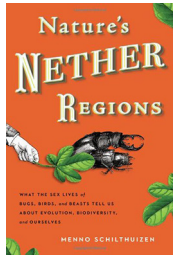
Peeking at private parts, for science

Nature's Nether Regions: What the Sex Lives of Bugs, Birds, and Beasts Tell Us about Evolution, Biodiversity, and Ourselves by Menno Schilthuizen, Viking Penguin, 2014. US\$28.95, ISBN 978-0-670-78591-9

Marlene Zuk¹ and Justa L. Heinen-Kay^{1,2}

¹ Department of Ecology, Evolution, and Behavior, University of Minnesota, St Paul, MN 55108, USA

² Department of Biological Sciences, North Carolina State University, Raleigh, NC 27695, USA



Peppered with personal stories, historical context, and examples from across the animal kingdom, *Nature's Nether Regions* provides an accessible and entertaining account of one of the most fundamental, but long overlooked, aspects of biodiversity – animal genitalia. Belying their seemingly simple function, genitalia often exhibit bizarre shapes and sizes. Taxonomists have known this for centuries,

employing genital morphology to identify species. But research aimed at unraveling why genitalia evolve such elaborate forms did not take root until recent decades. Waage's paper on damselfly penises [1] and Eberhard's book, *Sexual Selection and Animal Genitalia* [2], launched genital evolution onto the forefront of evolutionary biology research. We have learned much about the phenomenon since, and *Nature's Nether Regions* synthesizes the research for a general audience, confirming that the field has graduated out of infancy. Although other books on animal genitalia have recently been published [3], *Nature's Nether Regions* occupies a distinct niche, brimming with colorful tales of the how's and why's of animal genitalia and mating systems, and humanizing stories of the scientists behind the research.

Schilthuizen adeptly counters many widely-held assumptions about animal genitalia and mating. For starters, he details the astonishing diversity of genital form and function across the kingdom, from the file-and-scraper system of crane flies to the 'multiple sideways-pointing flanges on the rhinoceros phallus', with the latter apparently imitated by the intrepid penis-piercings in some men of Borneo. Invertebrates are the main stars here, showcased by the strange-but-true discovery of a woman 'impregnated' with squid spermatophores released after she ate raw calamari. Aside from their gee-whiz quality, however, such anecdotes underscore an important point: sexual selection has produced a wide variety of solutions to the ubiquitous problem of perpetuating one's genes, much wider than many people imagine. Meticulous drawings (we wished for more of them) illustrate the elaborate sperm storage organs of dung flies and the 'singing penis' of crane flies (on a note of middle C, as it happens). What is more, the book shows us how obscure species can be useful in arriving at general principles, including the realization that more than one way to be male or female exists.

Rejecting the popular notion that sex is a cooperative feat with male and female interests perfectly aligned, Schilthuizen recounts cases of sexual conflict and cryptic female choice. He emphasizes that copulation, insemination, fertilization, and reproduction are not synonymous – at each stage, females may exert control and males can work to circumvent female choice. The relative balance of these forces can differ drastically between species – from sheet-web spiders that spend hours engaged in energetically taxing courtship to gain female approval before insemination, to bedbugs that stab their penis into a female's abdomen to administer sperm. The battle for control of reproduction can occur even in hermaphroditic animals that rely on mutual insemination.

Schilthuizen seamlessly incorporates human examples, emphasizing the action of selection on our own genitalia. For instance, although the reason remains a mystery, at some point in evolutionary history humans lost the penile spines and solid mating plugs exhibited by chimps and some other primates. The clitoris in humans and other mammals also receives much attention, pointing to multiple 'discoveries' of the clitoris and (until fairly recently) its conspicuous absence from medical reference books as evidence of bias in science.

Although we heartily recommend the book for friends and relatives interested in biology, it might not be the best choice for a graduate seminar or other more scholarly purposes. For example, it does not accurately portray the relative roles of sperm competition and cryptic female choice, suggesting that the former had been overlooked until recently, when in fact beginning with Parker's work and continuing on in Simmons' exhaustive book [4], the reverse has been the case. Evidence for cryptic female choice, in which a female biases paternity of her offspring towards particular males after copulation, has turned out to be rather thin on the ground. Schilthuizen also seems to accept the appealing but unsupported notion that orgasm in women promotes fertilization, dwelling on work by Baker and Bellis [5,6] that turned out to have several methodological problems [7,8].

Nature's Nether Regions takes us from an era when even Darwin's thoughts on genital diversity may have been censored by the Victorian sensibilities of his daughter Etty to one when private parts are serious scientific topics, and does so without succumbing to either overly pedantic descriptions or prurient sniggers.

References

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