

***Future Humans: Inside the Science of Our Continuing Evolution.* By Scott Solomon. New Haven and London: Yale University Press; 2016. US \$25.00 (Hardcover). 225 p. ISBN: 978-0300208719**

Scott Solomon has created an enjoyable, memoir-style narrative aimed at well-informed readers. He takes us on scientific adventures from his lab to jungle expeditions to high-altitude plateaus where we can observe evolution in action.

My favorite story described how three completely different adaptations allowed our species to thrive in the environmental puzzles of the Peruvian Andes, the Tibetan Plateau, and the Ethiopian Semien Plateau. The environmental puzzle is this: *homo sapiens* physiology rests on aerobic metabolism, which requires oxygen. To transport oxygen from the air to the organs, we evolved a molecule called hemoglobin. Hemoglobin binds oxygen at a rate proportional to the oxygen concentration in the lungs (i.e. the air). The more oxygen in the air, the more oxygen binds to hemoglobin, the more oxygen hemoglobin takes to the organs. The puzzle is that at high altitudes, there is less oxygen in the air, so less binds to hemoglobin and less makes it to the organs, and you die. So, the puzzle is to stay alive.

Native Andeans (descendants of the Incans living in South America) solved this puzzle with a large chest with large lungs and more hemoglobin in their blood. A larger chest and lungs means more loading bays for oxygen. More hemoglobin means the overall oxygen transported to the organs doesn't change.

Yet Tibetans in similar low-oxygen environments have much less hemoglobin than the Andeans—the same amount, in fact, as people living at sea level. Tibetans evolved a completely different adaptation: Tibetans have more nitric oxide (a vasodilator) in their blood and more capillaries in their organs. This combination allows more blood flow (larger vessels) and more oxygen delivery (more vessels), so organ oxygen remains at a healthy level.

In the Semien Plateau, the Amhara people don't have more blood flow or capillaries like the Tibetans. They also don't have more hemoglobin like the Andeans. The Amhara evolved a separate adaptation that allows them to carry more oxygen on each hemoglobin molecule and perhaps in the blood itself (we're unsure how it works). Three populations, three completely different adapta-

tions: the *homo sapiens* version of Darwin's finches.

In another chapter, Solomon describes evolutionary altruism in terms of an App store. He again starts with a puzzle: how to get your organs to do stuff. The solutions can be thought of as tiny enzymatic functions that you can either genetically program yourself, or partner with someone who has already written the code. Think a genetic version of the App store, with millions of microbes offering their enzymes at your service:

"...Our evolutionary history involved outsourcing—some of the jobs that could be done in-house, by our own genes, are instead performed by the genes present in our microbial partners....Our microbiome contains one hundred times more microbial genes than does our own genome, meaning our partners can perform far more functions that we can on our own...[and] our microbiome can evolve far faster than we can—about one hundred thousand bacterial generations for every one human generation." (pp 149-150)

So why toil away, strumming at the genetic keyboard to code enzymatic solutions, when we could partner with our microbiome? The idea made me giddy.

The one criticism I have for Solomon's otherwise lovely book is he confines himself to theoretical discussion. Solomon notes that our species is more interconnected now than at any other time in human history, yet he doesn't apply this to the realm of policy. Specifically, I would have enjoyed more science-based, data-driven perspective of policies that affect international collaborations—whether scientific, economic, or cultural. It may be that to maintain our age of increased connectedness for *Future Humans*, people with Solomon's wisdom will need well-evolved vocal cords to insure these theories remain praxis.

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***Carnivore Minds: Who These Fearsome Animals Really Are.* By G. A. Bradshaw. New Haven: Yale University Press; 2017. US \$35.00 (Hardcover). 360 p. ISBN: 978-0300218152**

In popular media and public opinion, carnivorous

animals are typically portrayed as mindless killing creatures: everybody knows of the “lifeless eyes” of a great white shark or the “killer instinct” of a wolf. However, closer investigation of these animals often reveals complex social, emotional, and psychological features that are often ignored by us fearful, fleshy humans. In this book, G.A. Bradshaw takes readers on a deep dive into the minds of animals that so have often been feared and misunderstood, exploring unexpected connections between various fields of animal science and novel findings in psychology and neuroscience.

Bradshaw begins by pointing out some of the logical inconsistencies and gaps in conventional thinking – for example, grizzly bears actually mostly consume fruits, berries, and grains and kill only occasionally. We humans hardly classify ourselves as carnivores and yet humans often inflict far more pain and suffering to the animals we raise in captivity and kill for food than what so-called “wild” animals do in nature. Each chapter focuses on a particular animal (sharks, grizzly bears, crocodiles, coyotes, and others), detailing studies of these animals’ psychology, emotional behaviors and social sensibilities. Bradshaw paints a vastly more detailed portrait of the carnivore’s minds than has previously been appreciated. Various fields of study have been applied to animal psychology, but there has rarely been much cross-talk between researchers in such disparate fields as neuroscience, animal behavior, field researchers, and wildlife conservationists. Bradshaw makes important connections spanning decades of research in human and animal psychology, highlighting key mechanisms and common biological principles across the animal kingdom. These insights have important implications for scientific researchers and the public alike, in animal science, wildlife conservation efforts, and reveal deeper insights in neuroscience and psychology by studying common mechanisms across species.

The book is intended for a broad audience of readers of popular science and academics alike, and the wonderful narrative style will appeal to readers of all types. Bradshaw’s own expertise (recognizing and studying post-traumatic stress disorder in elephants and other animals) as well as the detailed research of others provide breadth and depth to the text, and extensive notes and references provide sources for further reading. Her storytelling ability and the structure of the book around personal stories, and of course the content itself, make this book a fascinating read.

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The Mystery of Sleep: Why a Good Night’s Rest Is Vital to a Better, Healthier Life. By Meir Kryger, MD. New Haven: Yale University Press; 2017. US \$20.38 (Hardcover). 330 p. ISBN: 978-0300224085

This book introduces readers to the topic of sleep, raises awareness of the effects of sleep disorders on people’s lives, and empowers people to use the tools in the book to recognize sleep problems and to seek help. The author has divided the book into four parts. Part one, titled “A Good Night’s Sleep,” covers chapters 1-5, with topics spanning reasons one sleeps, sleep requirements in the life stages, and discussions relating to sleep in the reproductive years, pregnancy and postpartum, and when sex hormone levels decrease in menopause and andropause. Interestingly, one learns that at various times and places, sleeping sitting up was the norm! Part two, titled “Do I Have a Sleep Problem?” includes chapters 6-9, covering the topics of how to identify a sleep problem, secondhand sleep problems, resetting the body clock, and a discussion on a world that never sleeps, noting that irregular-shift and overtime jobs can contribute to sleep deprivation and health problems. Part three, titled “Can’t sleep, Can’t stay awake,” consists of chapters 10-17, which introduce the reader to insomnia, restless legs syndrome, sleep apnea, narcolepsy, fear of sleeping and other unusual ailments, medical and psychiatric conditions that affect sleep (like diabetes, heart failure, depression, obsessive-compulsive disorder), and medications that contribute to sleep disorders. In part four, “Getting Help,” chapters 18-21 cover the value of the sleep clinic, along with topics on beating insomnia without pills, medications that treat sleep disorders, and time for bed.

Throughout the book, the author uses examples, like the case of the sleepy teenager or the sleepy woman with irregular periods who had symptoms of polycystic ovarian syndrome (PCOS), to bring the material to life; he also discusses treatment options for these cases. Additionally, the author uses figures throughout the book, like recommended hours of sleep for each of nine age groups, to summarize key data. The book can be of interest to various groups, including new mothers who may experience sleeplessness as a symptom of depression and who should seek medical attention for evaluation and treatment. Useful tools that are introduced in identifying a sleep problem include the Epworth Sleepiness Scale and the sleep diary. One can also read an interesting discussion about Spain and why one eats dinner there so late! In trying to manage insomnia, one learns about the usefulness of the sleep clinic, the 13 commandments for fighting insomnia, and treatment options for various conditions that affect sleep, like using a drug called prazosin for treating nightmares in patients with post-traumatic stress disorder (PTSD).