



The Evolution of Human Physical Activity

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Co-chairs:

Tatum Simonson, University of California, San Diego

Daniel Lieberman, Harvard University

Sponsored by:

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BIOGRAPHICAL SKETCHES: CO-CHAIRS



Tatum Simonson is Assistant Professor and John B. West Endowed Chair in Respiratory Physiology in the Division of Pulmonary, Critical Care, and Sleep Medicine at UC San Diego School of Medicine. Simonson applies integrative physiological genomics approaches to understand systems-level responses to hypoxia in highland populations. Her research provides evidence for genetic adaptations to high altitude and associations among these factors, molecular functions, and physiological traits. In addition to her research in the highlands of Tibet and Peru, her team studies natural variation in human responses to low oxygen and aims to understand the contributions of genetic and epigenetic factors to variation in hypoxia-related disease states (e.g., altitude illness, sleep apnea, and cardiopulmonary diseases). These and related interdisciplinary efforts are coordinated through the recently developed Center for Physiological Genomics of Low Oxygen at UC San Diego.



Daniel Lieberman is the Edwin M. Lerner II Professor of Biological Sciences in the Department of Human Evolutionary Biology at Harvard University. He received degrees from Harvard and Cambridge University, and taught at Rutgers University and George Washington University before joining the Harvard Faculty in 2001. Lieberman's research, which focuses on the evolution of human physical activity, combines experimental biomechanics, anatomy, and physiology both in the lab and in the field, and he has conducted research in Africa for almost 30 years, and now also works in Mexico. He loves teaching and has published over 150 papers, many in journals such as *Nature*, *Science*, and *PNAS*. He is best known for his research on the evolution of the head and on the evolution of running, which he also enjoys doing himself. He has published several books, *The Evolution of the Human Head* (Harvard University Press, 2011), and *The Story of the Human Body: Evolution, Health and Disease* (Vintage, 2013), and *Exercised: Why Something We Never Evolved to Do Is Healthy and Rewarding* (Pantheon, 2021).

BIOGRAPHICAL SKETCHES: SPEAKERS



Herman Pontzer is Associate Professor of Evolutionary Anthropology at Duke University. Through lab and field research, he investigates the physiology of humans and apes to understand how ecology, lifestyle, diet, and evolutionary history affect metabolism and health. He is also interested in how ecology and evolution influence musculoskeletal design and physical activity. Field projects focus on small-scale societies, including hunter-gatherers and subsistence farmers, in Africa and South America. Lab research focuses on energetics and metabolism, including the development of new methods for measuring energy expenditure, physiology, and metabolic health in the field.

BIOGRAPHICAL SKETCHES: SPEAKERS (CONTINUED)



Ellen Breen is part of the Research Faculty in the Section of Physiology, Division of Pulmonary Critical Care and Sleep Medicine, Department of Medicine at UC San Diego. Her research has focused on the molecular biology and physiology regulating the oxygen transport system. In particular, she has focused on the interaction of the lungs, skeletal muscle, and brain to provide sufficient oxygen during exercise and how these systems are compromised in many chronic diseases, such as chronic obstructive pulmonary disease. Recently, she started studying a very interesting evolutionary change in hominins that took place about 2 million years ago. This involves the expression of the gene for CMP-Neu5Ac Hydroxylase (CMAH). Other primates express CMAH but due to a genetic mutation, humans lost this hydroxylase which modifies a cell surface sugar, sialic acid. Her recent studies show that replicating this biochemical change in mice leads to remarkable improvement in endurance exercise capacity, mitochondrial function

and overall oxygen utilization.



Yana Kamberov is Assistant Professor in the Departments of Genetics and Dermatology at the University of Pennsylvania, where she joined in 2016. Her lab's research focuses on the genetic mechanisms governing the development and evolution of skin and skin appendages, particularly sweat glands, hair and mammary glands. She is a graduate of the University of Pennsylvania from which she received her B.A. in Biology and Anthropology, reflecting a deeply held interest in understanding the biological basis for how humans have evolved. She went on to carry out her graduate work in developmental and chemical biology as a student in the Biological and Biomedical Sciences Program at Harvard Medical School in the laboratory of Malcolm Whitman. Upon completing her doctorate, Yana became a post-doc in the lab of Cliff Tabin in the Genetics Department of Harvard Medical School. Her research focused on the genetic basis for the evolution of adaptive human skin traits and the biological mechanisms that control the

development and patterning of skin appendages, bridging developmental with evolutionary genetics and genomics. In pursuing this interdisciplinary endeavor, Yana was fortunate to have Pardis Sabeti, an evolutionary geneticist at Harvard and the Broad Institute, Daniel Lieberman, an evolutionary biologist at Harvard University, and Bruce Morgan, a developmental biologist specializing in skin appendage formation as co-mentors.



Jandy Hanna is Professor and Associate Dean in the Research and Sponsored Programs department at the West Virginia School of Osteopathic Medicine (WVSOM). Hanna is a functional morphologist and comparative primate anatomist. She studies primate evolution, with a focus on the biomechanical features of primates during vertical climbing. The evolution of bipedalism in the human lineage is thought to be related to biomechanics found during vertical climbing; however, little is known about how parameters like size, limb length, and phylogenetic history affect the biomechanics. Her work seeks to determine how differentiation between the forelimb and hindlimb during climbing may have contributed to the evolution of obligate bipedalism in humans.



David Carrier is a Professor in the School of Biological Sciences at the University of Utah. He is a comparative biomechanist interested in the ways in which the demands of movement have influenced the evolution of the anatomy, physiology, and behavior of terrestrial vertebrates.

BIOGRAPHICAL SKETCHES: SPEAKERS (CONTINUED)



David Raichlen is a biological anthropologist interested in the origins and evolution of the human lineage. He received a B.S. from Duke University in 1998. He received his M.A. in 2000 and his Ph.D. in 2004 from the University of Texas at Austin. He joined the University of Arizona in 2006 as an Assistant Professor. In 2019, he moved to the Human and Evolutionary Biology Section of the Department of Biological Sciences at the University of Southern California as Professor. His research examines the links between human evolution, physical activity, and health across the lifespan. His work in evolutionary physiology explores how movement and physical activity drove key aspects of human evolution, helping to explain how and why inactivity underlies many chronic diseases today. Combining biomechanics, physiology and neuroscience, and building on reconstructions of movement and exercise patterns in ancient human ancestors, his work suggests a full understanding of our evolutionary history can help explain how and why our current, more sedentary lifestyle impacts our physical and mental health, and how we can use this evolutionary context to improve well-being today. His current research is focused on understanding how and why exercise and physical activity benefits brain structure and cognitive function, especially in older adults.



Grazyna Jasienska is a Professor and Department Chair at Institute of Public Health at Jagiellonian University, Krakow, Poland, where she is a biological anthropologist whose research interests include reproductive ecology, human fertility, life history, and implications of evolutionary biology for medicine and public health. She is the author of *The Fragile Wisdom: An Evolutionary View on Women's Biology and Health* (Harvard University Press, 2013). Jasienska established the Mogielica Human Ecology Study Site in rural Poland where her team conducts longitudinal projects on human life history, fertility and health. Recently, she was involved in the Lancet series on evolutionary biology in public health, the topic that for the first time was covered by one of the most prestigious medical journals. Jasienska's work has been published in, among others, the *Lancet*, *PNAS*, *Proceedings of the Royal Society*, *Biological Reviews*, *American Journal of Human Biology*. She received a MA and PhD in biological anthropology from Harvard University and MSc in biology from Jagiellonian University. She was a fellow at the Radcliffe Institute for Advanced Studies, Harvard University. She is founder and president of the Salus Publica Foundation for Public Health which supports research and aims to improve quality of life in rural communities.