Gender and spatial behavior

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A group of Hadza relocating to a new camp, 2005. Credit: Brian Wood

Navigating, exploring and thinking about space are part of daily life, whether it's carving a path through a crowd, hiking a backcountry trail or maneuvering into a parking spot.

For most of human history, the driving force for day-to-day wayfinding

and movement across the landscape was a need for food. And unlike other primates, our species has consistently divided this labor along gender lines.

In new research published in *Nature Human Behaviour*, scientists including James Holland Jones of Stanford and lead author Brian Wood of University of California, Los Angeles, argue that the increasingly gendered division of labor in human societies during the past 2.5 million years dramatically shaped how our species uses space, and possibly how we think about it.

Underlying these conclusions is a huge and detailed trove of travel data revealing stark differences in the ways men and women among the nomadic Hadza people of Tanzania use space. A contemporary hunter-gatherer society, the Hadza provide a window into a highly mobile lifestyle, which was the norm for our species before the widespread adoption of agriculture.

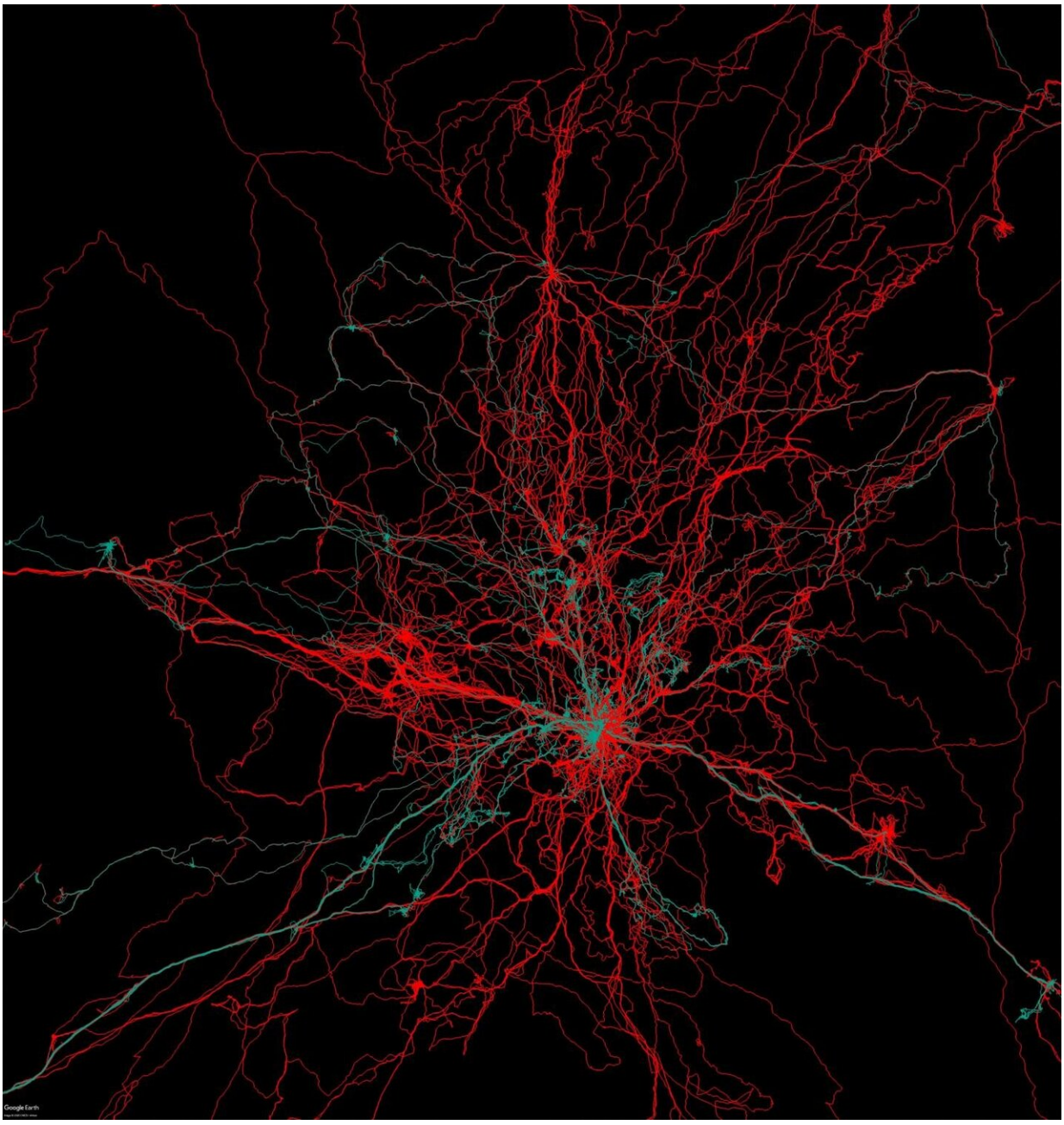
"We're taking gender differences as a given in this particular cultural setting, and then asking what consequences they have downstream," said Jones, an associate professor of Earth system science at Stanford's School of Earth, Energy & Environmental Sciences (Stanford Earth) and a senior fellow at Stanford Woods Institute for the Environment.

A better understanding of this dynamic could yield clues about why men and women seem to think about space differently. Research in many human populations suggests men and women are better at different types of spatial tasks. On average, women tend to excel on spatial memory tasks, while men tend to score higher on two basic measures of spatial cognition associated with movement: mental rotation of objects and accurately pointing to distant locations.

'Male work is more navigationally challenging'

The paper examines a popular theory that men's hunting for wild game would produce more extensive and sinuous travel, and that women's harvesting of plant foods would lead to more concentrated, straight-line travel to and from known locations.

While previous efforts to substantiate the theory have relied heavily on verbal accounts, the researchers here tested it by examining more than 13,000 miles of travel logged on lightweight GPS trackers worn by Hadza foragers between 2005 and 2018. "One or two researchers would walk through camp early in the morning as people were rousing," the authors write. "We would greet people at their homes or hearths and hand out GPS devices to be worn during the day."



A view of all GPS tracks collected from one Hadza camp, with male tracks in red, female tracks in green. Credit: Brian Wood

Around nightfall, when most people had returned to camp, Wood and assistants hired in the Hadza community removed the devices. They

ultimately used data from 179 people, representing 15 camps and ranging in age from two to 84 years old.

The authors also examined the degree of overlap in the lands visited by men and women. "One of the most surprising results of this study was the fact that Hadza men and women essentially occupy different worlds from a young age. In our data, most of the landscape was effectively gender-segregated," said Wood, an assistant professor of anthropology at UCLA who began working on this paper a decade ago as a postdoctoral scholar at Stanford.

To analyze the movement data, the researchers adopted techniques from the field of movement ecology and also developed custom software. As expected, the results show men walked further per day, covered more land in less direct paths and were more likely to travel alone. "In this hunting and gathering context, male work is more navigationally challenging," the researchers write.

Although some individual day journeys extended to 20 miles or more, Hadza men overall averaged eight miles per day and women—many of them accompanied by young children—averaged nearly five miles. Gender differences emerged by the age of six. From the mid-forties, the gender difference declined, mostly due to decreasing travel by men while women sustained more of their daily mileage.

Human mobility in a changing world

Detailed spatial data like those amassed in this study will aid future comparative research into human mobility, according to the authors. This holds particular resonance in light of a pandemic that has forced sudden revisions of normal movement patterns and heightened attention to the costs and benefits of different spatial habits.

Already, Wood has begun to apply technical, logistical and scientific lessons from this study to a new National Science Foundation project meant to help identify research and policy priorities to prepare the U.S. for inevitable future pandemics—in part by measuring mobility and modeling patterns of social interaction. "The study of human movement can be used to identify at-risk communities for disease transmission and spread," Wood explained.

Even when we're not in a pandemic, Jones said, people's mobility drives economic activity, social cohesion and environmental impacts. And the environment, in turn, shapes spatial behavior. That feedback loop is at the heart of some of the internal migration patterns already emerging as a response to global warming. As once-rare weather events become commonplace, Jones explained, migrant laborers will likely travel longer distances for work; more people will engage in seasonal migration to pursue agricultural work or escape hurricanes and droughts, and crop failures will drive more rural residents to urban areas.

"Changing mobility is going to be one of the key ways that humans adapt to a heated world," Jones said. "Knowing more about gender differences and other drivers for spatial behaviors across a wide swath of human populations and ecological contexts will help us anticipate how this adaptation will play out and inform policies to manage it."

More information: Brian M. Wood et al, Gendered movement ecology and landscape use in Hadza hunter-gatherers, *Nature Human Behaviour* (2021). DOI: 10.1038/s41562-020-01002-7

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