

A new explanation for the origins of human fatherhood

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Humans differ from other primates in the types and amounts of care that males provide for their offspring. The precise timing of the emergence of human "fatherhood" is unknown, but a new theory proposes that it emerged from a need for partnership in response to changing ecological conditions, U.S. and French researchers report today in the *Proceedings of the National Academy of Sciences*.

The new theory was developed using tools of economists and knowledge of the economic and reproductive behavior of human foragers. The theory focuses on the benefits of a "fit" between exclusive partners that enabled the strengths of [males](#) and females to provide for one another and their offspring, according to researchers from Boston College, Chapman University, University of New Mexico, and the University of Toulouse in France.

Scientists have long tried to explain how human fatherhood emerged. Paternal care—those investments in offspring made by a [biological father](#)—is rare among mammals but widespread across modern human subsistence societies. Much of men's parental investment consists of provisioning relatively helpless children with food for prolonged periods of time—for as long as two decades among modern hunter-gatherers. This is a sharp break with other great apes, whose observed mating systems do not encourage paternal provisioning.

That paternal provisioning arose in humans seems remarkable and puzzling and has revolved around a discussion about two groups of males

dubbed "Dads" and "Cads".

With promiscuous mating, a would-be Dad who provides food for a mate and their joint offspring without seeking additional mates risks being outcompeted in terms of biological fitness by a Cad, who focuses only on promiscuous mating instead of investing in offspring. Such a competitive disadvantage creates a formidable barrier for Dads to emerge when Cads abound.

An oft-invoked explanation for the evolution of paternal provisioning in humans is that ancestral females started mating preferentially with males who provided them with food, in exchange for female sexual fidelity. This explanation is insufficient for several reasons, the researchers write.

Instead, the team of anthropologists and economists argues that ecological change would have sufficed to trigger the spread of Dads, even in the face of female sexual infidelity, according to the report, "Paternal provisioning results from ecological change."

The key force in the theory of paternal provisioning is complementarities—in essence the cooperation between females and males, as well as between males. Complementarities are synergistic effects that increase per-capita benefits, which may arise from dividing labor and/or pooling resources. The path to complementarities began roughly five to eight million years ago, with a gradual drying in Africa, and a progressively greater need to rely on nutritious, diverse, spatially dispersed and relatively hard-to-obtain foods, including [animal products](#).

In response to ecological change, ancestral hominins adapted in various ways, including efficient bipedal locomotion, dietary flexibility, and an ability to thrive in diverse environments, facilitated by tool use. Complementarities between males and females would have resulted from the nutrients that each sex specialized in acquiring: protein and fat

acquired by males paired well with carbohydrates acquired by females.

Complementarities between males would have resulted from higher returns from hunting in groups instead of in isolation, and from food sharing to lower starvation risk. Dietary reliance on animal products is thus a key feature underlying these complementarities between and within sexes.

These complementarities would have led to a substantial increase in the impact of food provided by a Dad on the survival of his mate's offspring.

Using evolutionary game theory, the authors show that this impact can lead Dads to gain a fitness advantage over Cads, although Cads may still co-exist with Dads under certain conditions. If sons inherit their biological father's traits, then over time Dads will increase in number in a population. Theoretically connecting the evolution of paternal provisioning to [ecological change](#) allows the authors to make novel predictions about the paleontological and archeological record.

More information: Ingela Alger et al., "Paternal provisioning results from ecological change," *PNAS* (2020).

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