Featured Story

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Meet the Alloparents

Shared child care may be the secret of human evolutionary success.

By Sarah Blaffer Hrdy

In a silvered langur group in New York City's Bronx Zoo, a baby's golden hair—a distinctive juvenile trait—attracts attention from females in the group, which will take the baby from its mother and carry and groom it until the mother retrieves it.

Photo by Noel Rowe/The Pictorial Guide to the Living Primates

We cram our bodies into the plane's narrow seats, elbow-to-elbow, making eye contact with nods and resigned smiles as we yield to latecomers pushing past. Most ignore the crying baby, or pretend to. A few of us even signal the mother with a sideways nod and a wry smile. We want her to know that we know how she feels, and that the disturbance she thinks her baby is causing is not nearly as annoying as she imagines—even though we can tell (as can she) that the young man beside her, eyes determinedly glued to the screen of his laptop, does indeed mind every bit as much as she fears.

Thus does every frequent flier employ our species' peculiarly empathetic aptitude for intuiting the mental states and intentions of other people. Cognitive scientists and philosophers have long called this awareness of others' inner life "theory of mind," but many psychologists now refer to it as "intersubjectivity," a broader concept that roots our sophisticated skill at mind reading in the capacity to share in the emotional states and experiences of others. Whatever we call it, this ability to divine and care about the mental experiences of others makes humans more adept at cooperating than other apes are.

Imagine what would happen if one were traveling with a planeload of chimpanzees. We would be lucky to disembark with all our fingers, testicles, and toes attached, and with the baby still breathing and unmaimed. But human passengers fill some 2 billion airline seats every year and submit to being compressed and manhandled, with no dismemberments reported yet! Along with our 1,350-cubic-centimeter brains and capacity for language, such unusually well-developed impulses to cooperate have helped propel our success as a species. But why did humans become such "other-regarding" apes?

A female Francois's langur nurtures what look like twins, but only one of the infants (which are ninety-one and seventy-four days old) is hers. In this species, females other than the mother (allomothers) routinely care for, carry, and may even suckle any infants in their group. Normally, the infant's coat changes into full black within 130 to 140 days, but recent data suggests that the first-born of young females take a bit longer to mature and still have golden fur on the head at 150 days old.

Photo by Gang Hu

Although the genus *Homo* arose before the beginning of the Pleistocene epoch (1.8 million to 12,000 years ago), *H. sapiens*—anatomically modern humans with upright bodies and big brains—evolved only within the last 200,000 years. And *behaviorally* modern humans, capable of symbolic thought and language, emerged more recently still, within the last 80,000 years. Most evolutionists have assumed that our unusually sophisticated capacities for attributing mental states and feelings to others coincided with those late-Pleistocene behavioral transformations, and corresponded with the need for members of one group to get along so as to outcompete and defend themselves against other groups.

But there are difficulties with that scenario. There is abundant archaeological evidence for early warfare, but none dates back much before 12,000 years ago, when people began to settle down and live in more complex societies with property to protect. Moreover, genetic evidence suggests that our foraging ancestors in the Pleistocene lived at low densities. Although individuals no doubt fought and sometimes killed one another, there is no evidence that whole groups fought. More to the point, if the drive to outcompete members of opposing groups was the source of our hypersocial tendencies, why didn't selection favor even greater and more Machiavellian intelligence, better mind reading, and better capacities to cooperate against hostile neighbors among the ancestors of today's chimpanzees? Chimpanzees are competitive, dominance-oriented, aggressive, and reflexively xenophobic: wouldn't they have benefited just as much, or more, from being able to cooperate to wipe out competing groups?

Consider, however, an alternative explanation, the possibility that our empathetic impulses grew out of the peculiar way that children in the genus Homo were reared. I believe that at an early stage in human evolution, our bipedal ape ancestors were increasingly cared for and provisioned not just by parents but also by other group members, known as *alloparents*.

In my view, cooperative breeding (as sociobiologists term the reproductive strategy in which alloparents help both care for and provision young) came before big brains. I believe it first emerged among upright apes that were only beginning to look like us, and further evolved during the Pleistocene in African *H. erectus* (also called H. ergaster)—creatures that did not think or use language to communicate the way we do. Alloparental care and provisioning set the stage for children to grow up slowly and remain dependent on others for many years, paving the way for the evolution of anatomically modern people with even bigger brains. It was not the other way around: bigger brains required care more than caring required big brains.

Comparisons across cooperatively breeding species show how nonessential a sapient mentality is for shared care, and provide our best hope for understanding what selection pressures induce individuals to help rear someone else's young. Insights from such comparisons help explain why mothers among highly social apes living in Africa about 1.8 million years ago might have begun to abandon mother-only care, setting our ancestors on the road to emotional modernity.

Photographed near Mount Abu in India, a female Hanuman langur mother allows her infant to be taken and temporarily cared for by another adult female, a close relative. Such shared care keeps the infant safe while the mother is free to forage. The practice, widespread in primates, tends to evolve in species where females remain in their natal groups close to matrilineal kin and where, because of their feeding ecology, the female dominance hierarchy tends to be relaxed and relatively flexible. (For more about infant-sharing in langurs, see *The Langurs of Abu: Female and Male Strategies of Reproduction,* by Sarah Blaffer Hrdy (Harvard University Press, 1977.)

Photo by Sarah Hrdy

Although at first caring for and provisioning someone else's offspring seems to defy evolutionary logic, cooperative breeding has evolved many times in a taxonomically diverse array of arthropod, avian, and mammalian species. It occurs in 9 percent of the 10,000 living species of birds and in perhaps 3 percent of mammals. The advantages for parents are well documented, with significant demographic consequences.

Mothers able to confidently entrust helpless offspring to groupmates' care conserve energy, stay better nourished, and remain safer from predators and other hazards, leading longer lives with greater reproductive success. Because mammal mothers that have aid also wean babies sooner, many reproduce again sooner, and so give birth to a greater number of young over their lifetimes. More important, the extra help ensures the young have a better chance of survival. Certain species therefore spread successfully thanks to cooperative breeding and, with it, a faster pace of reproduction and the flexibility permitting young to survive in a wide range of habitats.

But how could natural selection ever favor caring for someone else's young? Why would young magpie jays in Costa Rica, ones that have never reproduced, bring back beakful after beakful of food to begging fledglings? Those allomothers often provide more food than the chicks' own parents do. Ornithologists J. David Ligon of the University of New Mexico and D. Brent Burt of Stephen F. Austin State University in Texas propose a two-step process for such development. Start with a species with particularly helpless, slow-maturing young, in which selection will favor high sensitivity to the cues emitted by needy babies as a parental trait. Then add some special benefit that encourages maturing individuals to linger in their natal place, such as defensible and heritable resources. As a result, group members will be exposed to sensory cues from chicks (or pups) and will be primed to respond. This "misplaced parental care" hypothesis helps explain why cooperative breeding is three times more likely to evolve in taxa that produce altricial (helpless) young rather than precocial young (those that are soon able to survive on their own).

Not all such caretaking is as self-sacrificing as it may appear. Often, alloparents only babysit when no more self-serving option is available. They may proffer food only when they do not actually need it themselves. They may volunteer only when they have energy to spare, or when they are still too young or lack the opportunity to reproduce themselves. Or if two cohabiting mothers are reproducing, as occurs among lions, ruffed lemurs, bush babies, and some mice, they may take turns as alloparents. One mother may suckle the other's offspring while the other mother is "at work" foraging. And where practice is critical for learning how to parent, as is the case for many primates, babysitters derive valuable experience by first caring for another's young.

In other cases, however, helping is more of a one-way street—and by no means entirely voluntary. Subordinate meerkat, wild dog, and wolf females that have never conceived (and may never do so) sometimes undergo a “pseudopregnancy,” developing a swollen belly and mammary glands. Then, once the alpha female’s pups are born, the nonmothers secrete milk for the alpha’s pups. By becoming a wet-nurse, a subordinate may increase her chances of being tolerated in the group. Had she given birth herself, her young might have been killed by the alpha female.

Perhaps after mating and undergoing a pseudopregnancy, a Jack Russell terrier belonging to the author’s neighbor chased away a mother cat and nursed the litter herself. Babies can be magnetically attractive to others, even members of a different species. It has been hypothesized that under some circumstances such misplaced parental care could lead to the evolution of cooperative breeding.

Photo by Sarah Hrdy

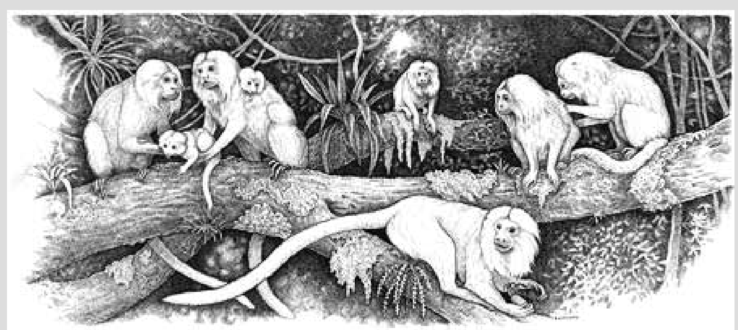
Of course, it makes good evolutionary sense for individuals to enhance the reproductive success of relatives with whom they share genes. But helpers are not always kin, and even kin can be less than kind: some meerkat and marmoset alphas eliminate their own daughters’ offspring—the grandmothers from hell.

In roughly half the 300-odd species of living primates, including all four great apes and many of the best-known species of Old World monkeys, such as rhesus macaques and savanna baboons, mothers alone care for their infants. A chimpanzee, gorilla, or orangutan mother will be literally “in touch” with her infant for almost every moment during its first six months of life, and the orangutan nurses her baby for up to seven years. Such continuous maternal care cannot be attributed to lack of interest from would-be babysitters, however. In all primates, babies are a source of attraction, most often to subadult females. The mother’s possessiveness is the determining factor. A wild ape mother is adamant that others will not hold or carry her baby.

Elsewhere in the primate order, mothers are more tolerant of allomaternal overtures. Shared care with at least minimal provisioning (often no more than one female allowing another female’s infant to briefly nurse) is found in some 20 percent of primate genera. But only among marmosets and tamarins, members of the family Callitrichidae, do we find shared infant care combined with extensive alloparental provisioning, such as we also see in humans. In that respect, those tiny-brained South American monkeys, which last shared a common ancestor with humans more than 35 million years ago, may provide more insights into the early evolution of human family life than do more closely related species such as chimpanzees.

Marmoset and tamarin mothers tend to produce twins (together weighing up to 20 percent of the mother’s body weight) as often as twice a year. But the social arrangements lighten the load. Usually, only the group’s most dominant female breeds, although groups with two breeding females sometimes occur. Fathers and alloparents of both sexes are unusually eager to help mothers rear their young. Babies are carried throughout most of the day by one or more adult males, which expend so much energy doing so that they actually lose weight. Other helpers, typically but not exclusively kin, voluntarily deliver even prized animal prey to youngsters.

Group members are also unusually tolerant of one another during foraging. Observing moustached tamarins in the wild, University of Illinois primatologist Paul A. Garber recorded only one aggressive act for every fifty-two cooperative ones he saw, such as collaborating to gnaw open hard fruits. When tested in the lab, cotton-top tamarins studied by psychologist Marc D. Hauser’s team at Harvard, and marmosets studied by evolutionary anthropologists Judith M. Burkart and Carel P. van Schaik at the University of Zurich, turn out to be unusually attentive to the needs of others. They are far more willing to deliver food to individuals (including nonrelatives) in an adjacent cage than are chimpanzees in comparable experiments. Marmosets go out of their way to provide food to others, and tamarins even keep track of and reciprocate generosity. Burkart argues that the combined mutual tolerance and spontaneous generosity of cooperative breeders are conducive to social learning, in particular to the ability of youngsters to glean information from and about their caretakers.



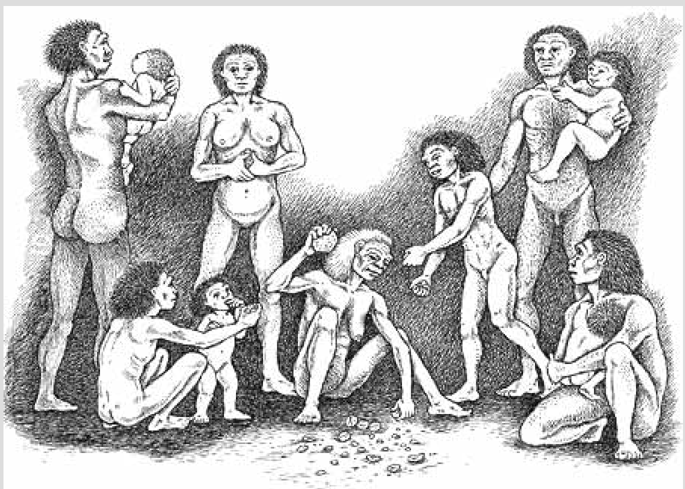
Pen and ink drawing of golden lion tamarins by the artist Sally Landry beautifully illustrates the patterns of child-rearing found among marmosets and tamarins belonging to the subfamily Callitrichidae. Typically, a single alpha female in the group will give birth to twins that are then carried most of the day by one or more of the adult males that the mother has mated with (they are passed back to the mother when they need to suckle). Other group members, like the subadult male in the foreground, catch beetles, frogs and other small prey to feed the infants around the time they are weaned, a time when youngsters are especially vulnerable to malnutrition.

Illustration by Sally Landry

In every human hunting-and-gathering society about which we have information, mothers allow others to hold newborns. But how could selfish apes ever make the transition from mother-only care to such cooperative breeding? At some point in the emergence of the genus Homo, mothers must have become more relaxed about handing even quite young infants over to others to temporarily hold and carry. No infant is more costly than a human one, and a growing body of evidence from traditional societies makes clear that wherever rates of child mortality were high, children with alloparental provisioning were more likely to survive. I believe that was the case among our ancestors in the Pleistocene.

Among ethnographically recorded hunter-gatherers, provisioning by allomothers starts early and goes on for years, beginning with “kiss-feeding” of unweaned infants with saliva sweetened by honey or with premasticated mouthfuls of other food. That encourages infants to pay attention to others, including their own mothers, with whom they are eager to maintain visual and vocal contact. An infant temporarily out of its mother’s arms will spend more time monitoring her whereabouts and looking at her face. Youngsters also have a big incentive to learn who else might be available and willing to care, and children with several trusted attachment figures learn to integrate multiple perspectives. In the words of pioneering child psychologists Ted Ruffman of the University of Otago and Josef Perner of the University of Salzberg, “theory of mind is contagious”—you catch it from older siblings and other caretakers.

Among our Pleistocene ancestors, infants with multiple caretakers would have been challenged in ways that no ape had ever been before. The needy youngster would have had to decipher not only its mother’s commitment but also the moods and intentions of others who might be seduced into helping. How best to attract care in varied circumstances? Through crying? With smiles, funny faces, gurgling, or babbling? The youngster best at mind reading would be best cared for and best fed. Such novel (for an ape) selection pressures favored a very different type of ape—one that we might call emotionally modern.



Artist’s rendering of *Homo erectus,* ancestral humans who lived in Africa in small groups as early as 1.8 million years ago: The woman in the center is cracking open nuts, while parents and other group members (so-called alloparents) help take care of infants. Shared care coevolved with empathetic awareness; mothers and infants benefited from intuiting who would help and who would hurt.

Illustration by Patricia J. Wynne (www.patriciawynne.com)

Almost all primates live in social groups, and it is generally advantageous for a mother to be in a group that includes close kin. Their help is especially critical when an inexperienced young female first gives birth. In most social mammals, and in the majority of monkeys, females remain with the group where they are born, and maturing males strike out to make their fortunes. But among our nearest living relatives, the great apes, only a tiny minority of new mother apes ever have matrilineal kin nearby. Evolutionary biologists have taken for granted that, like other apes, our female ancestors must have left their natal groups to breed in another community. There they would have encountered unrelated females, possibly competing mothers, who might be not only unsupportive but actually infanticidal.

Until recently, in fact, evolutionary biologists assumed hunter-gatherers followed a similar pattern of female dispersal. But in 2004, in an exhaustive review of ethnographic studies, University of Utah anthropologist Helen Alvarez concluded that mothers living in hunting-and-gathering groups were likely to have their mothers and other kin nearby when they gave birth.

For example, Stanford University anthropologists Brooke A. Scelza and Rebecca Bliege Bird found that among the traditionally polygamous Mardu hunter-gatherers of Australia’s Western Desert, older mothers would relocate to be near daughters of childbearing age, especially if the daughter lacked an older cowife to advise and help her. Mothers were also eager to join a daughter if she was married to the same man as her sister. In consequence, half of married Mardu women between the ages of fourteen and forty had a mother in the same group, while many had sisters or cousins as well, often as cowives. On average, female group members had an 11 percent chance of sharing a gene by common descent—just as do females of some of the nonhuman primate species that practice infant-sharing.

Something happened in the line leading to *H. sapiens* that encouraged female relatives to stick together. The impetus, I believe, had to do with food.

By 1.8 million years ago *H. erectus* had new ways of finding, processing, and digesting food needed to support both larger bodies and energetically more expensive, larger brains. The most plausible scenario, set forth by anthropologists James F. O’Connell and Kristen Hawkes of the University of Utah, is that long-term trends toward a cooler, drier climate leading up to the Pleistocene pressured the precursors of *H. erectus* to supplement a diet that had consisted mostly of fruit and occasionally meat. Game was increasingly important, but its availability unpredictable. A division of labor emerged between male hunters and female gatherers, and social bonds ensuring that men and women shared became increasingly essential.

O'Connell and others suggest that when other foods were scarce, our ancestors relied on the large underground tubers that plants in dry areas use to stockpile carbohydrates. Those storage organs occur throughout the savanna, but are protected by a deep layer of sunbaked earth. Savanna-dwelling baboons dig up rhizomes and undergound stems called corms, both found nearer the surface, and at least one unusual population of savanna-dwelling chimpanzees is known to use sticks to dig out the shallower tubers, suggesting that early bipedal apes may have done so as well. But it takes special knowledge and equipment to dig out the deeply situated larger tubers.

Chimpanzee mother with her baby in Gombe National Park, Tanzania: although considered the closest living relatives of humans, in the Great Ape (chimpanzees, gorillas, orangutans) mothers are highly possessive of their infants and do not allow other group members to share in their care.

Photo © Irven DeVore/Anthro-Photo

Tubers are not only hard to extract. They are fibrous and difficult to digest, hardly ideal food for children. Like nuts, they need skilled processing. To eat them, weaned juveniles would have to depend on capable providers. Nevertheless, evidence is increasing that starchy tubers were an important fallback food for African hunter-gatherers. A 2007 report in Nature Genetics revealed that people like the Hadza of Tanzania, who rely on roots and tubers, have accumulated extra copies of a gene that makes an enzyme useful in the digestion of starch, salivary amylase. While we can't test the saliva or sequence the genes of African H. erectus, isotopic analysis of their tooth enamel yields results consistent with a diet substantially reliant on underground roots. Once H. erectus developed the use of fire, perhaps as early as 800,000 years ago, roasting tough, fibrous tubers would have rendered them more digestible, and more useful still.

Even before cooking, the addition of tubers to nuts and other plant foods gathered and processed by women would have provided new incentives for food sharing between hunters and gatherers, as well as new opportunities for postreproductive women motivated to share. In their "grandmother hypothesis," Hawkes and O'Connell propose that Darwinian selection would have favored experienced, hardworking women who live on for decades after menopause, not just for a few more years, as in other primates. Such women could help provision younger kin, without the distraction of infants of their own.

In central Africa, an Efe girl carries an infant, a common helper role that allows a mother to give birth again before her infant has attained independence. Ethnographic studies of such traditional hunter-gatherers living in small, tight-knit communities, provide insights into how early humans kept children alive in the Pleistocene.

Photo © Steve Winn/Anthro-Photo

Across traditional societies, where it is not unusual for 40 percent or more of individuals to die prior to maturity, mortality rates depend a lot on family composition. Not surprisingly, presence of the mother matters most. The father's impact varies from being vitally important to having no detectable impact, depending on local conditions and who else is around to help. When it comes to alloparents, older siblings and grandmothers, especially maternal grandmothers, have the most reliably beneficial impact. Under some circumstances, their presence cuts the chance of dying during childhood in half.

In purely practical terms, we can envision a sequence that begins with hunters and gatherers sharing the fruits (and tubers) of foraging and then moving toward cooperative breeding. That would have allowed our Pleistocene ancestors to produce young that depended on many caretakers for a long time. No ape produces such big babies that mature so slowly, yet not only did our ancestors manage to survive, but our species eventually expanded beyond Africa and around the globe.

In terms of cognition and emotions, the transformations wrought by shared care and provisioning were even more profound. Our bipedal ape ancestors were surely as clever and manipulative as are living chimpanzees, able to manufacture and use tools; they must have been at least as empathetic in some circumstances, and endowed with a rudimentary theory of mind. But when they adopted what was, for an ape, a novel mode of rearing young, one that produced individuals more mutually tolerant and other-regarding than other apes, they laid the foundations for ever higher levels of empathy and cooperation. In such modest beginnings we can identify the groundwork for spectacular later developments.

Hear author Sarah Blaffer Hrdy interviewed by Vittorio Maestro, Editor in Chief of *Natural History*. (MP3, 32 minutes, 53 seconds)

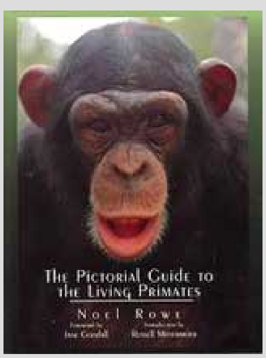
Web links related to this article:

- Sarah B. Hrdy
- *Mothers and Others: The Evolutionary Origins of Mutual Understanding* (Harvard University Press)
- *Mothers and Others: The Evolutionary Origins of Mutual Understanding* (Amazon.com)
- "Other-Regarding Preferences in a Non-Human Primate: Common Marmosets Provision Food Altruistically," by Judith M. Burkart, Ernst Fehr, Charles Efferson, and Carel P. van Schaik (*PNAS*)
- "Mothers and Others," by Sarah Blaffer Hrdy, Natural History, May 2001

This article was adapted from Mothers and Others: The Evolutionary Origins of Mutual Understanding, *by Sarah Blaffer Hrdy, ©2009, published by Harvard University Press.*

On sale in bookstores in April. Click book cover image for ordering information.

Sarah Blaffer Hrdy*, an anthropologist and mother, is a professor emerita at the University of California, Davis. Her book* The Woman That Never Evolved *(1981) was selected by the* New York Times *as one of the Notable Books of that year, and* Mother Nature *was chosen by both* Publishers Weekly *and* Library Journal *as one of the best books of 1999. Hrdy is a frequent contributor to* Natural History*; "Meet the Alloparents" is her ninth article for the magazine.*



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