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Scott Forbes: A Natural History of Families

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Chapter 1

Blame Parents

*You see a meadow rich in flower & foliage and your memory
rests upon it as an image of peaceful beauty. It is a delusion.
. . . Not a bird that twitters but is either slayer or [slain
and] . . . not a moment passes in that a holocaust, in every
hedge & every copse battle murder & sudden death are the
order of the day.*

—Thomas Henry Huxley

ON SEPTEMBER 25, 1994, Lele, a giant panda at the Beijing Zoo, gave birth to twins. Pandas are critically endangered in their native habitat—the bamboo forests of western China—and any addition to their number is welcome. But the joyous mood was dampened by the dark side of panda parental care. Lele’s babies were born 23 minutes apart, the first weighing 5.7 ounces, the second just 1.8 ounces. Almost immediately she abandoned the larger infant in favor of her smaller second-born. Ironically, the name Lele means “double happiness,” hardly the case here. Such behavior is not unusual for pandas. Following multiple births mothers normally abandon all but one cub, leaving the others to die. The obvious question is, why? Surely a mother a thousandfold larger than her newborn offspring could easily nourish her tiny twins. But she does not. This sinister habit is not peculiar to giant pandas. Parents commonly play favorites among their progeny, with often lethal consequences.

Children are right: parents are to blame for their woes. Parents are the architects of sibling strife and of conflict between parents and offspring. They make too many babies and then do not provide for all. They play favorites among their children and not only tolerate but foster rivalries. They prefer their offspring to be different, which only makes matters worse. Parents build amphitheaters to observe the contests, and some go so far as to deliberately place offspring gladiators in arenas of sibling warfare from which only one escapes alive. The parents watch from above while their progeny fight a short, bloody, and one-sided battle, and then turn thumbs down on the outcome. But parents are also nurturing and loving. A mother

crocodile will gently cradle her babies in fearsome jaws to carry them from their nest to a nearby stream. A male blackbird will risk his own life to defend his nestlings against predators many times his size. Parents that provide the vital resources to sustain and protect their offspring can also be manipulating and cruel.

Parents do not share the view of their children. Parents, in their own view, are self-sacrificing, overtaxed, and underrewarded. To them, the offspring—those objects of parental affection and recipients of lavish and expensive investment—can be too demanding, and too selfish. They are endlessly squabbling among themselves over how their parents' offerings are to be shared, and ever pleading for more.

Vulcan was the celestial artisan of Roman mythology, crafting trinkets for the gods and suits of impenetrable armor for warriors. He also had the misfortune to be born lame. This accident of birth so displeased his mother Juno that she flung him from heaven. Malformed infants were similarly treated in ancient Sparta, where they were cast into chasms called *Apothetae*, the place of throwaways. And inside the bodies of women everywhere across the globe, embryos with chromosomal defects are quietly discarded, early and out of sight, often without a mother knowing that for a brief time she was pregnant.

Infanticide of newborn daughters was also common in ancient Greece and Rome, as it still is in rural societies all over the world. The Scottish philosopher David Hume once remarked that to kill one's own child is shocking to nature. But is it? Infanticide is not the exclusive province of humans but is surprisingly common in nature. Marsh-nesting blackbirds, for example, treat sons and daughters differently. The male nestlings, being larger and more expensive to nourish, fall victim to starvation faster than females, especially when food is short. Here we might be tempted to suggest that the death of an offspring is attributable to parental neglect, a failure to make adequate provision for all the offspring. But even that view would be too narrow. We need to step back and examine what underpins this dark behavior. And it is this: infanticide, overt or otherwise, is part of a parental conspiracy. Parents produce more progeny than they can normally rear and then render them unequal. Among hyena pups and eaglet broods, fierce and lethal battles rage between brothers and sisters. Beetles and owls dine on their own progeny; hawks, sharks, tadpoles, and snails eat siblings; and aphids even consume their mothers from the inside out. Look just beneath the surface, and you will see Huxley's vision of nature, where chaos and mayhem are ever present.

Baby birds and infant humans would seem at first glance utterly different. One hatches after 12 days in an egg; the other is born after 38 weeks' residence in a womb. One is fed a diet of worms or insects. The other draws sustenance from its mother's blood before birth, and mother's milk after. The differences are many and obvious, yet there are important similarities too. Broods of begging nestlings, with necks stretched upward, beaks agape, stubby wings flapping, and a chorus of chirps, are a familiar sight. They are calling to their parents, and the message is easily decoded: "I am hungry—feed me—bring more!" Sometimes the parents will agree, and hurry away to gather worms or damselflies or other insect morsels to ensure that their nestlings are healthy and well fed. But sometimes not. The baby birds go hungry, often with fatal consequences.

The journey of a human egg from the mother's ovary to the site of implantation occurs out of sight. Over the span of about a week, the egg travels leisurely toward its destination, a blood-engorged uterine wall it nestles against and, if fertilized, grows into. And once there, the little embryo also sends a message to its mother: "I am here—I am healthy—don't forsake me!" Only this time the message is chemical, not acoustic. Sometimes mother will agree, and continue to keep her uterine wall in place and blood engorged so the embryo can draw life-sustaining nutrients and oxygen. But sometimes not. Mother withdraws her life-support system, with lethal consequences.

Do the Good Die Young?

The gaudy colors of male guppies that make them popular with aquarium enthusiasts also make them conspicuous to predators. So do the long tails of male peacocks and widowbirds. Charles Darwin—coauthor with Alfred Russel Wallace of the theory of natural selection—was puzzled by such traits that surrendered personal survival. For what end? These were antithetical to the theory of natural selection. His solution was to propose a theory of sexual selection: traits that impaired survival could nevertheless be selected if they enhanced reproductive success, and gaudy colors and long tails do exactly that by attracting more females. Darwin's new theory did not gain rapid acceptance—even Wallace remained a skeptic. The theory of sexual selection slumbered for a full century until it was resurrected by animal behaviorists in the early 1970s, and it now occupies a central place within the fields of behavioral and evolutionary ecology.

A powerful reformation of how we view families is also now at work, and as with the theory of sexual selection, its roots are deep in time. With somewhat less fanfare than Darwin, the botanist John Buchholz announced a theory of developmental selection in 1922. He suggested that natural selection—because it is subject to chance events was erratic and often weak (it is). Darwin had emphasized the struggle for existence in his description of natural selection, but Buchholz noted that similar processes occur during the embryonic development of plants. He further suggested that parents could (and do) supplement the clumsy process of natural selection with a contest of their own cruel design: it matches offspring in an arena of sibling competition. The winners escape the arena with the reward of continued parental succor. The losers forfeit their lives. Such a system begins at fertilization and ends when offspring leave their parents' care. It thus precedes the period of more familiar natural or "survival" selection, and it follows the process of sexual selection, which occurs when potential parents turn their attention to mating.

During the process of developmental selection, Buchholz surmised, defects in progeny would be exposed quickly and culled swiftly and coldly, avoiding needless waste of precious parental investment in progeny doomed to fail. This dark vision had manipulative parents arranging lethal battles among their own progeny for selfish ends—a foul union of Hobbes's war of all against all with the ruthless efficiency of a Brave New World. And everywhere the botanist Buchholz looked, he could see evidence of such parental machinations. Almost all higher plants employ developmental selection during the process of sexual reproduction. In cycads, ginkgoes, and conifers, multiple embryos engage in an intense life-and-death competition during their development. Weaker individuals are aborted in the earlier stages, and only one reaches its full term to become the seed embryo. But the process Buchholz described is not exclusive to plants. It is widespread in animals too, particularly those that provide their offspring with elaborate and expensive parental care. In fish, amphibians, birds, and mammals, internecine struggles are routine, and it is not the good that die young, but rather precisely the opposite.

The logic of developmental selection as it applies to both plants and animals is simple. Screen progeny early, identify those worthy of continued investment, and discard the rest. Sibling competition can provide such a test, revealing innate defects before parents make an expensive mistake. But as with sexual selection, the traits needed for victory in the sibling arena could prove inimical to their bearers,

or to their closest family members. One's closest kin are, after all, potential allies in the larger struggle. Why would parents encourage siblings to kill siblings?

The Family Myth

A mythology has arisen in popular culture about how families are intended to work. In humans they are expected to be warm, nurturing, and loving, and we are shocked to see otherwise. Deviations from this ideal structure appear to be just that, deviations, so much so that a family in conflict is viewed as dysfunctional. The neglect or abuse of children is both surprising and abhorrent: devoted parents are what we expect. Expectation shapes observation, and biologists, like painters, long described what they *saw*, not what was actually there. Infanticide was not a topic of serious scientific interest until the 1970s. Since biologists did not expect it, they did not look for it, and when it was reported, infanticide was considered an aberration caused by stress or a pathology, or was just plain inexplicable. As Einstein once remarked, it is theory that decides what we can observe, and in the 1970s what biologists could observe was changing. Across the world, entomologists, primatologists, mammologists, behavioral ecologists, herpetologists, sociobiologists, and anthropologists in the field and lab started to see the previously unseen. They saw infanticide in the Hanuman langurs and African lions. They saw cannibalism in spiders and scorpions, and sibs killing sibs in herons and egrets, pelicans and boobies, while parents stood by seemingly unconcerned. And in the lab they saw filial infanticide (parents killing their biological offspring) and cannibalism in gerbils and hamsters, and mice. Biologists had seen the unexpected, and they asked the obvious question: why?

Long ago Charles Darwin wrote to his colleague, the botanist Joseph Hooker, "What a book a Devil's Chaplain might write on the clumsy, wasteful, blundering & horribly cruel works of nature." Darwin could have easily illustrated his point drawing only from relations among family members: parents and offspring, brothers and sisters. Human reproduction fits Darwin's category of "clumsy" all too neatly. Both mothers and babies are ill suited for the ordeal, as a baby just a bit too large must squeeze through a birth canal just a bit too small. This requires that the skull of the fetus be sutured, allowing the bones to deform as they pass through the birth canal, and to make it work mothers must chemically soften the ligaments

of their pelvis. And even with these accommodations, the baby still gets stuck some of the time. What a silly system.

There are prodigious examples of wasteful behavior. In grebes, pandas, and harpy eagles, parents throw away—deliberately abandon—perfectly good offspring. Parents can be blundering too. I could use myself as an example (babies really should come with owner's manuals) but instead will defer to brown-headed cowbirds, who escape the burden of parenting by laying their eggs in the nests of other birds. They do it crudely. They do not attempt to disguise their eggs' presence from the potential host parents, many of whom simply toss the alien eggs from their nest.

And relations between the closest of relatives can be unspeakably cruel. A baby black eagle if it is the second hatched in the nest—the beta chick—faces a life that is poor, nasty, brutish, and decidedly short. Its sibling, four to seven days older, greets it with repeated blows to the face and body. Each chirp or movement triggers another beating, whether the parents are present or not. At one nest, closely observed, the alpha chick delivered nearly three hundred pecks over beta's first 24 hours, another six hundred during the second day, and more than six hundred on beta's third and last day of life. By the end of day one, the victim was blood spattered about its face, beak, and eye; by day two its left eye was swollen shut; and by day three it lay weakly on the nest, awaiting death.

Such behavior certainly runs counter to our expectation that relations among family members, and particularly between parents and offspring, are nurturing, protective, and kind. This instead is a story of Darwinian live and let die. Parents and offspring are among the closest of relatives, and indeed their relationship can be warm and giving. Or it can be terribly selfish. Or anything in between. Over the last two decades evolutionary biologists have had to revise drastically their views about families. Families are not just simple, harmonious social units but are in fact far more interesting. Families serve as forums for rival evolutionary agendas where brothers and sisters, parents and offspring, cooperate, compete, deceive, and nurture. As family members we even compete with ourselves, in a war of genes derived from mother and father. There is strategy, counter-strategy, and layers of intrigue.

One of the most puzzling intrigues is this. Parents often make too many babies. This behavior is understandable in species such as ocean sunfish, which may produce 300 million eggs in a single clutch, or orchids, which make as many as a billion tiny seeds. Each egg or seed is a ticket in an evolutionary lottery, and the more tickets any individual holds, the better its chances of winning. Such organ-

isms provide no parental care for developing offspring. Once the seed or egg is built and fertilized it is cast, with its parent's blessing, into the environment to find its own way.

When there is no parenting involved, producing as many progeny as possible maximizes the odds of success in the lottery. But parental overproduction is less understandable in birds, mammals, and some reptiles, as well as in amphibians, fish, invertebrates, and even plants that render considerable sums of parental care. Their offspring often depend on parents for long periods after fertilization: just think how long a human embryo/infant needs its parent(s) for its successful development and indeed its very survival. Yet even among organisms that provide such care, parents often produce more progeny, sometimes many more, than can ever survive to independence. Parents are optimistic, and this optimism leads inexorably to a secondary, downward adjustment of brood or clutch size by either infanticide or neglect. The obvious question is, why? Why do parent white pelicans and black eagles stand aside as older nestlings bludgeon younger brood mates? Why do hooded grebes, harpy eagles, or crested penguins abandon, bury, or eject viable eggs before hatching? Why do pandas and humans neglect newborns, and why do mice, owls, and burying beetles make routine meals of their own progeny? This nightmarish parenting not only occurs; it is widespread.

Parents also play favorites. They do so through birth or hatching delays, or by making some eggs or offspring larger than others, or even by fortifying some progeny and not others with steroid hormones. A first-laid black eagle egg hatches four to seven days ahead of its younger sibling, giving it a commanding advantage in the ensuing battle for life or death. Blackbirds and penguins make last-laid eggs bigger, sometimes much bigger, than first-laid eggs; litters of piglets and kittens often contain runts. Canaries and egrets dose some of their eggs with extra testosterone, making the chicks beg more and fight harder. Again, why?

One of the two central themes of this book is that nature provides useful models for the study of human behavior and reproduction. The following chapters provide a short tour of family relations in social animals with frequent detours along the way to explore where humans fit in. The tour's focus naturally reflects my own experience and bias. During the spring and summer months I work on birds. This has meant slogging through prairie wetlands in search of marsh-nesting blackbirds for more than a decade. Blackbirds comprise in many respects model systems. They are found everywhere in North America from the tree line south (and in the Caribbean

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and Central and South America too), are easily accessible, and occur in very large numbers. Unlike terns, their bills are not particularly sharp, or their aim particularly good. And they nest close to the ground, which is comforting for those of us who prefer to be close to the ground.

Birds, however, are far from the only kind of animal we encounter on this tour. During the long winter months in Winnipeg one has ample time to play hockey, root for global climate warming, and think longingly about blackbirds that nest in warmer places. Perhaps more important, one has the time to contemplate what avian models mean for other organisms with similar lifestyles, including us, and to write papers about this—sometimes with equations. The differences between humans and birds are obvious, the similarities less so, but the latter are what I find particularly compelling, and are what I explore here.

The second major theme of this book is that family harmony is not the default situation: that notion is what I call the family myth. Harmony is one possibility, but there are other, darker solutions too. Understanding families requires understanding that family dynamics are governed by the tension between conflict and cooperation among individuals who share common genes and experience.

I shall begin the tour by exploring the twin questions of how large a family should be, and how it should be structured. The answers require that we solve a twin paradox: why do parents produce too many babies (parental optimism), and why do they play favorites (parental favoritism)? The resolution of these paradoxes is key to understanding family relations, as parental optimism and favoritism are the direct antecedents of much of family conflict.