

**Kin**

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The utilitarian value of science to both society and the individual has long been undeniable. Our modern lifestyle would collapse without the props that science and its offspring, technology, have made possible. Yet most people go about their daily lives without a thought to how it all works. While science is central to the lives of almost everyone, it is not central in their minds, and is often vaguely, if not poorly, understood.

However, this ignorance is not due to any intrinsic lack of appeal in science. The commercial success of popular science books shows that even those who do not work in science are often fascinated by what they know of it, viscerally experiencing the pleasure of finding things out. The process of understanding science thus provides intellectual pleasure through the fulfillment of natural human curiosity.

A robust understanding of science may further benefit the individual by offering practical advantages in daily life. A basic knowledge of electronics and computers, for example, empowers the individual in the modern technology-reliant world. The proliferation of consumer products and advertising also means that scientific knowledge is crucial in making choices of consumption, especially in matters of bodily health.

On the social scale, a population of scientifically literate individuals is crucial to the proper functioning of democracy. With scientific issues often the subject of government policies, and with the growth of biotechnology leading to more scientific issues that would likely concern life and death, it would be dangerous if those influencing such policies were scientifically ignorant.

Throughout history, scientific discoveries have provided the impetus for major societal changes, sparking revolutions in all areas of human life. The situation is no different today - science still has the potential to reveal startling facts about the universe or about ourselves that lead us to rethink our actions in other spheres of life.

In the last century, biology in particular has promised to enlighten, if not revolutionise, issues concerning human nature. In its day, Darwin's theory of evolution jolted prevailing religious and philosophical paradigms. But this invasion of biology into humanistic fields of inquiry is far from abating. Amongst many others, biology now seeks to enlighten the origins of basic human instincts such as kinship.

Kinship-influenced behaviour pervades our daily lives, yet we hardly give a thought to the reasons behind it. Much of great literature deals with issues of kinship involving the conflict and love that characterize many real-world relationships. Our language reflects basic assumptions about kinship: bosom friends are likened to "brothers" and "sisters", being "like a mother" denotes a high standard of affection. We are more likely to help our kin without questioning their worthiness than we are for unrelated strangers. We have a sense of the significance of our "real" parents even if we were nurtured by adopted parents and had never seen our "real" parents before. While culture has been instrumental in cementing and developing notions of kinship, the commonality of kin-favouring behaviour in all known human societies is a hint that modern ideas of kinship may have

deeper roots in human nature. Since kinship itself has a biological definition, biology must have had a hand in the origin of such favouritism, but how far do us modern humans, with our fripperies of culture and education, still betray our evolutionary roots?

The first efforts at a biological theory of kinship focused on explaining non-human behaviour. The theory of kin selection, pioneered by W. D. Hamilton's proposal of a concept known as inclusive fitness, was successful chiefly in explaining formerly puzzling altruistic animal behaviour (Hamilton 1964). The role of kin selection in animal behaviour is well-supported by scientific evidence, and is central to the social organization of eusocial organisms like ants and naked mole rats, where large numbers of workers do not reproduce but seem to survive for the sole purpose of serving the colony and the reproducing queen. The influence of culture in human behaviour and the difficulty of observing human behaviour in controlled conditions has, however, meant that the evidence for kin selection-influenced behaviour in humans has been less conclusive, but still substantial.

That kin selection can at all be possible is due to the way genes are transmitted between generations. In sexually diploid organisms like humans, each parent on average passes down half of its genes to each offspring. This "amount" of inheritance is quantitatively represented in Hamilton's theory of inclusive fitness as the genetic relatedness,  $r$ . Thus, the  $r$  between a child and its mother and between full siblings is 0.5. Between aunts and

nieces, or grandparents and grandchildren, it is 0.25. Between cousins, it is 0.125. And so it proceeds through the generations.

Therein lies the mechanism through which a genetic tendency for altruistic behaviour towards one's kin may spread through a population. There does not need to be a specific, "gene for kindness", only a heritable tendency, whether it is the result of many genes in combination with environmental triggers or simpler mechanisms. If an organism possesses a genetic tendency towards kin altruism, this tendency will have a chance  $r$  of being present in the subject of its altruism. This leads to Hamilton's famous equation of inclusive fitness: For a genetic tendency towards kin altruism to spread, the expected benefit must exceed the cost. The mathematical condition is  $Br > C$ , where  $B$  is the benefit endowed upon the recipient of altruism,  $r$  the genetic relatedness, and  $C$  the cost incurred by the altruist in acting altruistically.

The hypothesis that humans practice kin selection has often been mistaken as a deterministic statement about how humans will behave in certain situations. It cannot be denied that culture has influenced our behaviour drastically enough that we can expect to find deviations from how other animals would behave under the same kinship conditions. Rather, it is a hypothesis that we possess subconscious evolutionary adaptations that predispose us to act in certain directions. There is no absolute certainty that we will always act in the directions dictated by the interest of our genes. Although the eminent British biologist J. B. S. Haldane was quoted, when asked if he would risk his life to save a drowning man, as saying that he would "to save two brothers or eight cousins", the

quote is amusing precisely because it is not expected that one needs a conscious or exact awareness of  $r$  for kin selection to occur.

In accordance with these conscious or subconscious tendencies, we would expect to find certain universal patterns in human behaviour that reveal kin selection at work. The most obvious would be a tendency to help kin more than genetically unrelated strangers, and a lower tendency to harm kin. The latter was confirmed in a few studies of homicides in America (Daly & Wilson 1997) and in patterns of helping amongst Los Angeles women (Essock-Vitale & McGuire 1985) and amongst Israelis during the gulf war (Shavit et al 1994). In addition, collaborators in homicides have been found to have a significantly higher level of genetic relatedness compared to that between killer and victim, a statistic confirmed for such diverse groups as urban Americans, medieval Englishmen, Mayan villagers and tribal horticulturalists.

The stereotype of the evil stepparent is another manifestation of increased altruism towards kin and decreased altruism towards nonkin. While stepparents can and often are as caring towards their stepchildren as the real parents would be, there is a trend of stepparent-stepchild relationships being significantly more problematic than those between genetically related parents and children. Many social scientists ascribe this pattern to the perpetration of the myth of the cruel stepparent creating irrational fears on the part of children, but this does not explain why conflicts in stepparent-stepchild relationships are common in the folklore of diverse cultures. Furthermore, studies confirming a greater frequency of problems in stepparent-stepchild relationships

compared to normal parent-child relationships have been done across the world, from Paraguay to England to Australia (Daly & Wilson 1997).

Inclusive fitness also predicts that patrilineal relatives would treat their children differently from how matrilineal relatives would treat theirs. This is because a mother will always be certain that the child she carried in her womb is biologically hers, but there is a non-zero chance that the mother has been unfaithful without the father's knowledge. Females past their reproductive age would also theoretically be more likely to invest in their genetic descendants than males of the same age are, because in most circumstances, males would be likely to profit more from investing in additional procreation and would hence spend more resources on attempts at procreation instead of investing in existing kin.

The general trend of less altruism on the part of patrilineal relatives was confirmed in a study measuring people's feelings towards their grandparents (Euler & Weitzel 1999). On average, people claimed to be most intimate with their maternal grandmother but least intimate with their paternal grandfather, even though there was little correlation between intimacy and either the age of the grandparent or the residential distance of the subject from the grandparent. These results are in line with the predictions of kin selection. Maternal grandmothers would be the most certain that their grandchildren are related to them by the full coefficient of 0.25, while paternal grandfathers are the least certain, because there is a chance that either their wives or their sons' wives had been unfaithful without their knowledge. Paternal grandmothers and maternal grandfathers fall in

between, each having one intervening generation in which paternity is uncertain. If, as seems reasonable, emotional intimacy correlates with the investment of grandparents in their grandchildren, then these results would confirm the existence of kin selective influences in human behaviour.

Kin selection also predicts age-based discrimination for altruistic deeds. Because an individual's reproductive potential decreases with age, if humans were influenced by kin selection, one would expect the young to be helped more than the old.. This was confirmed in a study of altruistic deeds amongst Los Angeles women, in which more altruistic deeds flowed from the old to the young more than from the young to the old (Essock-Vitale & McGuire 1985). Another study of attitudes towards altruism in America and Japan produced the same result – people were more willing to help the young than the old (Burnstein et al 1994).

Although an invention of civilisation that probably did not exist amongst prehistoric humans, even inheritances have provided evidence for kin altruism. One would expect to find that i) humans prefer to leave their wealth to relatives than to strangers, ii) that they would prefer to leave their wealth to closer relatives than to more distant relatives, iii) that they would prefer to leave their wealth to offspring rather than siblings, and iv) that the wealthy would leave more money to sons while the poor would leave more money to daughters. iii) is a consequence of siblings usually having a lower reproductive potential than offspring, making it a more effective allocation of resources to help those with a greater ability to reproduce. The rationale for iv) is that reproductively successful men

tend to have more children than reproductively successful women, since women are constrained by the considerably greater time and effort they have to invest in each child. Similarly, males that are less reproductively successful relative to their peers are likely to have fewer children than females who are in a similar standing relative to other females. If wealth increases reproductive success, then, as seems most likely, investing in daughters is a safer bet for poorer people, while wealthier people gain more from investing in their sons, who are likely to have disproportionately many descendants.

All these predictions were borne out in a study of wills made in Vancouver (Smith et al 1987). While it may not be surprising to learn that people really are more generous towards their relatives than to strangers, and towards closer kin than more distant kin, or are more likely to help their children than their siblings, the finding that a sex bias in inheritances can be influenced by wealth is particularly interesting, because it is a less obvious consequence of kin selection and because it shows that patterns of kin investment can flexibly respond to changes in environmental conditions. It is doubtful that the people concerned consciously reasoned their decisions in terms of the reproductive potential of their offspring, which raises the interesting question, unanswered in this study, of what conscious reasons they must have used.

Beyond enlightening the origins of behavioural trends common to all humans, kin selection, if a real phenomenon in modern human society, promises to influence family-related issues in the social sciences. Unless we commit the naturalistic fallacy, kin selection can have nothing to say about what is moral even as it tells us what is natural.

However, knowledge of general human tendencies to behave in certain manners can enlighten behavioural models used in sociology, law, economics and politics. Since the notion of the family itself can never be completely decoupled from biological relatedness, any model of family behaviour must consider the effects of subconscious inclinations in our actions with regards to kin. Although models incorporating kin selection are hampered by the complexity of human behaviour and ethical restrictions on experimenting on humans in controlled conditions, kin selection still offers myriad qualitative predictions. Furthermore, its quantitative predictions can be confirmed through the analysis of sociological statistics and through psychological experiments.

Family law is one area in which the predictions of kin selection could be applied. Intrafamilial altruism is an important consideration in the enforcement of contracts between family members. Kin selection suggests that since family members are significantly less likely to betray one another, breaches of contracts between family members are more likely to be due to sincere regret rather than purely selfish opportunism (Goetz & Scott 1980). Kin selection has also been used in legal analysis on child abuse, with suggestions that the higher probabilities of child abuse under stepparents, a phenomenon which kin selection suggests is more a human universal than a cultural quirk, be considered in making child-custody determinations (Jones 1997, 2005).

In economics, kin selection has been used to widen the narrow definitions of rational, self-interested actors that are so often relied upon in neoclassical economics. Economists

have attempted to build economic models of family behaviour that, unlike traditional assumptions of self-interested utility in neoclassical economics, take into account evolved preferences, which may include nepotism or maximization of reproductive success in the long run (Becker 1976, Bergstrom 1996, Campbell 1986).

Practical value aside, the theory of kin selection, like another other scientific enterprise, is valuable in itself for shedding light on the origins of kinship. Although some find it disheartening that “noble” sentiments like love for one’s relatives should be explained by the “enlightened self-interest” that underlies much of evolutionary psychology, one could just as well take the opposite tack and argue that on the contrary it should be heartening that human nature is indeed positive in some aspects, that we are not entirely selfish, Hobbesian beings. There is no reason to abandon our familial affections just because we suspect our genes may be pulling some of the strings in our subconscious. Science reveals reality to us, but we are free to impute meaning to this reality. For the most part, knowing reality is meaningful in itself – and that is chiefly why science is meaningful.

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