Anthropological Review • Vol. 77 (3), 355–370 (2014)

Anthropological Review
Available online at: https://doi.org/10.2478/anre-2014-0026

On the human ethology of food sharing

Wulf Schiefenhövel

Human Ethology Group, Max Planck Institute for Ornithology, Seewiesen, Germany

Abstract: This paper compares various explanatory concepts of food sharing in humans. In many animal species, parents share food with their offspring, thus investing into the 50% of their own genes present in each child. Even in modern families of industrialised societies, there is a very significant flow of material goods from the parent to the offspring generation. Sharing food between reproductive partners is also easily explainable in evolutionary terms: „food for sex" as male strategy is observed in some primate species. Sharing within one's group in small-scale societies can be explained also as consequence of its members being actually rather closely related to each other; this, among others, gives credit to the concept of group selection which gains attention again after having been discarded by classic sociobiology. The ethos of individual and group sharing can quite readily be transferred to larger groups, i.e. a whole nation or, especially in the case of unusually devastating natural disasters, to members of other societies. Food sharing beyond genetic relationship or reproductive interest has been explained as „tit for tat" and „reciprocal altruism". Events of give and take, however, are, how the last example demonstrates, quite often non-symmetrical, i.e. one partner shares much more than the other. „Tolerated theft", a behavioural trait in non-human primate species thought to be a stepping stone for the typical preparedness of humans to share, does not play a big role in traditional societies, which provide an important base to discuss the topic. The Trobriand Islanders, e.g., have a very complex system of sharing. In the years of competitive harvest, their yield of yam is distributed to close relatives, especially to fathers and elder brothers. The donors keep almost nothing for themselves, are however given as well, so that everybody has enough to live. High rank men receive a partly enormous surplus, by which their status is increased. Western farmers would find this generosity quite strange. It is one outcome of the human tendency to create bonds through food gifts. It is interesting, that Marcel Mauss has well described the power of the gift which generates a counter gift, but did not inquire evolutionary nor ontogenetic building blocks of the often very complex acts and rituals of giving and receiving one finds in all cultures. It seems reasonable to take an evolutionary position and argue that those of our ancestors who were generous and socially competent with a well-developed emphronesis (Theory of Mind) were preferred interaction and marriage partners and that this sexual selection was the ultimate mechanism spreading the motivations and behaviours involved in sharing. To counteract cheaters humans have a rather sharp perception to detect those who don't play by the rules and a very strong motivation to punish them, even accepting, in doing so, high costs for themselves. This strongly disproves the idea that humans mainly act on rationale choice. Rather, we are endowed, one must conclude, with a very powerful, archaic sense of balanced social interaction, of fairness and justice. This raises the interesting question whether the laws governing social conduct, made by all cultures of the world, are contra or secundum naturam. For quite some time, in the wave of sociobiological thinking, the common stand was that humans are dangerously egoistic beings and that their antisocial instincts must be kept in check by powerful laws. As Irenäus Eibl-Eibesfeldt, the founder of human ethology as a discipline, has stated and

Original Article: Received: 20 September 2014; Accepted for publication: 21 November 2014
DOI: 10.2478/anre-2014-0026

as recent primatological and anthropological research has corroborated, humans are much more social than postulated by some authors. The Ten Commandments are built on not against basic human tendencies. Konrad Lorenz spoke of animals having "morally analogous" behaviours and was criticised for this. Modern research is rehabilitating him. The joy of sharing, a proximate behavioural set of motivation, is typical for our species. Notwithstanding expectations of economic and status gain this biopsychologically rooted tendency most likely is the engine driving the systems of do ut des, so marvellously developed in our species.

Key words: food sharing, evolutionary concepts, human ethology, cross-cultural anthropology, traditional societies, Melanesia, social competence, emphronesis, sexual selection, group selection, joy of sharing

Feistner und McGrew (1989, p. 22) have given a very useful overview on sharing of nutritional resources in primate species. They define sharing as "transfer of a defensible food-item from one food-motivated individual to another, excluding theft". Jaeggi and van Schaik (2011) in a recent review study based on data from 68 primate species define, according the work by Feistner and McGrew (1989), food sharing as unresisted transfer of food. They conclude (op. cit., p. 2125) that"…

1) sharing with offspring is predicted by the relative processing difficulty of the diet, as measured by the degree of extractive foraging, but not by overall diet quality;
2) food sharing among adults only evolved in species already sharing with offspring, regardless of diet;
3) male-female sharing coevolved with the opportunity for female mate choice and sharing within the sexes with coalition formation. These results provide comparative support for the hypothesis that sharing is 'traded' for mating and coalitionary support in the sense that these services are statistically associated and can thus be selected for. Based on this, we predict that sharing should occur in any species with opportunities for partner choice."

Sharing with own offspring is easily explained in terms of evolutionary biology and widely accepted as a natural phenomenon. A parent, whether plant or animal, will invest in her/his "children" because they carry 50% of the parent's own genome. Interesting in the findings of Jaeggi & van Schaik is that, in non-human primates, it is not the quality of the food shared (e.g. protein or fat), but the difficulty the parent has to obtain it. One could imagine that evolution would have favoured a behaviour where food with the highest nutritional value is transferred to the young. The substantial review of the two authors confirms the "food for sex" hypothesis and adds an interesting same-sex dimension: food is shared when the social fabric of the species facilitates choosing partners; their social value for an individual is assessed and active food sharing, a central element in the life of primate and human family and group, is regulated by this assessment.

In a study on captive Capuchin monkeys *(Cebus apella)* which readily shared food across a mesh wire, Frans de Waal (2000), tested the hypothesis that reciprocity in food sharing is or can be, contrary to most previous assumptions, non-symmetrical. He found (p. 253) a "… significant covariation across tests for sharing in both dyadic directions, a result unexplained by relationship symmetry. Moreover, control procedures… indicated that behaviour during food trials is not fully explained by mutual at-

traction or aversion. The monkeys take the quality of their own and the partner's food into account, and possessors limit transfers of high-quality foods. Instead of a symmetry-based reciprocity explanation, a mediating role of memory is suggested, and a mirroring of social attitude between partners". In other words, food sharing in primates is a rather complicated thing. No wonder that it takes so many different forms in the human species and that humans construct their food sharing behaviour with evolutionary building blocks.

A particularly interesting behaviour of sharing food across species borders was observed by Feistner and Price (1999): "...a male golden-headed lion tamarin *(Leontopithecus chrysomelas)* shared food with an infant cotton-top tamarin. The lion tamarin provided more food to the infant than its mother did." One possible interpretation of this finding is that caring for the young is so deeply embedded in the emotional regulation of behaviour (cp. Konrad Lorenz', 1978, *Kindchenschema* or babyness schema, which very effectively releases parental care) that it can run wild, spill over, as it were, into a pathway which is normally unused. Cases of adoption which happen from time to time in domesticated animals living in households come to mind. It is remarkable that the male *Leontopithecus chrysomelas* provided more food for the *Saguinus oedipus* child than his own mother.

Caring for and sharing with the young and similarly for and with one's sexual partner are two sides of the same powerful phylogenetic package Eibl-Eibesfeldt (1975) has drawn attention to the dramatic and far-reaching evolutionary shift from caring for and parentally loving one's young to caring for and sexually loving one's sexual partner and to become bonded to him/her. Nature is parsimonious: Once it has "invented" a good strategy (in this case parental care and a loving personal bond), it tends to use it in other spheres as well. The phylogenetic history of affection and love between humans is thus rooted in food sharing patterns appearing early in the animal kingdom and, of course, in the even older mode of sexual reproduction and the behaviours making it work.

Frans de Waal (1996) has given the following classification of food sharing_

1) Forced claim/theft: One individual pushes another from the food source and takes food by force. This behaviour is most often shown by high rank individuals. The typical behaviour of lower ranking ones is trying to snatch a piece of food and quickly move away.
2) "Relaxed taking": An individual takes a piece of food in full sight oft he "owner" and does not show any aggressive signals or the use of force
3) "Cofeeding": An individual joins the "owner" of the food, both eat peacefully side by side; active giving of food occurs in these situations
4) "Nearby collection": An individual waits for pieces, which fall down while the owner is eating, moves as close as about an arm's length to the owner and collects such pieces.

Chimpanzees showed, in de Waal's samples, more often tolerant forms of transfer ("cofeeding" and "relaxed taking"), Bonobos more often intolerant transfers (forced claims/theft). – Vis-à-vis the schema of Gerhard Medicus (below) which accentuates the psychological/mental maximum capacity of animals to share, de Waal's schema shows the common actual everyday behaviour.

De Waal, like others before him, argues that the patterns of sharing food depends on the type of prey/food: species which need the highest effort to catch prey are the most likely to share. Among non-primates, sharing is most common among socially living carnivores. This can be explained with hunting requiring high energy and involving high risk, which some members of the family or group are unable bring to bear. Primates exhibit two basic forms of sharing. Monogamous Gibbons live and share in small family units, food is voluntarily given to partners and offspring. Hamilton's theory of kin selection (1963, 1964) well explains this pattern.

The second pattern exceeds genetic relatedness, it can best be explained as "reciprocal altruism" (Trivers, 1971) involving some elements of Hamilton's kin selection and is found (de Waal, 2000) among capuchin monkeys (whose spectacular use of stone tools to crack open nuts have only recently been discovered, Fragaszy et al. 2004) and among chimpanzees and humans.

The ethology of possession

Following Hans Kummer's work (1991) on how non-human primates and other animals handle the classic conflict about "property rights", namely A has something which B also wants to have, Gerhard Medicus (2012) has constructed a phylogenetic tree of possession rules (Fig. 1).

From bottom to top:

1) In animals up to lower mammals, the stronger individual gets the debated object (food), actually, he/she often takes it with force, e.g. in crocodiles.
2) In many mammal species, the object (also food) is taken, often without fight, by the higher ranking animal.
3) In primates, other than apes, the animal which arrives first at an object is granted possession (of food,

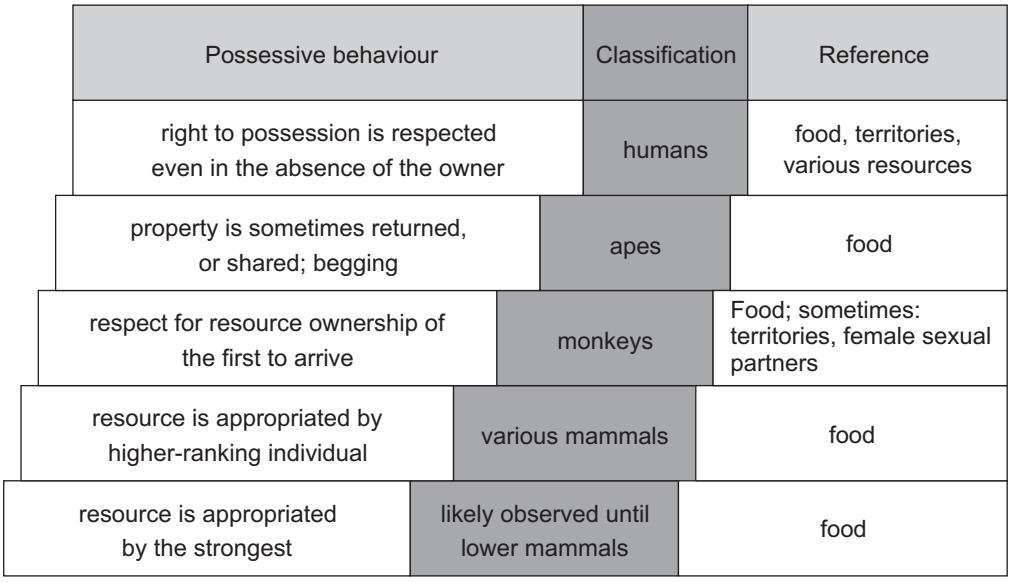

Fig. 1. Possessive behaviour within the phylogeny of mammals

territory, female sexual partners). Monkeys respect ownership, especially of non-edible kind (e.g. an interesting object to play with) but if the first owner will drop such item, another one may pick it up. Rightful ownership of an object, it seems in these cases, is necessarily connected to actually having it in one's hand. Hans Kummer (op. cit.) conducted an interesting experiment. He tied such object (an empty can) with a string to the first owner, now the others respected his right. The symbolic attachment of the object to the individual (not occurring in nature) was sufficient to inhibit the motivation to take it away. This kind of cognitive representation of ownership is not far from the situation in human society.

4) In apes an even clearer concept of possession is present. Objects of another individual may be taken into the hand, but then returned to the owner as was demonstrated in a film documenting Dian Fossey's work (1983) among mountain gorillas: A male, watching her handling paper and pencil, gently took the pen, sniffed and inspected it, than graciously gave it back to the researcher. Big apes actively share and also beg.
5) In humans, objects of all kinds (food, tools, territory, houses, partners, even ideas/inventions) are seen as belonging to the owner, even when she/he is away.

This schematic classification represents, as has been said above, quasi ideal behaviours, the maximum mental and social sharing capacity of the respective animal group. Many exceptions occur. That humans sometimes steal, whether it is something material or mental (see the deplorable academic plagiarising scandals concerning the doctoral theses of German politicians), or otherwise break rules in other domains is undebated. It is very interesting that all religions in all societies have a canon of behavioural rules which is directed at safeguarding exactly these evolved human tendencies to respect possession. To act against this universal rule means stealing and that is, in principle, considered wrong and is sanctioned everywhere. A common exception is, in some societies, when a person is not from one's own group: from him/her one may take, the norm of ownership is not conferred to this outgroup individual (see below). But, it is probably equally common that outsiders, strangers are given shelter, protection and food. These rules, e.g. the often religiously corroborated laws of hospitality, make sharing of food a sacred act (cp. customs of the Arabs, Tuareg etc.).

Are "leges contra" or "secundum naturam"?

This issue, whether we share voluntarily or have to be forced to share, opens a very interesting question: Do the laws formulated in all human societies run counter biopsychological tendencies, as an indispensable strict system of measures and sanctions forcing humans to behave properly, as a tight rein constraining antisocial impulses? This has been the position of sociobiology. Wickler for instance reformulated his book "The Biology of the Ten Commandments" (1971) to fit the selfish gene paradigm (1991). Or do the traditional rules and laws in human cultures follow our evolved tendencies? Konrad Lorenz (1956) stated that "animals behave in a morally analogue way", ergo human moral systems

have animal counterparts. He was very careful in this respect. Today, an increasing number of evolutionary biologists express their conviction that human moral systems are built on phylogenetic precursors. The two different opinions boil down to the question: Are "leges contra naturam" or "secundum naturam"? My position in this issue, comparable to that of I. Eibl-Eibesfeldt (1984), Frans de Waal 1982, 1989, 1996) and other ethologists is that we humans have powerful phylogenetically based, and thus genetically transmitted tendencies to be social and behave in surprisingly moral ways. Cultural rules in general and concerning sharing in particular are based on these tendencies.

Sociobiological, human ethological and other concepts of sharing

For those strands of evolutionary thinking which place genetically transmitted egoism (Wilson 1975), including its most extreme form, gene egoism (Dawkins 1976), at the conceptual core of their ideas, sharing food other with individuals who are one's own children or one's close kin are problematic and need special explanation. All biologists and also many sociologists agree that transfer of valuable items, like food, other material resources, energy, money, time to one's children is "normal". Biology explains this with the coefficient of genetic relatedness (r) which is 1/2 or 50% between parents and children (see above) and between siblings, 1/4 or 25% between grandparents and grandchildren, aunts/uncles and nieces/nephews, 1/8 or 12.5% between cousins etc. By helping my child to survive, become strong, successful and a parent herself/himself, I invest into my genome, that is the paradigm. By investing into my grandchild I do the same, only to half the degree than that of a parent (the "grandmother hypothesis", cp. Voland, Chasiotis, Schiefenhövel 2005). Offspring is the currency of life. All living matter basically only exists to turn the age-old wheel of reproduction one more time.

There is also considerable relatedness between all members of small groups, and surprisingly even of modern states (Salter, 2003; Roewer et al. 2005), quite contrary to what has been claimed by some authors. Sociopolitical units like large tribes and European countries still have, despite all the historic upheavals of the last few thousand years and marriages across ethnic borders, clear genetic markers, setting them aside against members of other such units. Sharing resources with others and carrying out other altruistic acts of solidarity (like paying taxes, getting involved in unpaid voluntary work etc.) will be, that is the prediction from an evolutionary perspective, more common in such homogenous groups than in heterogeneous ones (Salter, op. cit.)

Kohli, sociologist and historian, has studied financial transfers (1999) and found out that by far the biggest amounts of money moved from person to person are still flowing from parents to children and from grandparents to grandchildren. This is surprising, also in the light of claims that the family is a model of the past or that the family is not the nucleus of society at all. When supporting one's own young is normal, how about sharing food with other individuals of one's group? Some male animals (cp. Jaeggi & van Schaik, 2011, see above) follow, as was mentioned above, the principle

"food for sex" and let preferred, usually ovulating females participate in eating precious food, mostly meat, obviously in a "clever" attempt to make the lady get impressed by this chivalresque gesture and inclined to grant sexual favours… not so different from what happens among humans, one may add.

Sharing within family and group, then, is easy to understand. It is, viewed from the viewpoint of genetic interest, basically egoism… albeit coming in a nice form. This basic tendency of humans to be kin-altruistic can be extended to non-kin. Large groups of people, like nation states which share the same central ideas, religion etc. can function like this: The ethos of the small face-to-face community may, in the best case, be successfully transferred to the anonymous group of one's country (I. Eibl-Eibesfeldt, 1984). Fellow countrywomen and countrymen are sometimes addressed as sisters ands brothers, like it is common among members of church congregations, socialists parties and the like. A quasi-genetic community is created per definitionem and a higher degree of homogeneity can be achieved. Then, sharing is easier. The Christian religions, for instance, pursue this concept of worldwide solidarity.

But do we actually share with strangers, with people whom we did not meet before and whom we are not likely to meet again? That is the acid test of human altruism. Interestingly, we are able and even prepared to do just that: give to a stranger. Robert Frank (1988), economist with a strong evolutionary side, has been one of the first who highlighted this part of the human condition. "Passion within Reason" is the title of his book. He argues that our ancestors preferred to interact, also economically, strategically, with those who acted generously and honestly and did not hide their emotions behind the façade of a poker face. Hence our basically honest emotional signalling via facial expression. Individuals with this kind of mental and psychic set-up (honesty and generosity) would have been preferred by the others, they would have, therefore, had more success, better partners and more children who would, statistically, carry the same kind of characteristics like their generous parent.

Looking, as it were, at the other side of human generosity, and also grounding his ideas on evolutionary biology, Cosmides (1989) developed his "computational theory" of social exchange, stating that in the course of hominization it was very common that two or more individuals were confronted with the situation where cooperation would be the best thing to do. The protagonist of the field of "evolutionary psychology" argues that those early humans whose brain was good at cognitively monitoring and calculating the pros and cons of social exchange (may it be food sharing, joining physical or social forces or other ways of cooperation) had an advantage over others whose brains were not as clever to remember past actions and predict likely future behaviours of their partners. Very important in the chain of social cooperation is to make sure that one does not become disadvantaged, "tricked" by an interaction partner. Hence Cosmides' claim that a specific "cheater-detection-mechanism" evolved which makes humans very successful in all aspects of cooperation – from daily food sharing to playing poker.

A still rather influential hypothesis trying to explain the origin of sharing assumes (Blurton Jones 1984) that "tolerated theft" is the first building block of fully fledged sharing. The idea is that the costs necessary to defend one's proper-

ty (e.g. a large amount of meat) are too great compared to the risks of getting injured while defending it, of getting socially mobbed, being disliked or otherwise suffering disadvantages (Jandrasits (2012). Winterhalder (1996) argues that while the overall quantity of the precious item is not increased through the act of tolerated theft, its value for the whole community, or at least for those who participate in the theft, is increased. That he sees as the basic building block for reciprocal altruism – and that is the evolutionary biologist's attempt to come to grips with acts not directly increasing ego's own fitness. Altruism, in its powerfully non-egoistic (at least at first sight) mode of action is a challenge for evolutionary biology. Therefore, carefully backed up evolutionary scenarios have been formulated to explain the seeming paradox.

The individual who has once accepted tolerated theft carried out by others may receive a fair share at an occasion when another individual is the happy owner of a precious item (see, however, the critique of this hypothesis by Kaplan & Hill, below). Passive sharing, which well describes tolerated theft, would thus be an act of egoism (as all evolutionary paradigms of reciprocity and altruism suggest), delayed egoism in this case, taking the form of an altruistic act by letting the other individual(s) have a piece of one's possession in hope for future benefit.

Bird and Bird (1997) have studied sharing strategies among Torres Straight Islanders, who live in the shallow channel of water between New Guinea and Australia and sometimes catch large amounts of fish. The authors describe that the respective fishermen, depending on the size of the catch, do not defend it against tolerated theft/scrounging by others as that would take too much effort and energy, e.g. smoking the fish to keep it for feeding one's family in the future. My own observations among the Trobriand Islanders (from our field project in Tauwema village, Kaileuna Island), Austronesian speakers beyond the eastern tip of New Guinea, are quite in contrast to the finding of Bird & Bird. Whenever there is a large catch of fish, it will be orderly distributed between those who have, usually by genetic relatedness, a "right" to receive. Everybody, even small children, know who is entitled to take from the canoe full of fish and who isn't. Ingrid Bell has published a comprehensive account of Trobriand traditions and practice of generosity and exchange ("Haben um zu geben" = to have to be able to give, 1990) derived from participant observation of actual situations of daily exchange rather than representing special and rare occasions like the famous *kula* exchange (Malinowski 1922) with its highly ritualised forms of exchanging valuables between islands and thereby creating an almost sacred bond welding together various islands groups where vital commodities were available. There is definitely no tradition of "tolerated theft" among the inhabitants of Tauwema, on the contrary, the distribution of protein from the sea or other valuable food follows orderly rules ("… when the men come back... they distribute the fish among their clans folk... if someone would not share with the clan relatives he would become very unpopular", Bell, op. cit., p. 262). Trobrianders do indeed smoke fish, formerly to have food in the days after the catch and in recent times to make them a commodity for cash sale in the weekly local market. Yams *(tetu, Dioscorea alata)*, the very much valued staple diet of the Trobriand Islanders, is produced by family units and at harvest

time almost completely given away to relatives, particularly to the husband's father or elder brother, their most powerful relatives who will support them in future undertakings. The family's own supply is safeguarded, within this complicated *uligubu* exchange network, by the various gifts from other relatives (Bell Krannhals & Schiefenhövel, 1986). The rather unique *uligubu* system of sharing the central staple food is difficult to understand from a European perspective: A farmer would, most probably, not like to hand over all his harvest to his relatives and trust that he would receive sufficient food for his own family in turn. This typical Trobriand tradition must be understood (Bell, op. cit.) as a mechanism to gain status (the ones who give most and the ones who receive most) not to amass a surplus of food.

The big men and formal chiefs *(guyau)* receive such large amounts of harvest gifts that their relatives build special yams storage houses *(liku)* for them. Sometimes yams rot there because there is so much surplus. This scenario would lend itself to "tolerated theft"... but it does not happen.

The situation concerning (tolerated) theft can be different when foreigners, like white ethnographers, missionaries, shop owners etc., are concerned. In many regions New Guineans seem to have the concept that the visitors from the west are in possession of so much surplus that it is ok to steal from them. Another reason for this behaviour, which is seen to be ethically wrong when it occurs among themselves, is that we strangers do not belong to them, do not have blood ties and won't be defended in the classic way through violent revenge acts performed by our brothers, fathers, uncles and the like. The strangers must tolerate theft because they do not have (at least in post-colonial days) the power to prevent or revenge it.

I have once been victim of such massive breach of trust when the two modest huts which we had build (and paid for of course) as a small human ethology field station were burned down and most of the carefully locked aluminium boxes broken open, equipment stolen or destroyed. This act was part of a politically motivated campaign against my main local assistant. I called in the paramount chief who ruled that I should be compensated… which never happened. The persons who committed the act knew quite well that I would be furious and seek justice, but they also knew that I was basically powerless and would have to accept destruction and theft of my possessions. It was "tolerated theft" of a special kind.

Among the Eipo, typical Papuan mountain horticulturists, collectors and hunters (Schiefenhövel 1976, 1991) I have, in the course of repeated stays since 40 years, never had, fortunately, any such deplorable experience as on the Trobriand Islands. Among the Eipo, in the same way than everywhere in Melanesia, fights commonly break out because one person e.g. violates the border between individual garden plots, steals a pig or does some similar unlawful thing (by far most often it is extramarital sex which creates conflict), but there is also no situation I recall in this ethnic group where tolerated theft would have been carried out in the Torres Straight Islander way described by Bird & Bird (op. cit.). Neither is the concept of tolerated theft in any way the norm of accepted behaviour.

When there is, in the villages of the Eipo, a lot of harvest, most commonly to feed a large group of guests from another valley far away, all food is distributed

very orderly to those who are entitled to get a share. Special persons, men at the big feasts, are the official distributors… a very responsible job: If they make obvious mistakes, a fight may quickly flare up or, worse on the long run, this person may lose his face, his reputation. That is the last thing one wants to happen in these closely-knit societies – in the modern shark tank world of today, protagonists who are in charge of sharing and 'shares' don't seem to care. They take or get their unfair portion by tolerated theft – it is called *bonus*.

Also Trivers (1971) believes that tolerated theft is the basis for reciprocal altruism which, according to him and other authors, requires a face-to-face society (like that of typical hunter-gatherer groups) where people know each other and often haven repeated transactions with each other. Humans have, as Cosmides (op. cit.) states, an extraordinarily well functioning memory for former social interactions; this is an important building block for the emergence of reciprocal altruism, which is defined in such way that the benefit for the recipient of an altruistic act must be bigger than that of the person who does the altruistic act. – One could argue that begging is a form of tolerated theft. Beggars often use ethologically very powerful releasers, like babies, to gain access to the empathy of possible givers who are more or less forced to render some of their resources. Despite this aspect I do not think, that tolerated theft is a common strategy of sharing in contemporary societies. Humans have internalised the rules of proper conduct vis-à-vis property and share according to clear, albeit often quite complicated rules.

In non-human primates, as has been shown, sharing is usually limited to genealogically related individuals, who have a reciprocal relationship (Silk et al. 2005) and those who might benefit from a special relationship to another individual, either as sexual partner or as ally (de Waal 2000, Jaeggi & van Schaik 2011). The latter finding that sharing can be "politically" motivated indicates that non-human primates do have the mental capacity to assess, judge another individual, its past behavioural history, its present status, perhaps its possible future status and in general its possible usefulness for own plans and aspirations. This is a precondition to build up a functioning cooperative system in which different individuals are following their own strategies of relationship, reciprocity and, possibly, revenge.

Chimpanzees *(Pan troglodytes)* and to a probably somewhat lesser extent Bonobos *(Pan paniscus)* are the most advanced in exhibiting prosocial behaviours. In captivity, chimpanzees have been observed (de Waal 1989) to assist each other in tasks which one animal would not be able to perform alone and to form long lasting "political" coalitions. It is possible that individuals of these species, because they live in complex social groups, often witness acts of sharing and that this enhances their tendency to be cooperative (Jandrasits 2012).

Interestingly chimpanzees show a primordial sense of fairness: if one individual is given more food then its neighbour, it reacts with anger (de Waal 1991). Recently, studies have revealed (Kotrschal 2010) that even dogs become annoyed by repeated unfair treatment. In a case he reported two dogs had to perform a paw-giving task for which they were normally rewarded with food. When one dog was constantly neglected and not given any reward, it started to stop cooperating and express "dislike" and "anger". There

may be many more social animal species which have the capacity to cognitively monitor cooperation of different kinds and are able to detect unfairness. It is likely that they would be the ones where non-kin food sharing can be observed. According to Isaac (1978) the human social exchange system is characterised by "active sharing" which he claims has not reached the same level in animals than in humans. Also he sees acts of "tolerated scrounging" (i.e. "tolerated theft") in non-human animals as precursor for active sharing and explains the human capacity for this form of cooperation by the fact that all human groups are characterised by division of labour (which is most visible as division of labour between the sexes) plus the fact that humans have developed special methods to transport goods from one place to another. A small group of palaeolithic hunters would cut up a large prey and carry it, perhaps with the use of pole and string or bags etc., to the place where the rest of the extended family or group were. Here, the act of active sharing became a vitally important element of human existence, women, children and the elderly could thus participate from the valuable protein brought back by the men. Intuitively, this scenario has quite some appeal as providing a stage for the emergence of typical human generosity in sharing.

Kaplan and Hill (1985) argue against the classic sociobiological views on sharing.

They claim that sharing of resources partly takes place independently of genetic relatedness, that there is no clear cut system of reciprocity, i.e. individuals who give a lot do not always receive a lot and that resources are not, as postulated in the "tolerated theft" hypothesis, only shared when the effort to keep them is higher than the effort to defend them. They believe that mechanisms of group selection are more likely than those of individual selection to have given birth to altruism in general and sharing in particular and that common taking care/administration of resources benefitted everyone. This was, at the time they published their hypothesis, a rather daunting attack on the then leading theory of quasi egoistic individual selection (cp. Wilson 1975, Dawkins 1976). It is most interesting that group selection principles, which early on were also postulated by Eibl-Eibesfeldt (1984), are getting a much friendlier reception in recent years. Even Wilson and Hölldobler (2009), champions of sociobiology in general and ant research in particular, now see some elements of group selection at work – It is probably fair to say that the tendency for altruistic acts, cooperation and sharing, so typical for our own species, have been shaped, in the long process of hominization, by several independent evolutionary mechanisms. Group selection may very well have been an important one.

Schebeck (quoted after Peterson, 1993) has formulated a hypothesis which runs contrary to biological and evolutionary explanations of sharing. He believes that the origin of sharing comes from the fact that people demand from others, not that giving happens basically voluntarily. In a similar way Peterson (1993) sees that there are cultural differences concerning the norms of sharing (e.g. western societies stressing generosity) but still thinks that most acts of giving are brought about by demand. Fieldwork among Australian Aborigines seems to support this position. Yet, in my experience from 49 years of fieldwork in Melanesia and Indonesia there is much more

voluntary sharing than giving as a mere reaction to demand.

Byrne and Whiten (1988) and Byrne in a later publication (1996) postulate that an increase of cognitive power, especially those classed as Theory of Mind (ToM), which I call emphronesis, enables the employment of subtle social strategies and that these individuals gain Darwinian fitness through seemingly altruistic, honest and prosocial behaviours which are basically egoistic. In his words these abilities make up what he calls "Machiavellian intelligence", an important asset when it comes to sharing and exchange.

Conclusions – Proximate mechanisms of sharing and the joy to share

I hope it has become evident that "do ut des", the permanent giving, receiving and sharing going on in the human species, is much more complicated and complex than predicted by the classic Axelrod model (1984) of "tit-for-tat" which could be taken a exemplification of the age-old concept of *Homo oeconomicus* or "rational choice" which is still held dear by scholars in the arts and humanities. Many of them think in the idealistic Kantian tradition: If only humans were rational, guided by insight and ethics, the world would be such a better place. Yet, being emotion-driven, acting on the rein of evolved perception, evaluations, wishes and the like, we are a much more complex product of Darwinian evolution than just an animal with a well functioning calculator in its brain. And, I may add, most probably we are much more human, in the sense of a humanistic ideal, that way. Quite a consolation.

In German and probably other European and North American advisory books (of which there sometimes seem to be more around than possible readers) parents are told (Jandrasits 2012) that small infants cannot share because their wish to possess is too strong for altruistic acts. It may be Freudian theory which lies behind such distorted *Menschenbild* of our little ones. I remember vividly walking across the village square of Munggona, a settlement in New Guineas inaccessible mountains, when a little boy of about 2 and a half years of age stopped besides me, broke the piece of sweet potatoes he was eating from into two and handed me one half – a gorgeous smile on his tiny face. What made him do that? At that time, in the early days of our fieldwork, infants and children often cried when we came in sight: European "Black Men", white skinned monsters, much taller than everyone they knew, and of strange appearance. The evolutionary imperative "act altruistically, make him your partner!" must have been stronger than possible fear. I padded the brave little boy on his woolly head and thanked him for his gift. I did not bite in it; too copious was the snot from his running nose spread over the tasty morsel.

Do scientists concerned with the origin and patterns of sharing not have experiences like this? Or why do paedagogics, sociologists etc. develop their paradigm that only actively teaching generosity will lead to a generous person? Obviously, there is a solid biopsychic fundament even in the very young human brain which regulates the wish to have (very early present in the ontogeny of children), but also the preparedness to share. This fundament is the basis of all cultural superstructure creating the manifold ways and rules of give and take.

Without the inherent tendency to behave altruistically, cultures could not succeed to build norms of generous behaviour, of giving to the poor and the ones in need and of following the principles of loyalty and solidarity.

Just as communist ideology could not do away with the "bad" and "dangerous" human wish to possess certain things just for oneself, a small piece of land, a cow, a little house etc. ideologies not grounded in the evolved human psyche are bound to fail… or must be pushed through with outmost brutality, cp. present day North Korea. The quest for and concept of ownership is, intrinsically, connected to the possibility sharing. The two form an evolutionary bracket which can hardly be forced apart. If an infant does not feel and thereby knows that a certain object is "mine", she/he cannot share it in a meaningful way. If everything belongs to everyone, the act of giving is a meaningless transfer but not a heart-warming, socially powerful transaction in the Maussian sense (1923–1924).

V. Heeschen, I. Eibl-Eibesfeldt and myself (1980) have conducted a fine grained analysis of a filmed scene where some Eipo girls of the Highlands of West-New Guinea shared nutritionally very valuable and very tasty nuts (Eipo*: win, Pandanus brosimos)*. It is fascinating how complex and highly orchestrated these simple looking acts, stretching over many minutes actually are. One of the girls is the owner of this very much sought after fat containing delicacy and very skilfully uses her position as distributor. The girls surrounding the owner are differently close to her (physically as well as socially) and receive at different rates and in different quantities. Some utilise subtle signals to request of which eye contact is a very effective one. Also, begging gestures are seen. It is really remarkable how socially complex such a scene is and how subtle and diverse the individual gestures are performed. At the end, everyone receives some nuts and social peace is maintained. The fact that the girls at the scene are children demonstrates how soon the repertoire of requesting and sharing is mastered.

In my view it is most likely that these capacities mature on solid biopsychic ground. The evolutionary preparedness and joy to give, existing early on in the life of infants (cp. Jandrasits 2012) plus the gain in prestige and rank connected to skilful giving plus the Maussian power of reciprocity the giver exerts over the receiver are important elements in the manifold daily acts of sharing and must have been decisive advantages in the early days of our hominid ancestors. Step by step our species developed the exquisitely human trait of culturally refined sharing and offering food. The lavish feasts we are inviting each other to are built adaptations acquired in distant pasts.

Conflict of interest

The Author declares that there is no conflict of interest.

Corresponding author

Wulf Schiefenhövel
e-mail address: schiefen@orn.mpg.de

References

Alexander RD. 1987. The Biology of Moral Systems. New York: Aldine de Gruyter.

Axelrod R. 1984. The Evolution of Cooperation. New York: Basic Books.

Bell I. 1990. Haben um zu geben. Eigentum und Besitz auf den Trobriand-Inseln, Papua New Guinea. Basel: Wepf.

Bell-Krannhals I, Schiefenhövel W. 1986. Repu et de bonne réputation – Système de partage du yam aux îles de Trobriand, Nouvelle Guinée Papou. Bulletin d'Ecologie et Ethologie Humaines 5(1/2):128–40.

Bird RL, Bird DW. 1997. Delayed Reciprocity and Tolerated Theft. The Behavioral Ecology of Food- Sharing Strategies. Curr Anthropol 38(1):49–78.

Blurton Jones NG. 1984. A Selfish Origin for Human Food Sharing: Tolerated Theft. Ethol Sociobiol 5(1):1–3.

Byrne R, Whiten A editors. 1988. Machiavellian Intelligence, Social Expertise and the Evolution of Intellect in Monkeys, Apes and Humans. Oxford: Clarendon Press.

Byrne RW. 1996. Machiavellian Intelligence. Evol Anthropol 5(5):172–80.

Cosmides L. 1989. The logic of social exchange: Has natural selection shaped how human reason? Studies with the Wason selection task. Cognition 31:187–276.

Darwin Ch. 1872. The Expression of Emotions in Man and Animals. London: Murray.

Dawkins R. 1976. The Selfish Gene. Oxford: Oxford University Press.

Eibl-Eibesfeldt I. 1975. Krieg und Frieden aus der Sicht der Verhaltensforschung. München: Piper.

Eibl-Eibesfeldt I. 1984. Die Biologie des menschlichen Verhaltens. Grundriss der Humanethologie. München: Piper.

Fehr E, Fischbacher U, Gächter S. 2002. Strong Reciprocity, Human Cooperation, and the enforcement of Social Norms. Human Nature 13(1):1–25.

Fehr E. Gächter, S. 2002. Altruistic punishment in humans. Nature 415(6868):137–40.

Fehr E, Fischbacher U. 2003. The nature of human altruism. Nature 425(2043):785–91.

Fehr E, Bernhard H, Rockenbach B. 2008. Egalitarianism in young children. Nature 454(7208):1079–83.

Feistner ATC, Price EC. 1999. Cross-generic food sharing in tamarins. Int J Primatol 20(2):231–36.

Feistner ATC, McGrew WC. 1989. Food-sharing in primates: a critical review. In: PK Seth and S Seth, editors. Perspectives in primate biology, vol 3. New Delhi: Today and Tomorrow's Publishers. 21–36.

Fossey D. 1983. Gorillas in the Mist. Boston: Houghton Mifflin Company.

Fragaszy D, Izar P., Visalberghi E, Ottoni EB, Gomes de Oliveira M. 2004. Wild capuchin monkeys (Cebus libidinosus) use anvil and stone pounding tools. Am J Primatol 64:359–66.

Frank RH. 1988. Passion within Reason. The Strategic Role of Emotions. New York: Norton.

Hamilton WD. 1963. The Evolution of Altruistic Behavior. Amer Nat 97(896):354–56.

Hamilton W. D. (1964) The genetical evolution of social behavior. J Theor Biol 7:1–52.

Heeschen V, Schiefenhövel W. Eibl-Eibesfeldt I. 1980. Requesting, Giving and Taking. The Relationship Between Verbal and Nonverbal Behavior in the Speech Community of the Eipo, Irian Jaya (West-New Guinea). In: MR Key, editor. The Relationship of Verbal and Nonverbal Communication – Contribution to the Sociology of Language. Paris, New York: Mouton, Den Haag. 139–66.

Heeschen V, Schiefenhövel W. 1983. Wörterbuch der Eipo-Sprache. Eipo-Deutsch-Englisch. Berlin: Reimer.

Hölldobler B, Wilson EO. 2009. The Superorganisms. The Beauty, Elegance and Strangeness of Insect Societies. New York: Norton.

Isaac G. 1978. The Food-Sharing Behavior of Protohuman Hominids. Sci Am 238(4):90–108.

Jaeggi AV, van Schaik CP. 2011. The evolution of food sharing in primates. Behav Ecol Sociobiol 65:2125–40.

Jandrasists N. 2012. Teilen aus evolutionärer und entwicklungspsychologischer Sicht. Diploma Thesis. Faculty of Natural Sciences. Institute of Psychology. University of Innsbruck

Kaplan H, Hill K. 1985. Food Sharing among Ache Foragers: Tests of Explanatory Hypotheses. Curr Anthropol 26(2):223–46.

Kohli M. 1999. Private and Public Transfers between Generations: Linking the Family and the State. European Societies 1(1):81–104.

Kotrschal K. 2010. In einem Boot: warum soziale Beziehungen zwischen Menschen und Tieren möglich sind. Lecture, Meeting, Catholic Academy of Bavaria in Passau. 7.5.2010.

Kummer H. 1991. Evolutionary transformations of possessive behavior. In: FW Rudmin, editor. To have possessions: A handbook on ownership and property (special issue). J Soc Behav Pers 6:75–83.

Lorenz K. 1956. Moralanaloges Verhalten geselliger Tiere. Universitas 11:691–704.

Lorenz K. 1978. Vergleichende Verhaltensforschung. Grundlagen der Ethologie. Wien: Julius Springer.

Malinowski B. 1922, 1961. Argonauts of the Western Pacific. An account of native enterprise and adventure in the archipelagoes of Melanesian New Guinea. New York: Dutton.

Mauss M. 1923–24. Essai sur le don. Forme et raison de l'échange dans les sociétés primitives. L'Année Sociologique, seconde série 30(186):143–279.

Medicus G. Was uns Menschen verbindet. Humanethologische Angebote zur Verständigung zwischen Leib- und Seelenwissenschaften. Verlag für Wissenschaft und Bildung, Berlin. In press.

Peterson N. 1993. Demand Sharing: Reciprocity and the Pressure for Generosity among Foragers. Am Anthropol 95(4):860–74.

Roewer L, Croucher PJ, Willuweit S. Lu TT, Kayser M, Lessing R, de Knijff P, Jobling MA, Tyler-Smith C, Krawczak M. 2005. Signature of recent historic events in the European Y-chromosomal STR haplotype distribution. Hum Genet 116(4):279–91.

Salter F. 2003. On Genetic Interests: Family, Ethny and Humanity in an Age of Mass Migration. Frankfurt: Peter Lang Verlag.

Schiefenhövel W. 1976. Die Eipo-Leute des Berglands von Indonesisch-Neuguinea: Kurzer Überblick über den Lebensraum und seine Menschen. Einführung zu den Eipo-Filmen des Humanethologischen Filmarchivs der Max-Planck-Gesellschaft. Homo 26(4):263–75.

Schiefenhövel W. 1991. Eipo. In: TE Hays, editor. Encyclopedia of World Cultures. Vol. II, Oceania. Boston: G.K. Hall & Co. 55–59.

Silk JB, Brosnan SF, Vonk J, Henrich J, Povinelli DJ, Richardson AS, Lambeth SP, Mascaro J, Schapiro SJ. 2005. Chimpanzees are indifferent to the welfare of unrelated group members. Nature 437(7063):1357–59.

Trivers RL. 1971. The Evolution of Reciprocal Altruism. Q Rev Biol 46(1):35–57/

Voland E, Chasiotis A, Schiefenhövel W editors. 2005. Grandmotherhood – The evolutionary significance of the second half of female life. New Jersey: Rutgers University Press.

de Waal F. 1982. Chimpanzee Politics – Power and Sex among Apes. London: Jonathan Cape.

de Waal F. 1989. Food-sharing and reciprocal obligations in chimpanzees. J Hum Evol 18:433–59.

de Waal F. 1991. The chimpanzee's sense of social regularity and its relation to the human sense of justice. Am Behav Sci 34(3):335–49.

de Waal F. 1996. Good Natured. The Origins of Right and Wrong in Humans and Other Animals. 3rd edition. Cambridge: Harvard University Press.

de Waal F. 2000. Attitudinal reciprocity in food sharing among brown capuchin monkeys. Ani Behav 60:253–61.

Wickler W. 1971. Die Biologie der Zehn Gebote. München: Piper.

Wickler W. 1991. Die Biologie der Zehn Gebote. Warum die Natur für uns kein Vorbild ist. München: Piper.

Wilson EO. 1975. Sociobiology. The New Synthesis. Cambridge: Harvard University Press.

Winterhalder B. 1996. A Marginal Model of Tolerated Theft. Ethol Sociobiol 17(1):37–53.