

Frans de Waal . selected references

- 1 de Waal, F. B. (2012). The antiquity of empathy. *Science*, 336, 874-876.
Notes: The view of humans as violent war-prone apes is poorly supported by archaeological evidence and only partly supported by the behavior of our closest primate relatives, chimpanzees and bonobos. Whereas the first species is marked by xenophobia, the second is relatively peaceful and highly empathic in both behavior and brain organization. Animal empathy is best regarded as a multilayered phenomenon, built around motor mirroring and shared neural representations at basal levels, that develops into more advanced cognitive perspective-taking in large-brained species. As indicated by both observational and experimental studies on our closest relatives, empathy may be the main motivator of prosocial behavior

- 2 de Waal, F. B. & Ferrari, P. F. (2010). Towards a bottom-up perspective on animal and human cognition. *Trends in Cognitive Sciences*, 14, 201-207.
Notes: Over the last few decades, comparative cognitive research has focused on the pinnacles of mental evolution, asking all-or-nothing questions such as which animals (if any) possess a theory of mind, culture, linguistic abilities, future planning, and so on. Research programs adopting this top-down perspective have often pitted one taxon against another, resulting in sharp dividing lines. Insight into the underlying mechanisms has lagged behind. A dramatic change in focus now seems to be under way, however, with increased appreciation that the basic building blocks of cognition might be shared across a wide range of species. We argue that this bottom-up perspective, which focuses on the constituent capacities underlying larger cognitive phenomena, is more in line with both neuroscience and evolutionary biology

- 3 de Waal, F. B. & Suchak, M. (2010). Prosocial primates: selfish and unselfish motivations. *Philosophical Transactions of the Royal Society.B: Biological Sciences*, 365, 2711-2722.
Notes: Non-human primates are marked by well-developed prosocial and cooperative tendencies as reflected in the way they support each other in fights, hunt together, share food and console victims of aggression. The proximate motivation behind such behaviour is not to be confused with the ultimate reasons for its evolution. Even if a behaviour is ultimately self-serving, the motivation behind it may be genuinely unselfish. A sharp distinction needs to be drawn, therefore, between (i) altruistic and cooperative behaviour with knowable benefits to the actor, which may lead actors aware of these benefits to seek them by acting cooperatively or altruistically and (ii) altruistic behaviour that offers the actor no knowable rewards. The latter is the case if return benefits occur too unpredictably, too distantly in time or are of an indirect nature, such as increased inclusive fitness. The second category of behaviour can be explained only by assuming an altruistic impulse, which-as in humans-may be born from empathy with the recipient's need, pain or distress. Empathy, a proximate mechanism for prosocial behaviour that makes one

individual share another's emotional state, is biased the way one would predict from evolutionary theories of cooperation (i.e. by kinship, social closeness and reciprocation). There is increasing evidence in non-human primates (and other mammals) for this proximate mechanism as well as for the unselfish, spontaneous nature of the resulting prosocial tendencies. This paper further reviews observational and experimental evidence for the reciprocity mechanisms that underlie cooperation among non-relatives, for inequity aversion as a constraint on cooperation and on the way defection is dealt with Living Links, Yerkes National Primate Research Center and Psychology Department, Emory University, Atlanta, GA, USA. dewaal@emory.edu

4 de Waal, F. B. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annual Review of Psychology*, 59, 279-300.

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Evolutionary theory postulates that altruistic behavior evolved for the return-benefits it bears the performer. For return-benefits to play a motivational role, however, they need to be experienced by the organism. Motivational analyses should restrict themselves, therefore, to the altruistic impulse and its knowable consequences. Empathy is an ideal candidate mechanism to underlie so-called directed altruism, i.e., altruism in response to another's pain, need, or distress. Evidence is accumulating that this mechanism is phylogenetically ancient, probably as old as mammals and birds. Perception of the emotional state of another automatically activates shared representations causing a matching emotional state in the observer. With increasing cognition, state-matching evolved into more complex forms, including concern for the other and perspective-taking. Empathy-induced altruism derives its strength from the emotional stake it offers the self in the other's welfare. The dynamics of the empathy mechanism agree with predictions from kin selection and reciprocal altruism theory

5 de Waal, F. B. (2005). A century of getting to know the chimpanzee. *Nature*, 437, 56-59.

Notes: A century of research on chimpanzees, both in their natural habitat and in captivity, has brought these apes socially, emotionally and mentally much closer to us. Parallels and homologues between chimpanzee and human behaviour range from tool-technology and cultural learning to power politics and intercommunity warfare. Few behavioural domains have remained untouched by this increased knowledge, which has dramatically challenged the way we view ourselves. The sequencing of the chimpanzee genome will no doubt bring more surprises and insights. Humans do occupy a special place among the primates, but this place increasingly has to be defined against a backdrop of substantial similarity