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Beyond the provable?

Commentary on **Kujala** on *Canine Emotions*

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Abstract: Reading Kujala's (2017) target article, I wondered whether we really need to approach the issue of animals' emotions the traditional way, asking whether animals have emotions that are identical, similar or precursors to those of humans. As an ethologist, I prefer to examine psychological phenomena from an evolutionary perspective, focusing on Tinbergen's (1963) four questions (Bateson & Laland 2013).

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One might claim that the emergence of expressions of inner states/emotions during evolution is self-evident in contexts when honest signals are adaptive. Yet we can never know whether and how animals *feel* emotions; this might not even fall into the category of processes that can be studied by science. In an increasing number of species we can nevertheless collect behavioural and physiological data that can be connected to emotional situations or to the processing of inner states of social partners (see Andics et al. 2016, Kis et al. 2017, for the case of dogs). Whether we can extend this to non-human animals depends only on how broadly we define *emotion*. I do not blame Kujala (2017) for not providing a proper definition early on. Coming up with one that would fit into the theoretical framework of all related fields would have been a huge challenge.

Should we compare them to ourselves? We would like to compare advanced functions in non-human animals to our own, partly to learn how we evolved into the only species able to write papers on the welfare of other species, partly because learning more about animals' inner states, emotions, intentions, and ability to suffer may help us decide how to treat them. To reach these goals we need to argue within the theoretical framework of one of the relevant disciplines (biology, psychology, philosophy, etc.); it is too early to try combining them all.

Ethologically basic emotions. Some 40 to 50 years ago, it was already self-evident that the most popular model species, the mouse, does have at least one emotion: *fear* (e.g., Blanchard and Blanchard 1969). Aggression – referring to aggressive behaviours rather than *anger* – was also widely investigated in mice (e.g., Svare and Gandelman 1973). In the case of both fear and aggression, all four categories of Tinbergen's (1963) criteria (phylogeny, adaptive value, mechanism, and ontogeny) had been extensively studied in appropriate experimental environments.

Among positive emotions, although satiation (contentment?) may not be an emotion, *social play* can be associated with *enjoyment*, so the inner state in social play may be closely related to the human notion of *happiness* (e.g., Garvey 1990).

Our oldest and special friend. The non-human species about whose cognitive abilities, social behaviour, and emotions we know the most is the domestic dog (e.g., Pongrácz et al. 2006, Faragó et al. 2014a), although biologists cannot even reach a consensus on its taxonomic name. In the USA and Australia, it is called *Canis lupus familiaris* (because of the minimal genetic differences from the wolf); in most of Europe, it is called *Canis familiaris* (because of the huge ecological and behavioural differences from the wolf). Both sets of researchers insist on using their taxon in their publications and passively accept the other label in the papers of others. This would be a minor issue if we did not know that dogs, unlike wolves, are *attached* to their owners (Topál et al. 2005). This unique interspecific social bond has been shown to be functionally similar to the human infant–mother attachment bond (Topál et al. 1998); it is not to be confused with social attraction. Since our dogs are dependent on us and we provide a secure base (Horn et al. 2013), a safe haven (Gácsi et al. 2013) and social reference (Merola et al. 2012) for them, it is a major concern whether they need to be treated with specific care. *Attachment* is not an emotion, however, but a testable behavioural system; in relevant situations dogs show typical responses to the absence and presence of their owners. Labelling these responses (separation) *anxiety* rather than sadness or fear, and *greeting* behaviours rather than happiness, seems scientifically sound. However, we might end up in the same situation as in the case of animal *personality*, a trait that was formerly reserved for humans, but we now recognize in animals (Gosling 2001).

Secondary emotions – putting words in quotations helps? According to most definitions, secondary emotions require more processing and arise from beliefs or expectations related to other/primary emotions (Evans 2001). These pose a challenge for testing in animals. However, it can help if we adopt a functional approach and consider the adaptive value of the behaviours that are functionally similar to human ones. We can study the phylogenetic roots of complex human emotions such as *empathy* in animals (Preston & De Waal 2002); already in the 60s, researchers had demonstrated "empathy-like" behaviour in rats (Rice & Gainer 1962). In dogs, *jealousy* seems a clear case; defending a possession, a bone, a mate, or another valuable social partner (owner) may well belong to the very same, relatively simple biological system.

Owners seem to be able to differentiate *guilty* and non-guilty greeting behaviours in their dogs, but dogs also tend to show guilty behaviours if they face a temptation but can resist it (Hecht et al. 2012). Yet guilty behaviour cannot be proof of a high socio-cognitive capacity. Even in humans, guilt is strongly connected to culture; we all learn the specific rules of our

smaller and larger social groups during development, and we either behave accordingly, or show signs of guilt. Some of us may even feel guilty. But we all learn how and why to *express* guilt – because it is adaptive.

Attributed emotions? Based on 20 years of data from our basic questionnaire at the Family Dog Project, Budapest, some dog owners take a stance on considering their pet dogs as family members/children, whereas others claim that dogs are no different from other useful domestic species – although the proportion of the two extremes keeps changing.

In the traditional approach, which is still alive, dog-human relationships are thought to be based on the rules of a wolf pack: in dog-human mixed packs, the owner must act as an alpha wolf. In contrast, some researchers (and many owners) have adopted an anthropomorphic approach and attribute human-like roles and capacities to the dog. Pet dogs live in a social world similar to that of human infants; some experiments have revealed close similarities between dogs and infants. Hence viewing pet dogs as children also has some basis. It has recently been suggested that the modern human-pet dog bond is more like a friendship that may include asymmetry, such as dominant–subordinate or caregiver–receiver roles in the relationship (Miklósi 2014). The fact that owners attribute human-like emotions to their dogs is accordingly not surprising; it cannot be considered just unscientific anthropomorphism but is rather a phenomenon worth studying (Konok et al. 2015).

Robotic emotions. Functional behavioural parallels between dogs and humans suggest a trend for convergent evolution; thus, the dog has been widely used as a natural model for studying some aspects of the evolution of human socio-cognitive behaviour. The similar function of assistance dogs and service robots or pet dogs and companion robots, also makes dogs a promising model for developing social robots (Miklósi et al. 2017). Questionnaire data have revealed that the most preferred features of our dogs are connected to their emotions (toward us); so, we should try to use the features of dogs' basic emotional behaviours to design more lovable (acceptable) social robots (Konok et al. 2017). Human-like social skills in robots are still far away, so it might be more useful to view robots as a new species. The main advantage of building canine social behaviour into companion robots is that it is relatively simple, so it may be more easily implementable technically (Lakatos et al. 2014). Recent data suggest that people can understand the emotional expressions of a robot if its behaviour was inspired by dog behaviour (Faragó et al. 2014b), and tend to accept a service robot more readily if, in emotion-laden situations, it shows responses borrowed from dog behaviour (Gácsi et al. 2013b).

Each doing our share. The task of biologists is to collect sound data, observe, measure, and analyse the behaviours and physiological changes in animals in relevant contexts. Psychologists and philosophers can provide deeper insights into human-specific features and can integrate cultural and moral aspects of emotional processing. Sizing up, making decisions, and bearing the consequences – that's for all of us to do.

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